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STREET RAILWAY REVIEW

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No. 1

Middleboro, Wareham & Buzzards Bay Street Ry.

Some Operating Features of the Road—Employing Car Service Men—Block Signal System—General Inspection—Chart System of Posting Schedules.

So much is printed nowadays in the proceedings of the technical societies, associations and the trade press in general concerning the larger electric railway installations of the country that a thousand and one bothersome questions confronting the management of the medium size and smaller electric railway properties are often neglected and do not receive their share of discussion. Inasmuch as the problem arising in the larger installations are of practical interest to but a small minority of the electric railway fraternity, it would seem that more data ought to be forthcoming on numerous questions of practical interest to the constructing engineers and operating officials who are responsible for the success of what are frequently but indefinitely termed the smaller roads. It has always been the aim of the "Review" to give especial attention to the demand for this class of information.

On the Middleboro, Wareham & Buzzards Bay Street Ry., in the Cape Cod region in southeastern Massachusetts; will be found a

Mr. Charles H. Cox, resident general manager of the company, holds it as self-evident that the old, hard and fast methods of dealing with men, which were more or less prevalent in the early days of the art, have no place in modern economic conditions. The requirements of the service demand that men of higher mental attainment be secured to take charge of cars, that they be paid good wages, and that such rules and regulations be formulated as shall appeal to the intelligence of the men and secure their good will and hearty co-operation in the management of the company's business. The men are no longer mere machines, and cannot be so treated. This does not mean that the manager must subserve the interest of the company to the interests of the men, but it does mean that both interests must be considered and harmonized if the company's business is to go forward with that vim and snap that always characterizes the successful business enterprise.

Mr. Cox believes in permitting the men to express ideas and



TRESTLE BRIDGE 70 FT. LONG ACROSS BUTTERMILK BAY NEAR BUZZARDS BAY, MASS.

number of original schemes and ways of doing things that cannot fail to be of interest. Physically, the system comprises 26 miles of track and is a typical New England road, similar to any one of a dozen interurban roads in Massachusetts. Of the total 18 miles is built with 60-lb. T-rails in 60-ft. lengths, and 4 miles is 75-lb. T-rails in 30-ft. lengths. The rest of the mileage is over tracks of another company. The system is single track throughout with turn-outs at intervals averaging two miles. The overhead construction embodies a single line of 30-ft. round chestnut poles with flexible bracket suspension, supporting No. 00 round trolley wire. The rolling stock includes twelve 12-bench double truck open cars; five 15-bench double truck open cars; eight double truck vestibuled closed cars; one box freight car; one flat car, and four single truck nose snow plows. The physical characteristics will be described in greater detail later. The company at present has no power house of its own, but rents power from the Wareham power house of the New Bedford & Onset Street Ry., which was described in the "Review" for Dec. 15, 1901.

Perhaps in view of the present widespread discussion of vital labor issues, the feature of chief interest will be the company's attitude towards its men and the effort of the management to find a common ground upon which the men and the management can meet and stand.

suggestions concerning any detail of the service, provided of course that those suggestions be made in a dignified way and through proper channels. In the employees' waiting room at the car barn Mr. Cox has placed a wooden box with a slot in the top to which is attached a placard reading: "For the improvement of the service. Put your ideas in writing and drop them in this box," and at regular intervals these notes are taken out and carefully looked over by the management, a record of them being taken. Twice a year the men offering the best suggestions are awarded suitable rewards for their interest shown. When an employee, no matter what his grade, drops a suggestion in the box he is asked to come to the general manager's office to talk the matter over. The manager meets the man in his private office and after making the employee feel at home and at ease goes over the whole subject, asks questions and encourages the man to enlarge upon his suggestion and state his ideas in the minutest detail. The manager never ridicules a suggestion, no matter how impracticable it may be, but if necessary he explains to the man just why it is impossible to carry the idea into execution. Many of the suggestions that come in this way, however, are found to be of unquestionable practical value, and many of them placed in execution have resulted in distinct improvement.

Asked if he had found any tendency on the part of the men to take advantage of this freedom and become "chummy" with the

manager, Mr. Cox replied that he had had no difficulty along that line. A proper attitude of dignity and self-control on the part of the manager seemed to engender a similar attitude on the part of the men, and while they appreciated the confidence and freedom they have there is no inclination to overstep proper bounds, and the relation is one of mutual confidence and respect. This feeling cannot fail but redound to the good of all concerned.

As an instance of the efforts of the management to foster the spirit of good will, Mr. Cox at opportune intervals endeavors to get little notices into the reading columns of the local papers commending the service of the company's employees. Copies of the paper containing such notices are always posted on the bulletin board where the men will see them. As an example of a newspaper item of this nature the following is quoted: "Many are the compliments paid daily to the conductors and motormen of the Middleboro, Wareham & Buzzards Bay Street Railway Co. for their polite acts and courteous treatment of passengers. The employees all seem to have but one desire, and that is to be obliging. It is their custom to assist women and children and aged men on and off the cars, and they do it with a pleasure that is almost invariably recognized with 'I thank you, sir.'" Notices of this kind are good in many ways. They bring about a feeling of good will between the public and the employees, they show the employees that their efforts are appreciated by both the company and the public, and they also set a high standard of reputation to which each man tries to do justice.

The following are a few pointers as laid down by Mr. Cox: Make your road popular with the men and with the public. Never reprimand a man in presence of any one else. If the reprimand is necessary do it in private. When it can possibly be avoided do not lay off men, as the loss of pay punishes the man's family worse than it does the wrongdoer, and engenders hard feeling. During snowstorms and other trying times when the men are doing extra service provide for their comfort. Supply sandwiches and hot coffee when the men are fighting snow, even if it is necessary to drive with a team along the line to do this. Be liberal in the payment for overtime, as a few extra dollars invested in this way is money well spent. Issue all important orders in writing, and do not be surprised if employees fail to obey instructions hurled at them verbally on the spur of the moment. It is the custom on this road when a special order is issued to have every employee sign a blank certifying that he has read the order, that he thoroughly understands it, and that he is immediately prepared to carry it into effect. These signatures are certified to by the foreman in writing.



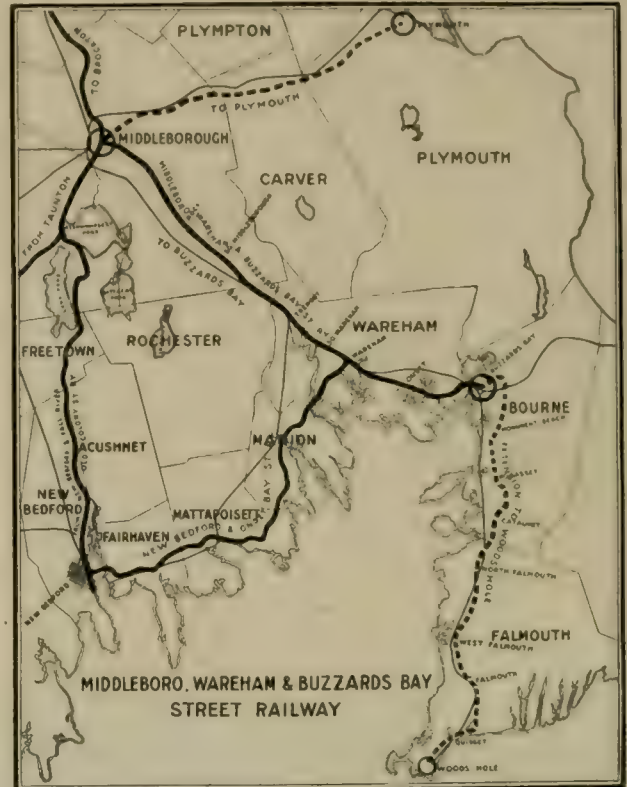
MILE STRETCH NEAR TREMONT, MASS.

A comfortable room is provided where the men can stay when they are off duty. The room is provided with rockers, chairs and tables, games of various sorts, copies of the "Street Railway Review" and other high class technical papers, together with all local daily and weekly papers.

The company employs about 35 men, including conductors and motormen and car barn men. Conductors and motormen are paid 20 cents an hour.

Employing Car Service Men.

When a man applies to the company for employment he is made to fill out a blank application of the form shown herewith. Applicants for position of motormen must be at least 5 ft. 8 in. tall and must weigh at least 165 lb. Applicants for position of conductor must be young, active men. The company prefers motormen who have had previous experience, but in the case of conductors gives



the preference to inexperienced applicants. For either position the company prefers married men. At the time the applicant signs the application he gives at least three references, covering a period of five years previous to the date of his application, which are

MIDDLEBORO, WAREHAM & BUZZARDS BAY STREET RAILWAY COMPANY.

APPLICATION FOR EMPLOYMENT.

MIDDLEBORO, 190...

Supt.

Dear Sir:—I hereby make application for a position as in the service of the Company. Believing that I am physically qualified and competent to discharge the duties of said position and with the full understanding that in the event of my securing employment I am to abide by such rules and regulations governing its employees as the management may from time to time establish.

If employed I promise to loyally and faithfully serve the Company, and to do all in my power to further its interests. To conduct myself honestly, soberly, and with proper obedience and respect to its officials, and courtesy to passengers and the public.

Age years Where born Height Weight lbs. Color of eyes Color of hair Married or single General condition of health

Employed the past five years as follows: (Give date as near as possible.)

REASONS FOR LEAVING.

Have you ever been employed by a Railway Company, other than stated above? If so give name of Company, location, in what capacity and length of time employed.

REFERENCES.

ADDRESSES.

Have you ever been convicted of a misdemeanor or felony? Do you use intoxicating liquors? (Full name of applicant) (Residence) (P. O. Address)

always looked up by either a personal caller or by correspondence. The blank used in this connection is also shown. If the applicant passes a superficial examination made by the manager, he is sent to a local doctor for a physical examination, for which a charge of \$1.00 is made. The form of the physician's report is also reproduced. It may be said that all of these forms are printed on standard letter size sheets, 11 x 8¼ in., which give uniformity and

MIDDLEBORO, WAREHAM & BUZZARDS BAY STREET RAILWAY COMPANY.

MIDDLEBORO, MASS.....190..

M. Dear Sir:—In applying to this Company for a position as
 Mr. Age Height ft. in., Eyes,
 Hair Complexion Born in refers
 us to you. Will you favor us with your opinion of his honesty, character, habits and ability, etc. Please state definitely as to honesty and habits. Has he ever to your knowledge been employed by any Railroad or Railway Company? It is very essential to applicant that this letter be answered promptly, also if ever in your employ that the dates of entering and leaving your service be given. The information that you give us will be thankfully received and considered confidential.
 Very truly yours,

N. B.—Employed as from to

greater convenience in filing and handling. If the physician's report is satisfactory, all the papers referring to the applicant, including the replies from references, etc., are bound together and placed on file for the time when the company needs a new man.

When new men are to be taken on the applicants standing at the head of the list are notified. When a man reports he is given a chance to show what he can do—that is, he is put on a car in charge of an experienced man and is told to familiarize himself with the conditions.

If he gives promise of becoming a reliable employe he is sent to the shops, where he puts on a pair of overalls, and goes through

MIDDLEBORO, WAREHAM & BUZZARDS BAY STREET RAILWAY COMPANY.

Physical examination of for the position of
 Date of examination Place of examination
 Analysis of urine reaction Sp G. albumen
 sugar Have you had gall stone or gravel?
 Have you ever had any difficulty in urinating? Is the gait
 firm and elastic? Any deformities? Age
 Weight Height Hearing Color of eyes
 Color of hair Complexion Is the sight good?
 Vision Color blindness Have you ever been vaccinated
 or had Small Pox? Have you ever received an injury or a
 wound upon the head? When were you last attended by a
 physician For what complaint? Name of physician
 Are you subject to fits? Are you subject
 to dizziness? Have you ever had fainting attacks?
 Chest measurements, Forced inspiration, Forced expiration
 Lung examination, Percussion, Auscultation,
 Measurement of abdomen Examination of abdomen
 Are you ruptured? Have you a chronic cough? Have
 you catarrh? Have you any chronic disease? Rate of
 respiratory action Heart Pulse (rate and character)
 Have you varicose veins Is there freedom from the
 swelling of the feet? Are you subject to rheumatism?
 Do you use intoxicating liquor? Do you use tobacco?
 After having carefully examined the applicant I am of the opinion
 that he is physically qualified for the position of
 and should be rated at per cent. Cause of rejection
 Remarks:—
 (Signed)
 Dated this day of 190..

all the details of cleaning and making general repairs to cars and equipment. He works in the shops for from one to two weeks, and receives a portion of his regular wages during this time. During this time his uniform is being made, and is ready for him by the time he has passed through the shops. For supplying uniforms the company has made arrangements with a local furrier, who acts as agent for a custom-made uniform house located at Boston. The local agent takes this work for the sake of the extra trade it brings to his place.

By this time the prospective employe is supposed to be fully competent to enter into his regular duties, and is placed on the list for a regular run.

The uniform of the men differs slightly from the regulation uniform used on most roads in that the coat is five button, single breasted, those of the conductors having lapels and the necessary pockets for change, etc., and there is worked in gold thread in half-inch block letters M. W. & B. B. on either side of the collar. Those of the motormen are also five button, single breasted, having M. W. & B. B. worked with silver thread on each side of the collar, the letters being made the same size and style as on the conductors' coats. The coat, however, has no outside pockets and is always worn buttoned, giving a military appearance.

The caps worn are the regulation kind, with small, drooping visors having the monogram M. W. & B. B. worked in the front and center of the bell. The conductors' caps are worked with gold thread, and the motormen's in silver. The badge is of the small shield type and is pinned to the left breast of the coat half-way between the arm pit and the edge of the coat.

Posting Schedules.

A modification of the "chart" system is used for announcing runs and schedules for the information of the employes. The



TRESTLE AND PLATE GIRDER BRIDGE OVER N. Y., N. H. & H. R. R.

different runs are all plotted on cross section paper, the horizontal rulings representing turnouts, and the vertical rulings representing intervals of time. When crews are to swing at any meeting point, that fact is indicated on the chart by a small circle at the junction point of the lines representing the two runs. The running chart for a half-hour schedule for an entire day and the scheme for posting the runs are shown herewith.

The following is a sample "running schedule" for crew No. 1, each crew receiving one corresponding to his run, as shown on the chart.

Sample Running Order.

Run No. 1. Snow and Balkam. 10 hours.

"Take car from Middleboro car barn in time to leave Middleboro Four Corners at 5:15 a. m. for Monument Beach, passing cars as follows: Crew No. 11 at Tremont, No. 10 at the double iron, No. 12 at Ellis turnout.

"Leave Monument Beach at 7:15 for Middleboro, passing crew No. 2 at Ellis's, No. 3 at Ramsdell's, No. 11 at the double iron,



CAR BARN, MIDDLEBORO, WAREHAM & BUZZARDS BAY STREET RY.

No. 4 at Chapel St., No. 10 at Tremont, No. 5 at South Middleboro, No. 12 at State road.

"Leave Middleboro at 9:15, sign car for Monument Beach, you going as far as the double iron, pass crew No. 2 at State road, No. 3 at South Middleboro, No. 11 at Tremont, No. 4 at Chapel St., and on the double iron change cars with No. 10, you coming to Middleboro, passing No. 6 at Chapel St., No. 8 at Tremont, No. 11 at South Middleboro, No. 7 at State road, relieved at Middleboro at 11:45 a. m. by crew No. 2.

"At 1:45 p. m. relieve crew No. 6 at Middleboro, you signing

your car for Monument Beach and passing at the following turnouts: Crew No. 8 at the State road, No. 14 at South Middleboro, No. 7 at Tremont, No. 2 at Chapel St., No. 3 at the double iron, No. 10 at Ramsdell's, and at Ellis turnout you will change cars with crew No. 11, you coming to Middleboro, passing crew No. 3 at Ramsdell's, No. 13 at the double iron, No. 5 at Chapel St., No. 2 at Tremont, No. 7 at South Middleboro, No. 10 at State road.

"Relieved for night at 5:15 by crew No. 4."

Block Signal System

The block signal used on this system for the purpose of blocking single track sections between turnouts was invented by Mr. Cox and was installed under his personal supervision. It comprised six boxes for each block, there being three boxes at each end of each block. There is only one lamp in each of the six boxes, and these are connected in series by a single wire. The middle box of each group of three is known as the switch box (No. 1 on the sketch). The switch box has a single lamp, and has a 5 in. opening covered with glass. This middle box in each case is located 7 ft. above the rail on the track side of the first pole nearest the beginning of the turnout switch at each end of the block. The light in this box indicates to the conductor that he has blocked or cleared the section, as the case may be.

Box No. 2 (as per sketch) is known as the indicator box. It is located 15 ft. above the rail on the track side of the second pole from the turnout. It has a 5-in. opening on the side of the box facing the turnout and contains a single lamp. The object of this box is to indicate to the crews going on to the turnout whether or not the section ahead is occupied by another car, and also to show to the motorman when going on to the single track that the conductor has blocked the section, by the lamp in this box lighting. The motorman is held equally responsible with the conductor for the blocking and clearing of each section.

Box No. 3, as shown in the sketch, is called the tell-tale box and is located 15 ft. above the rail on the side of the first pole on the turnout from the switch. It has a 5 in. opening covered with glass and facing the switch, and contains a single lamp. This box is to indicate to the motorman that the conductor has cleared the section which he has just left before he proceeds through the turnout, by the lamp in the box being extinguished.

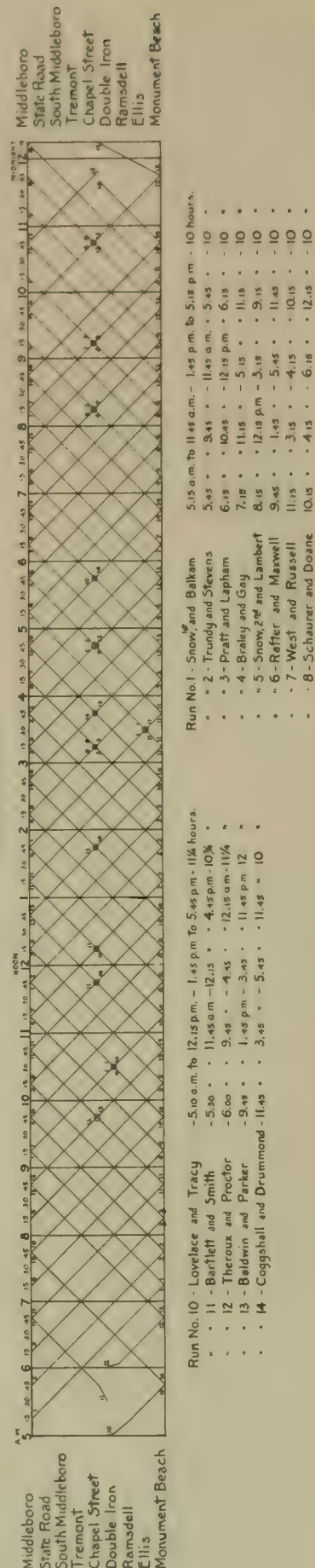
To illustrate more fully the working of the system, let it be assumed that a car is starting from the end of the line. The lamps in the three boxes at the beginning of the first block not being lighted, the crew knows that the block is clear. Just as he starts the conductor throws the switch in box No. 1, thus closing the circuit and lighting the lamp in each box on the circuit, i. e., in the three boxes at the entrance, and the three at the distant end. The light in box No. 1 at the entrance to the block indicates to the conductor that he has lighted all six lamps, and blocked the section into which he is going to enter, for if the integrity of this circuit is destroyed in any way, of course, the lamp will not light. The lighting of the lamp in the indicator box No. 2 shows to the motorman from his position on the front platform that the conductor has properly blocked the section, and it is safe for him to enter. The lamps at the distant end of the block close the block at that end.

After the first car has proceeded through the section to the distant end of the block the conductor as he enters the turnout at that end throws the switch in the switch box or box No. 1, thus extinguishing all the lights in that series of boxes, i. e., in the three boxes that he has just reached and also in the three boxes at the other end of the block from which he has just come. As the lamp in box No. 1 goes out the conductor knows he has cleared the section over which he has just passed. The extinguishing of the lamp in the tell-tale box, or box No. 3, indicates to the motorman that the conductor has done his duty, and he therefore proceeds on to the turnout.

It will be assumed that as the motorman is about to leave this turnout and enter the next section he sees by the indicator box of the series of boxes protecting that section that the lamp is lighted, which shows him that his section is blocked, and he has to remain there until the section is cleared by the conductor of the car occupying that section, or, in other words, until the opposing car has arrived at the turnout.

MIDDLEBORO, WAREHAM & BUZZARDS BAY STREET RAILWAY CO.

RUNNING CHART.



It will thus be evident that each conductor as he enters a section throws on the lights, thus protecting himself from both front and rear, and as he leaves the section extinguishes the lights, thus clearing that section for the next car, and by means of the indicator and tell-tale boxes the motorman knows just what the conductor has done in each case. The simplicity of the system is striking, and by placing equal responsibility on the conductor and motorman, each of whom takes his information from different

will step to the telephone and communicate the orders to the office as he understands them, from having heard the conductor repeat them.

"When two or more cars are running as double headers, or in one section at the same time, the conductor of each car must receive orders as to the number of cars in the section and the conductor of the first car will be held responsible for the block, cutting the switch in before entering the same and stopping his



BLOCK SIGNAL SYSTEM. MIDDLEBORO, WAREHAM & BUZZARDS BAY STREET RY.

boxes, a high degree of safety is obtained. The system has the advantage of always indicating its condition, for if the integrity of the circuit is lost through any cause, the first conductor who throws the switch is aware of the condition, as the lamps will not light.

The signal system has been in operation since the opening of the road in August, 1901. Mr. Cox has applied for patent rights covering the chief features.

As supplementary to the block signal system, a private telephone system has been installed, with telephone boxes at each turnout. In further explanation of the workings of the system the following extract is made from the company's rules on this subject:

Special Notice to Conductors and Motormen.

The following rules and regulations must be observed in the operation of the block signal system:

"The block must be used by all cars, snow plows, construction trains, etc., in operating over the line or any part thereof, to block each section through which they are moving.

"The conductor will in all cases throw the switch, observing that the lamp in the switch box lights.

"The motorman must also note whether or not the lamp in the

car at the other end until all the cars following are in sight and close behind, before throwing the switch clearing the block.

"The conductor will not under any circumstances allow any employe or any other person to operate any signal switch for him, and he will not use a switch stick or anything other than his hand to throw the same. Motormen must slow the cars down to such a rate of speed while passing the switch box that will enable the conductor to operate the same while standing on his car, excepting in such places as the conductor will be obliged to get off his car, in which case the motorman will slow up, or stop if necessary, and then must receive two bells from the conductor before proceeding. At boxes where the conductor can reach the switches from the car the motorman will proceed without two bells when the lamp in the tell-tale box ahead is lighted.

"When the lamps are lighted they indicate that there is a car in the section in which they are located, and should the lights be burning at the point where a car is not due, the approaching car must be stopped and the conductor ring up the office, advising the one in charge of the facts, and from him receive the necessary orders.

"Upon the arrival of a car at a turnout where another car is to be passed upon the regular schedule, and there is no indication



STANDARD OPEN CAR.



STANDARD CLOSED CAR.

signal box light, and in case of failure to light in either box the car must not under any circumstance proceed into the block without specific orders to do so from the superintendent's office.

"In case of a signal circuit being out of order or otherwise failing to work, the conductor will immediately go to the telephone at the turnout, ring up the office, and in a few words as possible advise the dispatcher or the one in charge of the facts, who will issue the necessary orders required in the case. The conductor will repeat the orders back to the office, word for word, the motorman must stand by the side of the conductor while he is repeating these orders, and when the conductor is finished he

of the other car arriving there, within a minute or two, the conductor must ring up the office for orders.

"As the signal system is a precaution against accident, it is amply protected by law, and it is the duty of any employe to make known to the superintendent the full name and address of anyone known to in any way tamper with or operate any signal, whether the same be done maliciously or otherwise.

"Under no circumstances will any extra car, construction train, snow plow, etc., be run out on the line without first advising the dispatcher of the full intentions regarding the movements and distance to be run, etc.

"The motorman will in all cases be held equally responsible with the conductor in the observance of this rule or any part thereof.

"Any violation of the same by the conductor or motorman will be considered sufficient cause for suspension or discharge from the service of this company."

Indicating Danger Points.

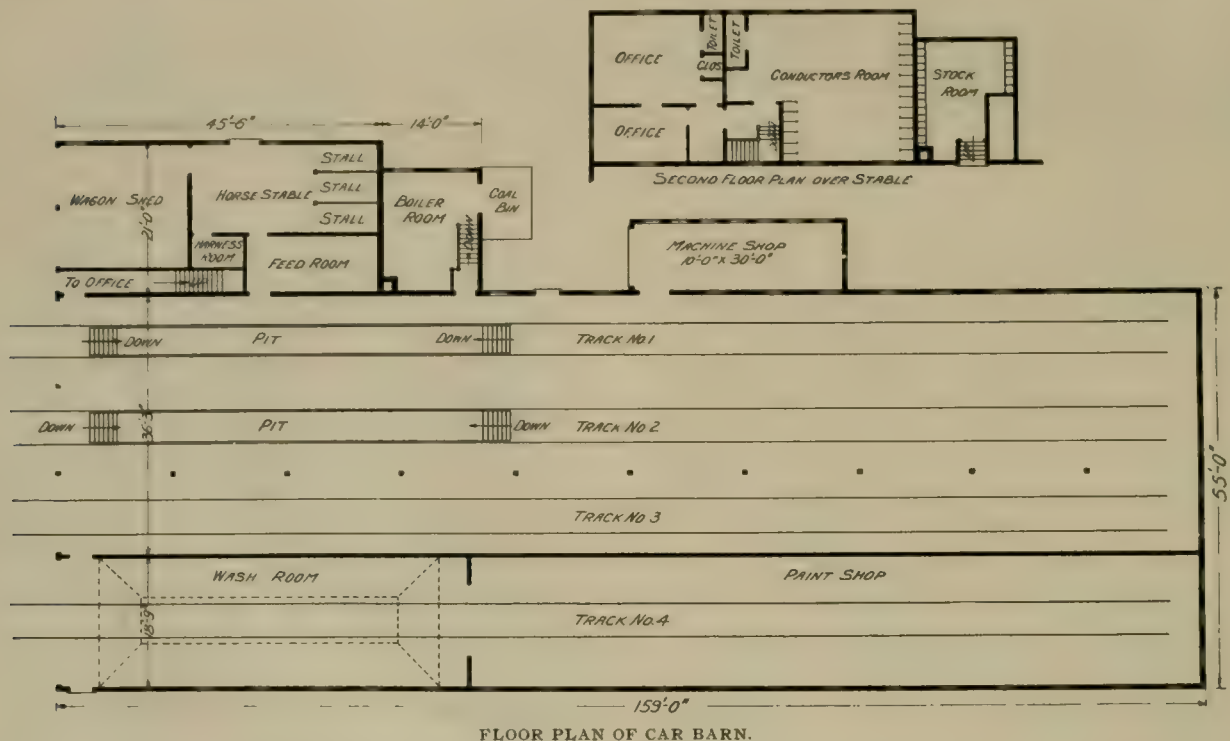
In line with the general system of precautionary methods, the approach to all dangerous points, blind curves and unusual grades are indicated to the motorman by a system of striping the poles. On the fourth pole from the dangerous point in both directions are painted four broad stripes diagonally across the side of the pole where the headlight will shine on them as the car approaches. On the third pole from the danger point are painted three stripes; on the second, two; and on the first, one. The motormen are hereby enabled to compute the distance to the danger point, and are instructed to bring the speed of their cars down to four miles

time the cars enter and leave a block, but it is believed to be the only safe way to operate cars on a single track road.

General Inspection.

All cars on the system are inspected at the car barns twice a day, that is, there is always one car more than is called for by the schedule, so that there is always one car in the barn being inspected. This inspection includes examination of trucks, motors, bearings etc., and when the car leaves the barn for its next trip it is practically in perfect condition. This method requires that each car will lose two trips a day, but the greater security and freedom from breakdown are believed to justify this course of procedure. The company pays the car inspector \$10.50 a week, and the manager makes the statement that this is one of the most satisfactory investments the company is called upon to make.

A secret inspection of all the men on the system is made once a month, at which time a report is made on the work of every



FLOOR PLAN OF CAR BARN.

an hour as soon as the four stripes become visible. This idea is original with Mr. Cox and has proved very beneficial, particularly during foggy weather and snowstorms, as well as at night.

Car Following Signs.

Whenever necessary to run double or triple headers, all the cars following are run on the schedule time of the first car, and the first car has displayed on its front dash a large metal tag bearing a number corresponding to the number of cars that are following. The second car carries a sign indicating the number of cars that follow it, and so on until the last car, which bears no sign. For instance, if there are three cars running on the same time, the first car would bear a number 2; the second, a number 1; and the last car would have no tag. These tags indicate to the crews of all opposing cars that other cars are following the regular, and by means of the number the opposing crews are able to count off the cars correctly and there is no excuse for anyone failing to know whether or not all the cars following have passed. The metal signs or tags bearing the designating numbers are 10 x 14 in. with the figures in white. These signs are put on the cars at the car barn by the dispatcher or some other one in authority.

The conductor of the first car blocks and clears the sections for all the following cars before he leaves each section, but before throwing the switch he must assure himself that all the other following cars are in sight. This procedure necessarily takes a time, and will result in throwing the schedule back a little each

conductor and motorman, and any lapse of attention to duty is noted and rectified by proper means.

Keeping Good Time.

Another safety precaution is the care emphasized in keeping the watches of all employes in good repair and accurately regulated. Each man is required to have with him constantly when on duty a watch of some standard make. This must not be necessarily an expensive timepiece, but must be guaranteed. The company has made arrangements with a local watchmaker to take general oversight of all the watches and clocks on the system, and each employe must submit his timepiece for examination every two weeks. For this purpose a watch certificate is issued to each man, and on this is entered the date examined, the condition of the watch, whether fast, slow or out of repair, and notation is made of the fact that it has been regulated and put in shape on the date examined. The time record or watch certificate is reproduced herewith.

Cleaning Cars.

In line with the inspection of cars is the matter of car cleaning. On this road soap and water are never used for washing varnished surfaces. In lieu a preparation compounded by Mr. Cox, having as its foundation raw linseed oil, is applied twice a week, and rubbed in with cotton waste. In between these semi-weekly applications the cars are merely rubbed down with a dry cloth. This is found to preserve the varnish, and gives the cars a bright, clean appearance at all times.

Physical Characteristics.

As previously stated, the road has no power house of its own, but rents power from a connecting road on a kilowatt basis, measured at the switchboard.

The cars of this company run over the tracks of the New Bedford & Onset Street Ry. from Wareham to Onset Bay at the

No

MIDDLEBORO, WAREHAM & BUZZARDS BAY ST. RY. CO.
TIME INSPECTION SERVICE.

EMPLOYEE'S CERTIFICATE.

This is to certify that the watch of *May 15th 1902*
H. E. Balkam
employed as *Conductor*
Movement No. *617106* Brand *B. W. Raymond - Elgin*
has been inspected and is up to the standard of excellence required by the
M. W. & B. B. St. Ry. Co., and is performing as per record on the back
of this certificate.

Edw. F. Linckham, Inspector.
Address *Middleboro, Mass.*

PRESERVE THIS CARD—IT WILL BE TAKEN UP NEXT INSPECTION

FACE OF TIME INSPECTION CARD.

southern end, and at the northern end connect with the tracks of the Old Colony system in the town of Middleboro. Extensions are contemplated from Middleboro to Plymouth, a distance of 16 miles, and from Buzzard's Bay to Wood's Hole, a distance of 22 miles, and from Sandwich to Chatham, 40 miles. These extensions may be built by separate companies, but will all act as feeders to the Middleboro, Wareham & Buzzard's Bay Street

TIME RECORD.

| + FAST. — SLOW. ○ RUN DOWN □ STOPPED | | | | |
|--------------------------------------|----------|-----------|----------------|---------------------------|
| MARK TIME IN SECONDS. | | | | |
| DATE. | RATE | SEC. | REGU- LATED | REMARKS. |
| <i>May 15</i> | <i>+</i> | <i>22</i> | <i>yes</i> | |
| <i>" 22</i> | <i>+</i> | <i>15</i> | <i>"</i> | |
| <i>" 29</i> | <i>+</i> | <i>10</i> | <i>"</i> | |
| <i>June 5</i> | <i>-</i> | <i>10</i> | <i>"</i> | |
| <i>" 12</i> | <i>-</i> | <i>5</i> | | |
| <i>" 19</i> | <i>-</i> | <i>10</i> | | |
| <i>" 26</i> | <i>0</i> | | | |
| <i>July 3</i> | <i>+</i> | <i>5</i> | | |
| <i>" 10</i> | <i>+</i> | <i>20</i> | <i>yes</i> | |
| <i>" 17</i> | <i>+</i> | <i>5</i> | | |
| <i>" 24</i> | <i>+</i> | <i>10</i> | | |
| <i>" 31</i> | <i>□</i> | | | <i>main spring broken</i> |
| <i>Aug 7</i> | | | | |
| <i>" 14</i> | <i>+</i> | <i>40</i> | <i>yes</i> | |
| <i>" 21</i> | <i>+</i> | <i>25</i> | <i>"</i> | |
| <i>" 28</i> | <i>+</i> | <i>5</i> | | |
| <i>Sept 4</i> | <i>-</i> | <i>10</i> | | |
| <i>" 11</i> | <i>-</i> | <i>5</i> | | |

INSTRUCTIONS.—The employee to whom this certificate is issued should report to his watch inspector every two weeks, and oftener when convenient, in order that the condition of his watch may be noted and a record of its time made in the rate space. This certificate will be called in next inspection—preserve it carefully.

REVERSE OF TIME INSPECTION CARD.

Ry. The road is loaded with Morr and "Crown" protected bonds, with points of the Weber type. Rails are laid on 5 x 6 in x 7 ft. chestnut ties, laid 2,800 to the mile.

The single No. 60 round trolley wire is supported from flexible brackets of the Croughhead type. The poles are 30 ft. round, chestnut, except in villages where square poles were potholed. Anderson overhead material is used throughout. The feeder system is simple, and comprises 12 miles of 200,000 in. cable and one mile of No. 0000 steel copper wire.

The rolling stock, which was all built by the Wason company, comprises twelve 38-ft. 12-bench open cars mounted on Bemis double trucks, with two Westinghouse No. 38-A motors per car; five 15-bench open cars mounted on Wason double trucks, with four Westinghouse 12-A-25 motors per car; eight 38-ft. vestibuled closed cars mounted on Bemis double trucks, with two Westinghouse 38-A motors per car; one freight car 39 ft. over all, mounted on Wason double trucks with four Westinghouse 12-A-30 motors; one flat car 33 ft. over all, mounted on Wason double trucks and used as a trailer; four single truck Wason nose snow plows, which are equipped in winter with the motors taken from the open



STANDARD BAGGAGE CAR.

cars. The cars are equipped with Christensen air brakes. The following materials and appliances are standard: General Electric trolley wheels, Nuttall gears and pinions, Wilson trolley catchers, Hunter car springs. Pfingst fenders, New Haven car registers, Heywood Brothers & Wakefield car seats finished in red plush, Consolidated heaters, Pantasote curtains on Curtain Supply Co's. fixtures, Kilburne sand boxes, Mosher headlights, made by the Dayton Manufacturnig Co., double trolleys. At the car barn is a safe of the Morris-Ireland design for receiving conductors' receipts and reports.

The Middleboro, Wareham & Buzzard's Bay Street Railway Co. has a capital stock of \$150,000 and is bonded for \$75,000. It owns franchises granted in perpetuity. The territory traversed is known as the "Summer Garden" of Massachusetts, all of the towns along the route being prominent summer resorts. Buzzard's Bay, is particularly noted for its palatial summer residences, which include Gray Gables, famous as the home of ex-President Cleveland; the picturesque mansion where Joseph Jefferson makes his home when not touring; the estates of General Taylor of the Boston Globe, and others almost equally as prominent. The route



SNOW PLOW.

parallels the New York, New Haven & Hartford R. R. for its entire length, and passes within a stone's throw of every station on the steam road in this vicinity. The electric road is therefore able to reach exactly the same points as are accessible by the steam road, with all the advantages of frequent schedule and lower rates made possible by electric traction. The business of the road

is not confined to summer touring, as prosperous towns which it serves provide a good, substantial traffic all the year round. Middleboro is the hub for the Cape Cod country. It is the junction for steam connections to Fall River, Providence, Boston, Plymouth and Taunton, and has direct connection to New York by way of the boats on the Providence and Fall River lines. Middleboro has a population of 7,500, Wareham about 4,000, Onset has 2,000 in winter and 12,000 in summer and there is a large suburban population scattered between the towns. The total summer population in the territory served is estimated at about 20,000. During the heavy summer traffic through service is given from Monument Beach to Taunton. The company has carried on a small package freight business with satisfactory results.

Mr. A. M. Bearse is president of the Middleboro, Wareham & Buzzard's Bay Street Ry. Mr. Bearse is a life-long resident of the cape territory, and was interested in the building of the New Bedford, Middleboro & Brockton Electric Ry., as he early recognized the possibilities of electric railway developments in this locality. Through his connection with the early roads in the vicinity he conceived the idea of a through line that would give continuous service from Boston to the extreme southern points on the cape. Recognizing that one of the most important links in this connection would run from Middleboro south, he devoted all his energies to overcoming such obstacles as presented themselves. Late in 1900 he interested Colonel H. B. Parker, Thomas F. Carey and other capitalists of Boston in the project, and in 1900 a franchise was secured for an electric railway forming connection at Middleboro with the Old Colony system, and running south through Wareham to Bourne, the present route of the Middleboro, Wareham & Buzzard's Bay Street Ry. Construction was commenced in the spring of 1901, and the road was opened for a portion of the distance in August, 1901. Mr. Bearse is postmaster of the town of Middleboro, and is a prominent capitalist, politician and man of affairs in this locality.

Mr. Lawrence H. Parker, son of Colonel H. B. Parker, one of the promoters of the road, holds the office of superintendent of the Middleboro, Wareham & Buzzard's Bay Street Ry.

Mr. Charles H. Cox was made resident general manager of the Middleboro, Wareham & Buzzard's Bay Street Ry. in October, 1902, having held the position of superintendent of the road since

tinuous service. Resigning this office, he became superintendent of construction for the Worcester Construction Co., which was building and operating street railways all over New England and in many of the middle and central states. He was with this firm for several years, and was engaged on work in a number of



A. M. BEARSE.



C. H. COX.

states, particularly at Dayton, O., where he built the Dayton & Xenia Transit Co. He severed this connection to accept the superintendency of the Middleboro, Wareham & Buzzard's Bay Street Ry. Mr. Cox is a member of the New England Street Railway Club and other technical and social organizations.

CANADIAN PACIFIC PENSION PLAN.

Following the example of a number of other steam railroads the Canadian Pacific Railway Co. put in operation a pension system January 1st. A committee consisting of the president, the vice-presidents and the chief solicitor of the company directs the administration of the department.

The benefit of the system applies to each officer and employe who has been in continuous service of the company or its leased lines for a period of ten years or more and has attained the age of 65 years, at which age he shall be retired with a monthly allowance equal to one per cent of his average monthly pay for each year of service. Thus, an employe in service for 30 years will receive 30 per cent of his usual wages. His average monthly pay is based upon that received during the ten years previous to retirement.

Retirement is effective on the first day of January and July of each year, a period of less than six months being neglected and a greater one counting as a year. Leave of absence, suspension, dismissal followed by reinstatement within one year, or temporary layoff on account of reduction of forces, need not necessarily be treated by the committee as constituting a breach in the continuity of service so long as the employe has not entered into employment elsewhere during his absence. Under special circumstances the committee may retire with a pension, an employe who has not reached the age of 65 years or may allow him to continue in service above that age if it meets with the approval of the board. A pensioner may engage in other business only with the consent of the committee without forfeiting his allowance.

The establishment of the system was entirely voluntary on the part of the company, and as the employes do not contribute in any way toward it, no employe has a legal right to be retained by the company in order to claim a pension allowance when the interests of the company, in its judgment, may require his dismissal.

A 3-cent fare for school children is being discussed by the school directors of New Haven, Conn.

The commissioners of Erie County, O., who refused two years ago to grant a franchise to the Lake Shore Electric Railway Co. to cross the county bridge at Huron, have finally agreed to a new proposition and granted a franchise for 18 months. This will establish through service between Cleveland and Sandusky and avoid the necessity of passengers walking over the bridge as they have previously done.



STATION AT GRAY GABLES.

the company was organized. The promotion was well earned and came as a recognition of the good work Mr. Cox had accomplished. Under his guidance and management the entire road was built, and many of the features as outlined in the foregoing article are original with Mr. Cox. From his early youth Mr. Cox has been a railroader. In 1874 he obtained a position with the old Metropolitan Horse Railway Co. in Boston, which was one of the forerunners of the present Boston Elevated system. Mr. Cox's first duty was turning a switch point. He soon outgrew this position, and in quick succession was made messenger, conductor, starter, superintendent's clerk, and finally superintendent of construction. When the Metropolitan company was merged into the West End Street Railway Co. he retained his position and remained in the company's employ until 1890, making sixteen years of con-

THE ABOLITION OF GRADE CROSSINGS IN MASSACHUSETTS.

A paper on this subject was read by Mr. Edmund K. Turner at the October, 1902, meeting of the Boston Society of Civil Engineers and printed in the November issue of the Journal of the Association of Engineering Societies, in which the author gives the history of the movement towards the abolition of grade crossings in Massachusetts and a number of statistics on the subject. In 1890 the state adopted the policy of a gradual abolition of existing grade crossings, and the sum of \$5,000,000 was appropriated by the legislature to be spent in ten years towards this object. The proportion of expense of the change of grade in every case was fixed by this act as 65 per cent for the steam railroad company and 35 per cent for the commonwealth. In regard to street railway crossings the author states as follows:

"There is one element which has not as yet, except in two instances, been brought into the grade crossing cases as a contributor to the expense; that is, the street railway companies. When the law of 1890 was passed, and, in fact, until several years later, the street railways did not fill so important a place as they do now. With the application of electricity to railway traction and the great increase in the number and mileage of railways, great additional danger has been introduced at the crossings where the railways exist and the necessity for the separation of grades has been made much more urgent than when the comparatively small number of horse railways was to be considered.

"The danger of crossing railroad tracks by electric railway tracks at the same grade has been fully appreciated by the railroad commissioners. No such crossing can be established without their consent, and they have not given consent without very weighty reasons. Many projected railways have consequently been obliged to wait until the public way upon which they were located and to be built could be carried over or under the railroad. In a few cases the railways have built bridges over the railroads, with trestle approaches, at or near the public way, rather than wait for the abolition of the grade crossing. In quite a number of cases the railroad commission has given consent for the crossing of a railroad by a railway at grade for a limited period, fixing a time within which the abolition of the crossing may reasonably be expected to be carried out.

"The existence of a railway or the proposed construction of one has been the cause of quite a proportion of the petitions for the abolition of grade crossings.

"It has been felt by many that the railways should contribute toward the expense of abolishing grade crossings, and bills have been introduced into the legislature having this object, but until the last session of the legislature nothing definite was reached toward a general law covering this subject.

"In their report to the legislature the railroad commissioners recommended that the street railway should be required to pay part of the expense of abolishing a grade crossing on which its tracks existed; that the special commissioners should decide the amount to be paid by the railway, and the remainder of the expense should be paid by the other parties in the same proportion as they now pay the whole cost. This seems to be fair to all parties.

"It has been found difficult to establish a basis for so dividing the expense that all parties in interest shall be treated fairly. The conditions vary greatly in the various cases, and possibly each of the parties heretofore in interest desires that its share of the expense shall be lessened by the contribution of the newcomer. The conditions vary so much that it would be difficult to fix percentage of the whole cost which would be fair in all cases for the railway's proportion.

"It would in many cases be a decided advantage to the railway to be made a party in interest and have regular standing before the special commission. If it should be required to pay part of the cost, it would have a right to be heard concerning the work to be decided upon by the commission.

"Several street railway companies have within the last few years located their lines partly upon their own land outside the limits of public ways. By so building, it has become necessary in some instances to cross public ways from one part of their private right of way to another, thus establishing grade crossings differing but little from those of railroads. The conditions leading to danger are nearly the same in both cases, and it will probably be found nec-

sary to place by legal enactment the same safeguards around railway crossings of this nature as have been applied to railroad crossings.

The writer has been pleased to note that in some recent locations the railway companies have recognized this element of danger and have provided for carrying their lines over or under public ways.

"According to the railroad commissioners' report for 1902, there were, on Sept. 30, 1901, 312 crossings at grade of street railways with railroads. Quite a number of these crossings were, however, railway tracks crossing spur tracks of railroads away from the main lines.

"In consequence of the expenditure of all funds available under previous acts, the legislature during its last session passed additional acts providing means for continuing the work of abolishing grade crossings and dealing with some features of the work not previously provided for.

"Chapter 440, Acts 1902, approved June 4, 1902, makes several important changes in the provisions of the Act of 1890 and the acts passed at later dates amending the same.

"The directors of a street railway company having a location in that part of the public way where such crossing exists are given the same rights of petition as the city or town authorities and directors of railroads have heretofore had. 'Upon all petitions hereafter filed and upon all now pending on which no commission has been appointed * * * such street railway company shall be made a party.'

"The actual cost to the street railway of changing its railway and location to conform to the decree of the court is made part of the cost of abolishing the crossing. The commission may assess upon any street railway company duly made a party to the proceedings such percentage of said total cost not exceeding fifteen per cent thereof, as may in the judgment of the commission be just and equitable. The proportions to be paid by the railroad and city or town remain the same as in the previous acts, thus relieving the commonwealth of the part assessed upon the railway. Provision is also made for the repayment by the commonwealth to the railway company of the amount so paid by it if in the future its location is revoked without its consent, the railroad commissioners to decide whether such repayment shall be made. The special commission may change the location of a street railway.

"Chapter 440 also authorizes the expenditure of \$5,000,000 by the commonwealth, the amount to be paid in any one year not to exceed \$500,000; but if in any one year the amount expended shall not be \$500,000, the unexpended remainder shall be added to the amount to be paid in any subsequent year.

"No final decree shall be made by said Superior Court upon any report of commissioners setting forth a plan for the abolition, discontinuance or alteration of a grade crossing, adopting or confirming such plan or authorizing any expense to be charged against the commonwealth, until the board of railroad commissioners, after a hearing, shall have certified in writing that in their opinion the adoption of such plan and the expenditure to be incurred thereunder are consistent with the public interests, and are reasonably requisite to secure a fair distribution between the different cities, towns and railroads of the commonwealth, of the public money appropriated in the preceding section for the abolition of grade crossings, and that such expenditure will not, in the judgment of said board, exceed the amount provided under the preceding section to be paid by the commonwealth.'

"The work of abolishing grade crossings in this state has proceeded in a manner which promises to remove, within a few years, a large proportion of those most dangerous to public travel. The large expense involved has made it necessary to move with some degree of deliberation. The interests of both taxpayer and stockholder require that care be used to avoid undue expense in carrying out the work. The decreased number of casualties at crossings already shows that the work done is producing the result hoped for."



The formal opening of the Oneida (N. Y.) electric railway occurred December 15th.

The Supreme Court of Illinois refused a rehearing of the transfer case of the Chicago Union Traction Co. and the Chicago Consolidated Traction Co. This assures the continuance of the transfer system put in operation by the companies November 1901.

THE MASON CITY & CLEAR LAKE RY.

The freight business done by the Mason City (Ia.) & Clear Lake Railway Co. demonstrates the variety and extent of the service which an interurban electric line may perform for prosperous farming and stock-raising communities of the middle west. Mason City is an industrial town of some 8,000 inhabitants, and the country tributary to it is exceptionally rich in agricultural products. Clear Lake, a town of 2,500 winter population, is peopled in the summer by a large number who take advantage of the excellent fishing in Clear Lake, a sheet of water some seven miles long and five miles wide. These two towns, which are 12 miles apart, are connected by the single-track electric line of the Mason City & Clear Lake Ry. In summer 16 trips in either direction are made each day by the passenger cars; and nine trips are made daily in winter. But large as the passenger traffic over the interurban may be, it is in some measure subordinate to the freight service. The latter business is in the hands of the company's agents and solicitors, and consignments of stock, grain, coal, farm produce, etc., are billed through to their destination over the lines of the Chicago & Northwestern, the Chicago Great Western and the Iowa Central railroads, the interurban company receiving a proportion of the through rate. This is arranged by special traffic agreement with the management of the steam roads, and at regular intervals settlements are made by a kind of clearing-house system. The freight cars are, of course, those in regular service over the steam railroads, and are propelled over the interurban from the company's yards to the three points of connection with the steam roads by motor cars used especially for the purpose, each having an equipment of two 75-h. p. motors. The Mason City & Clear Lake Railway Co. has two stockyard quarters, one located at Clear Lake and the other at Emery, a village half-way between the termini, where the power house and car house are also located. From the stock yards the consignments are transported to either of the three separate freight connection stations of the steam lines, which latter are located at distances of from a mile to a mile and a half from Mason City. Twenty cars of live stock are no unusual single consignment for the electric road to handle, and the coal and grain hauled are in proportionate quantities. Switches connect the interurban with the local lumber yards, and this affords another constituent of traffic.

The physical system of the Mason City & Clear Lake Ry. is not especially remarkable, though it may be cited as a good example of modern road construction and equipment for its class. Inclusive of the lines within the limits of Mason City, the road has 17 miles of track. It is of standard construction, laid with 60-lb. T-rail. Cedar poles and white oak ties are used. The power house at Emery, equidistant between Mason City and Clear Lake, is equipped with two Walker generators of 150 kw., and the other of 250 kw. There are four boilers of 125 h. p., and two Allis engines, one of 200 h. p. and one of 250 h. p.

The car house, adjacent to the power plant, is a structure 40 x 148 ft., with a capacity for storing 20 cars. Three tracks enter the building, and there is but one pit. Only light repair work is conducted at the company's shops at Emery, such as painting and refitting with minor equipment. All supplies are purchased, and mechanical repairs are hired done at the machine shops in Mason City. But two men are employed in the company's repair department.

Of the 16 cars on the line, nine are motor cars, and all but one are mounted on double trucks. They are of Pullman manufacture, and range in length from 24 to 30 ft. over all. The equipments vary, some of the cars having two 25-h. p. motor equipments; some two 75-h. p.; some four 50-h. p., and some four 38-h. p. equipments, furnished by the Walker and the General Electric companies, and geared to a uniform speed of 35 miles per hour. The trailers are 45 ft. over all, and all but one are open. They are of the center aisle type. The one baggage car in the service was formerly operated as a trailer, but has been recently equipped with four 38-h. p. motors. It is 34 ft. over all and is mounted on double trucks. The company handles mails, but has no special cars for this service.

The company employs a total of between 40 and 50 men. It owns a private right of way between Mason City and Clear Lake, and 25-year franchises in the terminal towns. The road has been running for five years. Its officers are: W. E. Brice, president, treasurer and general manager; F. J. Hanlon, vice-president, secretary and auditor, and G. A. Emery, general freight and passenger agent.

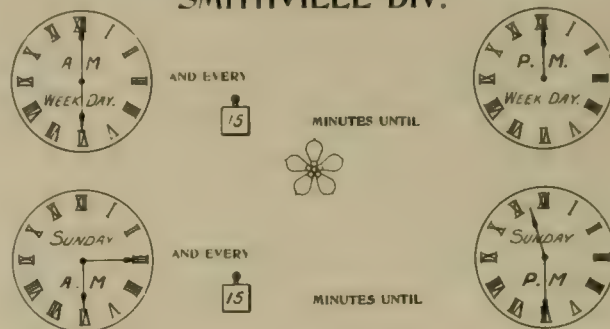
BOARD FOR ANNOUNCING SCHEDULES.

The accompanying suggestion has been made for an effective way of announcing schedules. The device is particularly applicable for use in cities and towns where all the routes converge at a common point or station. The board can be made any size desired, and as elaborate as fancy may dictate. Preferably, it is to be hung in the waiting room or may be placed outside at any point most convenient for patrons.

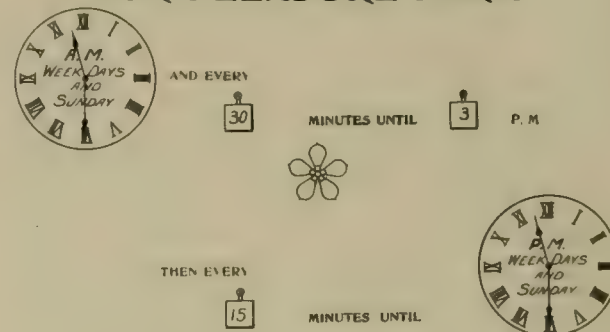
The clock dials may be painted on the board, and should be at least a foot in diameter, or the dials may be cut out from some suitable material and nailed or glued to the baseboard. The hands are made of tin or thin sheet metal, and should be painted black. The clock dials should be painted white with the numbers in black. The hands are attached to the dials by a small bolt and nut with suitable washers, and the hands should be adjusted so they will turn

CARS LEAVE DEPOT

SMITHVILLE DIV.



FOR PLEASURE PARK



easily, but will not move of their own weight. The small sign for designating the number of minutes intervening between cars can be made of thin metal about 6 or 8 in. square, painted black with the figures in white. These signs are hung on small hooks and of course can be changed to suit changes in the schedule. This whole scheme adopts itself very readily to the general movement of cars, and winter, summer or special schedules can be announced to the public, plainly and with no other work than the moving of the dial hands and the changing of the small signs. The value of the board is enhanced by arranging one or more banks of incandescent lamps so that the lettering and dials will be illuminated at night. The board makes an excellent advertising medium for local merchants, and by arranging advertising spaces around the edge of the board or somewhere on the face so as not to interfere with the dials or lettering, the board can be made a source of considerable revenue from local advertisers.

The Manhattan Railway Co., of New York, the property of which was leased to the Interborough Rapid Transit Co. last month, will run 6-car trains on the Sixth Avenue line during the rush hours. The station platforms along the line have been lengthened to correspond to the increased train length.

AN EFFECTIVE MEANS FOR INTERESTING THE PUBLIC.

Mention has been made in the "Review" of the Detroit United Weekly, a small publication issued by the Detroit United Ry., for the purpose of advertising its lines and bringing the public and the company into a more close and friendly relation. Through the courtesy of Mr. J. H. Fry, assistant General passenger agent for the Detroit United Ry., we are able to give complete data regarding the cost of getting out this publication, and we also give the views of the management as to the results secured.

The first issue of the Detroit United Weekly appeared on June 26, 1902, and the paper has been issued regularly every week since that time. The Weekly is issued under the general supervision of the assistant general passenger agent, and takes the form of a four-page folder, each page of which is 4 in. wide x 6 in. high.

The company is now having printed 50,000 copies of the Weekly each week. Mr. Fry gives the cost per week of getting out the little paper as follows: The printers print, do the folding, put the papers up in packages, each package properly marked with addresses furnished by the company, and deliver the edition to the company's general office at a total cost of \$32 per week. In addition to the cost of printing, the salaries for editorial writers and other expenses come to \$20 per week, making a total cost of \$52 per week for the edition of 50,000. The company employs two editorial writers who are connected with local daily papers. The assistant general passenger agent furnishes the subjects and suggestions, and the editorial writers compile the matter and supervise the printing. A proof is submitted of each issue for the management's inspection before finally going to press.

The Detroit United Weeklies are sent out from the general office of the railway company each Thursday (the same day as received from printers) to the various car houses in numbers proportioned to the number of cars operated on each line. The cars are provided with small boxes to be used as receptacles for the paper. The car house men see that the boxes are filled and keep them supplied from time to time during the week. On the front of the box is painted "Detroit United Weekly. Take one."

The distribution, therefore, is of no expense to the company, except a very small amount paid for having the Weeklies placed in the advertising racks in the hotels, restaurants, etc. With each new issue, any of the old numbers left over are destroyed. On the average about 95 per cent of the entire issue for each week is placed in the hands of the company's patrons.

Of the objects and results, Mr. Fry writes as follows:

"The aim of the paper is not strictly an advertising medium although we publish in each issue our interurban time tables, things doing, and usually good local notices of important events such as State Fair, Summer Assembly Meetings, County Fairs, and special attractions which continue for a number of consecutive days. The paper is designed more as a means of educating the people in reference to the workings of the company along lines that they cannot be reached by other methods. Through its pages, we talk to our patrons about the efforts of the company to provide proper men to man the cars. We tell of the work of a conductor or motorman. What the company expects him to do. We explain why it is necessary to have certain rules, and to see that they are enforced. Special emphasis is laid on the safety of passengers, what is required of them by the company, and what part the company takes in avoiding accidents. The transfer system is explained in detail. We keep before the public our interurban properties with their attractive features and so on. Whatever is said is brief and written in a pleasing and attractive form. We can easily refer over and over again to any points we wish to establish in the minds of the people by so changing the form as to make it fresh and new to them with each appearance.

"It is difficult to determine just how far the distribution of the Weekly has increased riding, but we do know it has elicited a great deal of interest and favorable comment among our people. The management has frequently expressed satisfaction at the results so far attained."

A definite plan of "make-up" is followed each week. The first page of the Weekly is devoted entirely to an editorial apropos of some event of local interest. The editorial for the last few weeks have been as follows: "The Suburbs in Autumn," pointing out the

autumn charms and beauties of the country, tributary to the interurban lines; "The Hunting Season," speaking of the game to be found along the lines; "The Party We Are Giving," referring to the American Street Railway Convention; "The Street Railway Behind the Scenes," giving interesting information about the inside workings of the street railway company; "Au Revoir Yolande," commenting on the discontinuance of the special excursion car Yolande, and pointing out that the service will again be resumed in the spring; "The Democracy of the Street Car"; "The All-Night Service"; "The Modern Thanksgiving"; and others of a similar nature. These editorials are written in an entertaining way, and always develop some lesson regarding the advantages of the electric railway cars. At the top of the second page are printed the time tables for all the lines and divisions of the system. The bottom of the second page is usually devoted to a short pithy editorial, and oftentimes to special notices, printed in black face type, dealing with such subjects as getting off and on cars, transfers, collections of fares, etc., all of these being educational in spirit, and aimed to educate the public as to the best ways of using the company's facilities, with the end in view of making the service of still greater value to the public.

At the top of the third page are "Things Doing," including the week's attractions at all the theaters, and notices of any special attractions, conventions, etc., that may be going on in the city or vicinity. On this page is also printed a short installation of a serial novel which is cleverly written in a somewhat facetious style. This idea of the serial novel undoubtedly adds interest to the paper, and gets the public into the habit of looking for the next issue, in order to discover the probable fate of the hero or heroine, who, at the end of each chapter, are usually left in some highly precarious predicament. Each chapter of this continued novel contains only about 150 words, but this is sufficient to arouse interest and inquiry. The bottom of the third page and all of the fourth page are usually given over to quotations, poetry, humorous sketches, epigrams and pithy sayings. The attempt is usually made to select for the last page, a short quotation or verse of poetry that has some higher ideal for its motive, and will appeal to the poetical sentiments of the readers.

It will thus be seen that the conception is to give in concise form, a little paper that will at once interest, amuse and instruct the patrons of the lines and the public in general.

To give a better idea of the nature of the matter used, we append some quotations from recent issues of the Weekly:

EXTRACTS FROM DETROIT UNITED WEEKLY SHOWING NATURE OF MATTER USED.

What we are can be more easily explained by telling what we are not. It is unnecessary to say that the Detroit United Weekly is not a pretentious publication. Our purpose is not lofty, for our space is limited. This is not a political organ. We have no entangling alliances. We putter with no issues and mold no sentiment. This is not a medium of general advertising. We respect the field allotted to the daily newspapers and we have not the space, time nor inclination to compete. The mission of the Detroit United Weekly is first to amuse, and second to attempt to bring to the attention of Detroit and her summer guests the beauties of our lake and river roads, of the little sylvan glens and nooks that hide in the shadows of the hundred inland lakes, of sun-bathed fields where the harvest hay is being cut, of our steel-ribbed course which takes you through the shadows of primeval woods, beside stately suburban villas and the lowly shanty of the lake-shore fisherman. We want very much to show you what we here in Detroit have right about us.

A BUNCH OF GOOD ADVICE.

Importance is the only excuse for repetition, and as the rush of the holidays is near at hand, we repeat rules of safety. The season always brings out the women and children in force, the care of the latter by the former being a task even under the most favorable circumstances. Attempt to get them on or off the car only when it is standing still. Do not permit them to run ahead or lag behind, for a second's absence may mean danger. Look before you cross the tracks and take no chances by attempting to outfoot an approaching car. If you ride past your street do not attempt to get off until the next stop is reached. Above all things, keep your mind on yourself and the little ones, for the traffic is continuous, and constant vigilance is the price of safety.

FARES FOR CHILDREN UNDER SIX.

That there may be no misapprehension upon a subject that all of our patrons do not seem to understand, we publish our rates for little ones less than six years old, all beyond that age being required to pay full fare. Each fare entitles the person paying the same to be accompanied by one child under six. One older person with two such children calls for two fares; with three, two fares; with four, three fares, and with five, three fares. These are the rules of the company, and the conductor cannot be expected to depart from them.

This is a handy hint that you will find useful, even from your own point of view. If you go forward, away forward, when you enter the car you will escape being jostled and trodden upon by later comers. Moreover, you will be more apt to find a seat up forward there, because you will be among the first to "be let in on a good thing." There are really lots of good seats up there. But when the conductor says so, you feel that his remarks are wholly professional.

THE RIGHT OF WAY.

The people getting off a car take precedence over people getting on. That is well recognized in theory, but in practice it is frequently disregarded. This is particularly apparent at the crowded corners of the city, at Hudson's and the intersections of Woodward Ave. and State St. It is often difficult to see that people are about to alight and there is the fear that the conductor will start the car. But we say authoritatively that the prospective passenger is safe in waiting to see that all have disembarked. When in-going and outgoing passengers meet on the back platform, there is much unnecessary delay.

Please wait until all have disembarked.

THE MISFORTUNATES, OR THE ROMANCE OF A RAIN-COAT.

BY RICHARD TARDY SAVUS.

Chapter III.

Truly it was not a nice situation in which Ethelbert Van Bibulous found himself. He had had nothing to eat for three days but a silver case full of trix. But by far the most sinister of all his privations was the inevitable doom of being found dead in evening dress before 6 p. m. It was this hideous fate which haunted him while he played solitaire, pool and ping-pong, for there was no one in this parvenu hostelry with whom Ethelbert Van Bibulous could associate without danger to his social prestige.

In his wanderings he chanced to pass an open door, through which he could see a number of draperies in muslins and silks and tulle, which he knew could not belong to the wardrobe of a pugilist. Cautiously he entered and looked about. On the dresser was a colored photograph. Ethelbert examined it hurriedly. Then with a gasp he sank down in a morocco easy chair.

"I have stumbled," he said, striving to be calm, "into the dressing room of Lillian Florodoorlets, the leading lady who draws \$500 a week for burlesquing my romantic dramas. But my life is at stake." He said "me laff," but that makes trouble for the compositors.

To drape himself in a \$10 shirt waist, a rain-dav skirt and a picture hat was the work of six minutes. Then he snatched up a pair of white opera gloves, a pair of lorgnettes and a parasol, and made a bolt for the door, which had previously been secured with nothing more stable than a Yale lock.

Cautiously he pulled his skirt about him and had descended six flights of the fire escape, when a shrill feminine scream ripped to ribbons the air behind him.

He drew his trusty fountain pen as a voice at his elbow shouted:—
(To be continued.)

An Evanston man has it published that he caught a mosquito an inch long, having pink eyes and covered with hair; weight not given. If the animal was not a bird, the story is.

Now Winter comes with shadows to enfold
The earth's bright foliage of red and gold;
The bird's last songs are sung; the night is here:
Fades now the gorgeous Sunset of the year!

NEW POWER GENERATING AND DISTRIBUTING SYSTEM FOR THE CONESTOGA TRACTION CO.

BY JEFFERSON E. KERSHUM, CONSULTING ENGINEER, CONESTOGA TRACTION CO. AND EDISON ELECTRIC ILLUMINATING CO.

The Conestoga Traction Co. is enlarging its power plant by installing two Rice-Sargent engines of 1,500 h. p. each. The first engine is in position and the foundations for the second engine are now being built. The main feature about these engines is that they are built for the use of superheated steam. There will be two superheaters installed as close to the engines as possible, so that the piping from the engines to the superheater will be relatively short, not over 30 ft. In this way it is hoped that the superheated steam may be carried to the engines with but little loss. The engines are provided with poppet valves, operated by a special valve gear designed by the engineers of the Providence Engineering Works. The valves on the low-pressure cylinder are of the usual oscillating corliss type.

The superheaters are known as the Schmidt system. They are not yet installed, but it is hoped they will be working in the near future. This part of the work has been much delayed since it is necessary gradually to release from service, old boilers and generating units before the new ones can be installed.

The generators are 1,000-kw., 2,200-volt, three-phase Westinghouse machines. The 2,200-volt current was adopted because 60 per cent of the current has to be transmitted through the city and will be used in sub-stations from one to two miles from the power station. These generators will furnish current for lighting as well as for power. This design is probably somewhat new and may be considered questionable. It is, however, probable that the experiment will be entirely successful, for although the load varies all the way from 200 to 800 kw. in a short time, the voltmeters remain very constant, and do not appear to vary more than one per cent. No doubt the lighting load will have a steady effect, so this part of the undertaking, as far as tried, looks very feasible.

At present the generators deliver three-phase current to four sub-stations, but three or more sub-stations will be opened up in the near future, making six sub-stations for railway work and one for lighting.

The sub-stations are of different capacities, and are located at varying distances from the main generating station. The sub-station for the city lines will have two rotaries and transformers of 300 kw. each. This station is about two miles from the main generating power house. Another sub-station within the city is for the lighting work. This will contain two 300-kw. rotaries to do the direct-current lighting on a three-wire system. The neutral is taken from the alternating current converters direct, and the outside wires from the commutators of the 200-225-volt rotaries.

The railway rotaries are of three sizes, 200, 250 and 300 kw. The most distant sub-station is 20 miles from the generating station. Since the system is not yet completed, no actual data as to economy are at hand. The main power house is near Conestoga Creek, where an abundance of water can be secured for steam and condensing purposes.

The Conestoga Traction Co. operates the following roads: Lancaster City Street Ry.; Lancaster & Lititz Ry.; Lancaster, Mechanicsburg & New Holland Ry.; Lancaster & Millersville Ry.; Lancaster & Columbia Ry.; Columbia & Ironville Ry.; Columbia & Donegal Ry.; Lancaster & Strasburg Ry.; Lancaster & Manheim Ry.

NEW POWER HOUSE AT SOUTH M'ALESTER, I. T.

The Indian Territory Traction Co. has purchased a block between Ninth, Tenth, Lincoln and Johnson Sts., South McAlester, as a site for the company's new power house and car barns. It has been decided to install three 200-kw. generators and one converter. There will be four or five boilers aggregating 1,100 h. p. The barns will be 50 x 150 ft. Plans of the buildings are now being made. The company contemplates a much improved service in South McAlester and also on its suburban line as soon as the power house is completed. Mr. L. P. Boyle of Chicago is president of the company and L. W. Bryan, of South McAlester, is vice-president.

EFFICIENT DISCIPLINE.*

BY W. W. WHEATLY.

"Order is heaven's first law." Permanence and stability depend upon law and order. The proper management of large enterprises, such as armies and railway systems, requires the united action of a large number of individuals. It is essential that the individual units work with one common purpose and that individual energies be concentrated. This is usually done by focusing power and authority in one individual, be his title president, general manager or superintendent. He secures united action by asking obedience to certain regulations or laws which are intended to restrain action within certain bounds and direct its course. As the cars are guided by the rails upon the permanent way, so do rules and regulations guide the action and energy of railway employes within certain limits. The ability of the manager is reflected in the skill with which he makes the laws and enforces them and in the facility with which he brings into harmonious relations the component parts of his organization so that, while each will perform its proper functions independently of the other, there will be a time and place where the energy and action of all will unite and work together for a common purpose.

The existence of rules and regulations presupposes the authority and power to enforce them. Unless the power goes with the authority the very best rules are imperfect and impotent. In the army and navy the power to enforce the rules and regulations is embedded in the law of the land, but in the railway service it must depend upon the voluntary consent of the parties concerned. For the purposes of this paper efficient railway discipline will be considered, first, as synonymous with instruction and training in accordance with established rules, and second, as synonymous with punishment inflicted by way of correction and training.

Instruction and Training.

The generally accepted idea of discipline, that it is entirely punitive, is wrong. The railway officer who proceeds upon the theory that punishing the offender is the beginning and the end of discipline, is making a serious mistake. Discipline is or should be primarily educational and the railway officer must be the teacher—upon him must rest the responsibility of educating and training his men. The instruction and training of railway employes, especially those engaged in the train, station or car service, has not been given the attention its importance demands. After a long and varied experience in steam and electric railway operation the writer has become greatly impressed with the lack of systematic methods of instruction and training. New and untried men come into the service as apprentices and graduate into responsible positions under the guidance of some older man. The instructor may not himself have been properly instructed or trained, or if properly trained he may not have the faculty of teaching others. Later, these new men undertake to instruct others. The new man without any special attention upon the part of anyone becomes part of the great machine. Proper training depends not alone upon a thorough acquaintance with the rules and regulations and the general or specific requirements of the service, although this is a primary requisite; it depends largely upon a methodical and systematic course of instruction to determine whether there is proper observance of the rules and an honest pride in the service. To know the rules is one thing, to habitually observe them is another. Furthermore, the strict observance of rules is not the end of training—no code of rules can cover all the varied requirements of a perfect railway service; good judgment and discretion must begin where the rules end, and these things can only be instilled into the apprentice by continual inspection of his work and the correction of his faults.

The admirable discipline in the army and navy comes from constant and persistent training and inspection. The instruction is given by men selected and educated for the purpose and frequent inspection is made by the higher officers. This training kept up through a long period of time enables the apprentice to secure an adjustment to active service. Then when the supreme emergency arises, for which he and his companions have long been preparing, they go into action as one man, guided by one mind, and become a mighty force. In railway service the instruction and training of the apprentice is more often a matter of chance than of system, left to

pick up what he can he does not always get what he should have. To know just enough of the rules and of the business in general to pass an imperfect examination and get to work as quickly as possible is the controlling idea in his mind. Too often he expects only to use his position as a stepping stone to something that temporarily pays better, and he is filled with a restless craving for change. He does not expect to become a careful, earnest worker in this field, nobody makes him do it, and therefore he does not do good work. This lack of inspection and instruction permits many poorly trained men of this stamp to pass into and out of the railway service and their presence is inimical to good discipline.

Some of the electric railroads have established schools of instruction and nearly all of them have more or less effective methods of inspection. The schools of instruction are equipped with skeleton cars exposing to view the operations of motors, controllers, trucks, brakes and showing clearly the wiring and all the mechanical and electrical details of the cars. Competent instructors are present and here the older men as well as the apprentices are given instruction concerning their routine duties. Lectures on technical subjects by experts are given periodically and there are occasional talks before large numbers of the men by one or more officers of the company. The steam railroads have maintained for many years air brake instruction schools, but their efforts as a rule have gone no further.

If it is expected that those who are in the service today and those who enter it hereafter are to make it their life work the question of proper methods of instruction and training is an important one to the men as well as to the company. It is due to the men that they should be fitted for advancement, that their work should be watched and, whenever they fall short, that they be advised and encouraged.

Punishment Inflicted by Way of Correction and Training.

To enforce laws, rules or regulations there must be a recognized authority with power to fix penalties for infringement. The responsible officer of a railroad must become the judge and jury, take the evidence in every case, establish the facts and render judgment. It is better to prevent disobedience by careful training and systematic inspection than it is to punish the offender. But there will always be those who will shirk their duty or who will take chances, as well as those who may unwittingly err. It should become generally known that each and every infringement will be taken up and punished without fear or favor.

That is generally the best government which is supported and upheld by the governed, and which accomplishes the end of its organization with the least friction and the least display of arbitrary authority. While it requires great executive ability to carry large enterprises forward to successful issues, it also requires the rarest kind of executive ability to administer punishment for wrongdoing in a manner that will be considered by all men as fair, just, righteous and honorable. In determining what the system or method of punishment shall be we must consider what purposes are sought in inflicting the penalty. They are two-fold, viz.: (1), to vindicate the law and secure obedience to it, and (2), to set an example to others, to benefit them as well as the subject. The most merciful and righteous penalty which will secure these ends would appear to be the better one. The old method of punishment by means of suspensions and fines appears to be giving way to a more enlightened and merciful method which not only answers the same purpose but has a greater educational value. Every occurrence for which punishment may be administered ought to be turned to the benefit of the transgressor and be so handled that he may look upon it as an object lesson and a stimulus to better things. The system or method of punishment, whatever it may be, should encourage rather than discourage the subject. Its effect should be instructive. It should have a tendency to increase the efficiency and loyalty of the subject rather than the reverse.

Many of the large roads of the country have within recent years adopted one or another modification of the system known as the "Brown or Fall Brook system" of discipline without suspension, and have reported its good results. Volumes have been written in its advocacy and we shall probably hear much of its workings from those who take part in this discussion. Without going into its details, it is evident that the best-managed railroads of the country are committed to the principle involved and it may be concluded therefore that the argumentative stage has been passed. The writer believes thoroughly in the underlying principle and thinks that all

*Read before the New York Railroad Club, Nov. 2, 1902.

roads should adopt some modification of the essential idea. Its adoption will not, however, alone bring successful results; something more is required than to inaugurate the principle. To secure the best results the men must become willing and earnest workers and be induced to take pride in their vocation. They must become attached to it. Show me a road or a business where the tenure of position is secure, where the wages are satisfactory, where promotion for merit is certain and where there is ample provision for sickness, disability, old age and death, and I will show you a service where the administration of discipline is easy and the results satisfactory. In such a service men gladly become earnest and loyal workers and take an honest pride in the successful conduct of the business.

Conclusion.

Returning now to the idea of the concentration of individual energies as expressed in the beginning of this paper, you are requested to look around and say whether it is not apparent in every department of business and of labor. Is it not true that the one thing which forces itself strongly upon our notice is the superseding of individuality by concentration? Have not the great aggregations of capital and the aggregations of labor grown greater and stronger? Is not authority and power to act concentrated in fewer hands? Have they not for many years been strengthening themselves, extending their organizations, perfecting their discipline, and trying by every means within their power to attach men to them and to increase the earnestness and loyalty of every unit of the great combinations? We are just beginning to comprehend that irresistible economic forces are at work, and that the universal desire for a more compact and better disciplined organization is in response to the instinct of self-aggrandizement or self-preservation. Recent troubles in the industrial world have shown that mixed with our boasted national supremacy and material prosperity there are throbs of discontent and the conflict of opposing elements. Organized boards of conciliation and arbitration may for a time plaster over the breach, but the crack in the wall remains an element of weakness and of danger. If such is the condition now when times are prosperous, what may happen when the times are bad, competition keen and profits disappearing?

The opposing elements are not irreconcilable but the danger is greater than ever before, because of the combined power and strength of the contestants. There will be no halt in the march of intelligence and progress, but there may be a re-alignment of the opposing forces. It is a time when employers and employed should understand one another better and cultivate a spirit of frankness and conciliation. The master and man idea should be dispelled; in its stead there should come a higher idea of the relation of the employer and employee and its foundation stone should be co-operation. The manager of every large institution should not meet his men only when trouble arises; he should meet them, as does President Vreeland, at regular intervals, touch elbows with them, talk with them about their routine work and show them by his actions that he has an interest in them and a genuine regard for their welfare. By such means, doubt and distrust are overcome and a more perfect confidence is encouraged. These are the fundamental principles of efficient discipline.

ELECTRIC CARS IN CALCUTTA.

The Calcutta Tramways Co., Calcutta, India, referred to in the "Review" of May, 1897, page 287, reopened the Chitpur section of its line Nov. 20, 1902, with electric power. The road has hitherto been operated by steam locomotives and horses. Duncan's Manual for 1901 reports that at the beginning of that year the company operated 19 miles of road with 10 locomotives, 1,071 horses and 186 cars. The conversion of the motive power from equine and steam to electric power has been completed within the time specified in the agreement between the company and the corporation which is noteworthy, considering the innumerable difficulties in the way. Each train consists of first and second class cars and a trailer. A first-class fare is two annas (5 cents); a through fare on second-class cars or trailers is five pice (3¼ cents) and a six or nine pice fare will transfer a passenger to another section. There are no transfer fares for first-class cars. The whole of the line is now operated by electricity.

TRIBUTE TO MR. LANG.

On the occasion of the retirement of Mr. A. E. Lang, president of the Toledo Railways & Light Co., a delegation of some 50 of the officials and employees of the company, acting on behalf of the whole of their number, presented Mr. Lang with a handsome gold watch and chain, accompanied by a brief address signed by every employee of the company. The presentation speech was made by Thomas McMahon, a conductor who has been in the service for 15 years. Mr. McMahon's address was a glowing tribute to Mr. Lang, and was as follows:

"We meet today at the close of your long service, to express to you, in some degree, our appreciation of all your kindness to us and our sorrow that the ties of friendship which have so long bound us together are soon to be severed. All the men who work for the company have asked me to tell you how sorry they are to see you go. When you came, bob-tail cars were running, and bells on the collars of the mules were jingling through the quiet streets; now as you are going away, the streets are filled with long processions of trolley cars, clanging their heavy gongs. Some of the men who are running these big modern cars were driving the little cars that were running when you came. They who have known you the longest may think that they are the most sorry to see you go, but those who have been here even for a little while will not wish to admit this. We don't lose a Lang every day and we don't want to.

"To us you have been more than a president. You have been a personal friend, ever ready to give a helping hand to one, an encouraging word to another and at all times we have felt that to ask was to receive. The future may bring you more pleasure and happiness, but I doubt if it will bring you truer hearts or warmer friends than those you leave behind. The triumphs and successes which the coming years may bring you will be watched with great interest by all of us, perhaps, with a little regret that we can no longer share them with you, but surely with a great deal of pride that our lives have formed a part of what you have done in the past. Some of us have passed through the stormy days with you and know that you are to be relied upon in the hours of difficulty, yet, while we shall miss your kind help and encouraging words in times of trouble and your genial smile in the rarer times of peace, we cannot but congratulate you on your coming rest and well earned retirement.

"We hope that while you will be relieved from the burdens of the daily cares which come with your duties as president of the Toledo Railways & Light Co., you will still have an interest in us and in all that pertains to the business which you have built up with such great ability and unceasing labor. You surely can not but look with pride and satisfaction on the result of your years of care.

"As a body of men, employees, officers and directors, we are proud of you, proud of the immense railway system you have built up in Toledo, many times against the bitterest public sentiment, when the strongest heart might well have failed; proud of your personal honesty and integrity and proud to have served and worked with you. Now that you are going, they would like to feel that you will always remember them and think of them sometimes as they will always remember you and think of you.

"They ask me to give you this; not that it is necessary to give you something to make you remember them; but they would like to put their feelings for you in some form that will last as a substantial symbol long after they have passed away. We hope that the coming years will bring both to you and your loving wife all the joy and happiness that life has to offer, and that you will now receive our token of love and friendship with as much pleasure as we have each taken in helping to give it."

CAR CONTRACTS FOR NEW YORK SUBWAY.

The Interborough Rapid Transit Co., which is to operate the New York rapid transit subway road, has let contracts for 500 cars, which will be built by the following concerns: 200 by the St. Louis Car Co., of St. Louis; 100 by the John Stephenson Co., of Elizabeth, N. J.; 100 by the Jewett Car Co., of Newark, O., and 100 by the Wason Manufacturing Co., of Springfield, Mass. Contracts have been let for 660 trial trucks, the order having been equally divided between the St. Louis and Wason companies. The contract for motor trucks has not yet been placed.

THE RAILWAY PRESS.

We give here some extracts from an article on this subject by Col. H. G. Prout, editor of the Railroad Gazette, which was published in the English railroad journal Transport. What Colonel Prout says of the necessity for railroad men wishing to keep abreast of the times to read the railroad periodicals applies with equal, if not greater, force to the electric railway field, and some of the points he mentions are of application to all journals, as well as the railway and the electric railway press.

"The man who would be at all familiar with the present state of the art must read the special periodicals devoted to it. This he must also do in medicine and surgery, but it is not quite so important there as in railroading. For, in medicine and surgery, the changes are not so rapid, and they proceed along channels more closely confined. In law the changes are still slower, and still more restricted in scope. The new statutes and the decisions that establish new principles get themselves promptly embodied in the stout volumes that stand on the shelves ready to hand when the brief is to be made up. It is not so with railroading.

"For instance, let us consider the fundamental matter of the rail. There is not a book in the world that will tell us the lessons to be drawn from the St. Neot's accident; or the most approved practice in various countries, as to chemical composition, as to mill treatment, and as to specifications and tests. Only nine years ago a set of standard rail sections was approved by the American Society of Civil Engineers, and these have come to be well-nigh universal in the United States. Now a committee has been appointed by that society to study a possible revision of those sections. But outside of the 'Transactions' of the society I do not know of a book in the world which states what those sections are, or how they were evolved (a most interesting scientific development), and even in the 'Transactions' of the society we can find no statement of the reasons which have led up to the appointment of the new committee. Yet, these reasons are a necessary part of the intellectual equipment of an engineer if he wishes to take a place in the first rank among the men charged with the responsibility of the construction and upkeep of track. This important history can only be found in the files of one or two periodicals.

"Again, there does not exist in the world today a book which comes anywhere near giving an adequate picture of the state of the art in locomotive practice. At the end of 1900 a costly and elaborate volume of 490 quarto pages, entitled 'Modern Locomotives,' was put on the press. Today that book is valuable history, but it does not give us present practice. In 1898 a French treatise on the locomotive engine was brought out, in four large octavo volumes. It is an encyclopedia of the locomotive practice of that day, quite complete and admirable; but it has never been made available to the man who does not read French, and it is still less abreast of the times than 'Modern Locomotives.' Present practice can only be known to the student who has constant access to the files of three or four good periodicals. Last year a very good little book on block signaling was published. We find that already it is defective in some important points, and within two years it will need serious revision.

"Or, take certain recent discussions and doings in England in the important matters of transportation statistics, of the reorganization of traffic departments, and of the big wagons and heavy train loads. Surely, an intelligent railroad officer, responsible for the best administration of the trust developed upon him by his shareholders through their directors, must be informed as to these matters. But he can only be informed in one or two ways: He must read the railway press or he must talk much with men who do read. If he is wise and enterprising he will do both. * * *

"Minor chronicles of changes and of personal doings are of proper interest to many among those tens of thousands, and they are frequently of direct business interest. But such chronicles are very imperfectly published in the daily newspapers available to any one man, and, what is worse, a great deal printed in the daily newspapers is not true. The editor of the railroad journal must collect, verify and classify this news. No one else will do it.

"Building new railroads, building branch lines, revisions of line and grade, change in permanent structures, are all matters of important interest to engineers, contractors and investors in stocks and bonds. This is another class of news which must be gathered, clas-

sified, scrutinized, verified, and, in brief, edited, with the skill and judgment that can only come with long and careful training.

"* * * I cannot, however, refrain from suggesting one function of the railway press more important than all the rest. We all recognize that, in the individual, character is more important than special knowledge and skill. This is precisely as true of groups of individuals, and a courageous, able and high-minded press has done much, and may do more, to give character to the body of men who make up what we may now call the young railroad profession. The thirst for knowledge, the zeal in service, the devotion to duty, the sense of trusteeship, which must lie at the foundation of a profession, do not spring up by chance and do not thrive without cultivation. In the last thirty years these attributes of the professional man have been developed fast in the railroad service, until now we may say with confidence that we have a railroad profession. In this development a small group of editors have had some hand. They have helped to supply the place of special schools, and of professional organizations, and have helped to build up, not only a body of knowledge but a body of traditions.

"The development of the railway press of the United States has been more important than anywhere else in the world, for two main reasons. First, the journals have always been conducted as private commercial enterprises, and their owners have been under constant pressure to make them valuable to increasing lists of subscribers and advertisers. Second, they have been supported by their advertisers with quite wonderful liberality. The volume of their advertising and the rates paid are sufficient to enable the owners of the journals to spend considerable money in payment for editorial service, for manuscripts purchased, and for engraving. Probably the reader of a technical journal seldom stops to think how much he owes to the advertising. Generally speaking, such a journal cannot be supported by its subscription list, which is small in the nature of things. It would be quite impossible to pay the cost of manufacture without the help of advertising revenue, and any net profit to the owners must come from advertising. Having these facts in mind, one who looks over the advertising pages of the most important railroad journals in the United States will understand how it is possible to spend so much money in producing the other pages.

"This necessary dependence of the journal upon its advertising revenue, when it is conducted as a commercial enterprise, has some serious drawbacks, as will be understood by one who thinks a little about the matter. It is obvious that if a paper is to be produced which shall cover the field adequately, and beyond that, yield incomes that will attract men of energy and ability, the advertising must be somewhat large. It follows that the men charged with the responsibility of producing that part of the revenue are always tempted to try to get quick results by the use of the 'reading pages.'

"This is only ordinary short-sighted human nature. The editor is thus under constant assaults from within his own house, and from long habit in protecting the paper from its own friends his judgment sometimes becomes unreasonably exacting. This shows how important it is to have a nice balance between the business department and the editorial department resting in the editor himself.

"Finally, looking over the railway press of the world, it is a surprisingly small group of journals. There are not more than twenty of real importance; indeed, if I were disposed to be strict, I should say there were not more than a dozen. But, in ability, dignity, enterprise and moral sense they compare well with any other body of class journals with which I am at all familiar."



NEW ROAD AT WORCESTER, MASS.

The Worcester & Holden Street Railway Co., with headquarters at Worcester, Mass., is building a new line from Worcester to Jefferson through Holden. The road will be 8 miles long and three cars will be operated. This, however, is but one link in a proposed chain of electric roads to traverse this section.

The equipment at the power house comprises McIntosh & Seymour engines, Babcock & Wilcox boilers, General Electric apparatus. Bradley cars equipped with four 38 h. p. motors to each car will be used.

The officers are: President, A. R. B. Sprague, of Worcester; treasurer, E. S. Douglas; directors, Stephen Salisbury, Gen. Sprague, Otis E. Putnam, C. C. Milton, J. E. Fuller, H. W. Warren. The capital stock is \$100,000, all paid in.

KEEPING RECORDS OF EMPLOYEES.

Mr. A. F. Potter, manager of the Union Railroad Co., Providence, R. I., has devised a very simple little scheme for keeping a record of the conduct of every conductor who works for the road. It has been the practice of this company for a long time to keep strict account of every man's record, but heretofore the information has been entered in large books. These records have become so voluminous as to fill three books. The very size of these has destroyed to some extent the usefulness of the data they contain as they are unhandy and cumbersome for reference purposes.

The records they contained have now been transferred to a card filing system. The record for each man is entered on a card about 8 in. wide by 10 in. high, having headings as reproduced in Fig. 1. The conductor's name is placed at the top and on the card is recorded every instance in which the conductor is reported by an

| Date | Insp'r | Route | Car | Passengers | | Shortage | REMARKS |
|------|--------|-------|-----|------------|--------|----------|---------|
| | | | | Cond. | Insp'r | | |
| | | | | | | | |

FIG. 1. CONDUCTOR'S RECORD CARD. SIZE OF ORIGINAL 8x10 IN.

inspector. The date of the report, the badge number of the inspector making the report, the route, and the car number are entered in the columns indicated. Under the heading "Passengers" the number of passengers reported by the conductor for each particular trip recorded is given and also the number of passengers for the trip as reported by the inspector. If there is a discrepancy in the two reports the amount of the shortage is entered in red ink in the column "Shortage." When the manager thinks the entries in the shortage column are becoming too numerous he takes steps for calling the conductor to account. When the employee is called to the office the card is laid before him and he sees for himself of just what he is accused. The inspectors are changed about among the various routes so that no conductor can give as an excuse for unfavorable reports against him that he is being discriminated against by any individual inspector. The inspectors make their reports on a blank as shown in Fig. 2, which gives the line and the exact time at which the inspector got on and off the car, the car number, the conductor's number, and the number of passengers on the car at the time. There is a space at the bottom of the sheet for any additional remarks. The cards are kept in a large drawer in alphabetical order.

When a conductor leaves the service his card is placed on file in another drawer and can always be used as evidence for or

NORTH JERSEY BENEVOLENT ASSOCIATION.

The North Jersey Street Railway Employees' Benevolent Association, of Newark, N. J., is one of the oldest organizations of its kind among street railway men. It was organized as the Essex Passenger Railway Employees' Benevolent Association July 23, 1887, with 100 members. Although the name has been changed several times to correspond with the name of the railway company, and the place of meeting has been changed several times, the organization has remained intact, several of the members holding office since the date of organization. The membership has grown to over 600. Any employe of the North Jersey Street Railway Co. between the ages of 16 and 50 passing the physical examination, and having been in the service three months, may become a member. The initiation fee is \$2 and dues \$4 a year. The benefits are \$7 per week, 39 additional weeks of disability, and \$100 in event of death. In

order to meet the drain on the treasury without assessments a benefit is held every year. The benefit this year will be at the Newark Theater in January, when "Way Down East" will be produced under the auspices of the association. The officers are: Charles Dunn, president; Martin Shorter, vice-president; John Healy, secretary; John B. De Groot, financial secretary, and A. Frederick Hanson, treasurer. The latter two have held their respective offices for more than fifteen years.

OMAHA & COUNCIL BLUFFS STREET RAILWAY CO.

The Omaha & Council Bluffs Street Railway Co. filed articles of incorporation December 22 with a capital of \$15,000,000. The incorporation is in the form of an amendment to the articles of incorporation of the Omaha & Florence Street Railway Co., which never constructed any lines. The amended articles are signed for the old company by its officers, Gus C. Barton, president; William S. Cox, secretary; Frank Murphy, W. A. Smith, W. V. Morse and Luther Drake, directors. This was the final step in the consolidation of all the street railways in Omaha, South Omaha and Council Bluffs, which aggregate about 200 miles of track. The Council

PROVIDENCE, R. I.

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| Line | Time | On | Off | Car | Cond. | Pass. | |
|------|------|----|-----|-----|-------|-------|--|
| | | | | | | | |

Fig. 2. INSPECTOR'S REPORT SHEET. SIZE OF ORIGINAL RULING 8½x7 IN.

against him should he ever again apply for a position on the road. The men do not object to being watched in this way and the very knowledge that their records are entered on a card that is constantly under the supervision of the manager has in itself a good effect.

Enraged because an electric car in Chicago failed to stop when signalled by two men they boarded the next car and beat the motorman into unconsciousness with the controller handle.

A suggestion has been made by Mr. Percival Moore, vice-president of the Louisville, Anchorage & Pewee Valley Electric Railway Co., that the proposed coliseum building in Louisville, Ky., be used as a terminal for all the new interurban railways.

Bluffs' lines were acquired by a 99-year lease. The company proposes to build an extension from Council Bluffs to Griswold, a distance of 26 miles, and may eventually reach Des Moines, as there is now under construction a line of the latter city which will extend to Spaulding, a distance of only 45 miles from Griswold. Extension will be made from Omaha to Blair, Plattsmouth, Wahoo and Lincoln, aggregating about 150 miles. A power house to cost \$700,000 is contemplated but the location has not yet been determined. The incorporation privileges include the operation of a telephone system. The company increased the wages of its conductors and motormen January 1st by an amount equal to from five to ten per cent of their former wages. It is understood that the officers of existing lines, with few exceptions, will be retained. The entire project is said to be financed by J. & W. Seligman of New York.

CONSPIRACY CASE AT BALTIMORE.

Lewis S. Finklestein was convicted in the criminal court of Baltimore, Dec. 17, 1902, of conspiracy to defraud the United Railways & Electric Co., of Baltimore, of \$800. The plan under which Finklestein and his confederates operated was to board a car together with one or two friends as witnesses, the latter taking seats immediately behind Finklestein. When the car was stopped and just as it was about to start again, Finklestein would alight from the car and fall to the ground and roll over several times, pretending that he was badly injured. The confederates would censure the conductor for his alleged negligence, but would take good care to give him their names and addresses, so that in making the investigation the inspector would be sure to find evidence to convict the company of negligence.

May 31st, 1901, Finklestein fell from a car of the United Railways company at the corner of Fayette and Arch Sts., Baltimore. He refused to go to a hospital and gave his address as 717 W. German St. A confederate, Herman Max Blumenthal, was also on the car and gave his name to the conductor as a witness and his address as 721 W. German St. He volunteered to take Finklestein to his home. The company's surgeon was immediately sent to examine the injured man, but was not permitted to make the examination. On the following day a physician who happened to be on the car



LEWIS S. FINKELSTEIN, ALIAS FINK.

Age, 35 years. Height, 5 ft. 3½ in. Weight, 121 lb. Build, medium. Hair, black. Eyes, hazel. Complexion, dark. Occupation, peddler.

when the alleged accident happened, put Finklestein's arm and body in a plaster paris cast and gave out the statement that the man had his arm fractured in two places and had a probable fracture of the fourth rib.

The two confederates then commenced to press the railroad company for a settlement, Blumenthal calling frequently at the office, and on one occasion stated that Finklestein was dying, requesting that the company send its physician at once, which was done. Upon the arrival of the physician Finklestein was found groaning and writhing in apparently great agony, but an examination showed his temperature, pulse and respiration to be normal. No examination could be made of the alleged injuries as the man was in a plaster cast. The railway declined to consider any settlement until the plaster cast was removed and the alleged injuries submitted to an X-ray examination. Finklestein then filed a suit in the Baltimore city court for \$10,000 and in about four weeks left Baltimore. Both men were indicted in Baltimore in August, 1901, charged with conspiracy to defraud the railway company out of \$800.

Finklestein was next heard of in Washington in August, 1901, at which time he and Simon Kupferburg attempted to repeat the same fake accident. A Baltimore man was taken in with them as a confederate, and the three boarded a car in Washington, and when the car made a stop Finklestein jumped off and rolled over several times and cried out apparently in great agony. Kupferburg as a witness, was standing behind him. The new confederate, who had been taken into the game in Washington, went at once to the rail

way company's office and confessed the whole scheme. Finklestein and Kupferburg were both arrested and indicted in Washington, where they were tried and convicted in the early part of April, 1902. Before the trial Kupferburg was released on \$2,000 bail, and during the trial he jumped his bail. Finklestein served six months in jail at Washington, and immediately upon his release was brought to Baltimore and tried. The jury convicted him without leaving the box and he has not yet been sentenced. He admits that he collected \$50 from the Boston Elevated about a year and a half ago under the name of Samuel Fink, and that Kupferburg shared part of it. He has also collected money from the railways in Brooklyn and Philadelphia. He filed his claim in Baltimore under the name of Samuel Finklestein and in Washington under the name of Louis Semmel. He is believed to be one of a gang who have systematically defrauded railway companies in a number of cities.

BRANTFORD STREET RAILWAYS.

The Quarter Centennial issue of the Brantford (Ont.) Expositor gives an interesting description of the Brantford street railways, which commenced operation in 1886 with four horse cars. In 1893 the company equipped its road with electric power and added a number of new cars to its equipment and inaugurated a much better service. The headquarters of the company are located in Toronto,



SIMON KUPFERBURG.

Age, 40 years. Height, 5 ft. 4 in. Weight, 118 lb. Build, slender. Hair, black. Eyes, hazel. Complexion, dark. Occupation, furrier.

and the road prospered for a number of years under the management of Mr. William Barron, who was succeeded by Mr. John Murdoch, who continued as manager until last summer, when the road was purchased by the Von Echa Co.

In 1895 the company purchased Mohawk Park and extended one of its lines to this resort, which has been a very popular one with the citizens of Brantford. On July 8, 1902, the Von Echa Co. assumed control of the road. Its present officers are: S. Ritter Ickes, president; J. H. Armstrong, treasurer; A. Warfield, superintendent. This company is a construction company and it has already built and is operating an electric railway from Woodstock to Ingersoll. It has also finished a section of the railway between Brantford and Paris.

According to the conditions under which this company assumed control of the Brantford Street Ry. it agreed to spend the sum of \$25,000 in putting the line in thoroughly efficient condition, and this has been done. The company has also projected the Grand Valley Ry. between Bradford and Berlin, running through Paris, Blue Lake, St. George and other towns, to Berlin and Waterloo. Part of this line has been completed and the work will be vigorously prosecuted during the coming season. A park site has been purchased by the company, on which a theater with a seating capacity of 1,200 will be erected this winter.

January 14th the plant of the Steubenville (Ohio) Traction & Light Co. was totally destroyed by fire.



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THE PAST YEAR.

While the development in electric traction during the year 1902 has been greater than during any previous year the most of the new systems proposed and installed have been built along lines which have been standard for a number of years; the past year, however, has been notable from the fact that the alternating current has begun to assume an important position in street railway work, and it is almost certain that 1903 will see some important developments in this field.

The high speed, long distance railway is a feature of electric traction which seems to be coming to the front, and with the new systems of B. J. Arnold, the Westinghouse company and H. Ward Leonard all under construction in different places, it will indeed be surprising if great progress in the direction of alternating current practice is not made in the near future. The advantages of alternating current in electric railway work would be innumerable should a practicable alternating current street car motor be produced. It not only lends itself admirably to the operation of long distance trunk lines, but further, eliminates the question of rotary converter sub-stations with their high cost for installation and attendants, and with such a motor the alternating current would supersede the direct 500-volt current for railway work to as great a degree as it has already superseded the direct current for electric lighting.

Another engineering feature which has come somewhat prominently forward during the past year is the development of the steam turbine for a central station prime mover. With the development of this machine it is probable that a considerable change may be expected in the design of central stations. The difference in size of the steam turbine and the steam engine of equal capacities will permit a great reduction in the engine room space required, and the high speed of the turbines will considerably alter the design of generators, greatly decreasing their size for a given output. The future may see our central stations greatly reduced in size containing small high speed units, the rotary converter sub-station abandoned and its place taken by a transformer station without moving machinery and not requiring attendants, and the distribution system entirely on the alternating current plan with alternating current motors upon the cars.

While the present 500-volt system, which has become standard, will continue in use for many years on city systems, an alternating current system as described for suburban and long distance lines is the direction towards which many of our most prominent electrical engineers are working, and from the progress already made it seems probable that some of the many efforts in this direction will soon prove successful.

PIECE WORK.

Elsewhere is printed a brief extract from a paper on "Piece Work," by Mr. Gus Giroux, which brings out the essential points to be considered in adopting this plan of paying for labor, and the subject is one of interest to street railways operating large repair shops as it has already been successfully introduced by some of the largest electric railways. Our readers will undoubtedly recall the description of the repair shops for the North Jersey Street Railway Co. published in the "Review" for April, 1902, in which article were given complete lists of the piece prices paid for every operation in the repair shops of this company.

There is no question but that the method of paying daily wages which are the same for all, offers no inducement to any one man to try to improve or do more than another, and under this system it is hard to make any workman see why he should try to do more than just enough to hold his job; but no matter what efforts may be made at equalization there must always be a great difference in the quality and quantity of work done by different men. It is obvious, then, that if all are paid alike, some of them are not paid enough or others are paid too much. The premium plan and the bonus system of paying for labor have been introduced in many places with apparently satisfactory results but there can be little question that the piece work system is the fairest for both the employer and employee if the scale of prices is properly adjusted. The latter system also gives the workman the greatest opportunity to improve himself and increase his output, and while the premium system gives the workman a certain increase of pay for all work performed above what

is accepted as a fair day's work he does not, under this plan, receive pay in the same proportion for his extra work as he does for the acceptable amount of work for a day.

If a workman planes 20 castings a day for which he received a certain daily remuneration there is no reason why, if he can increase the output of his machine to 25 castings per day that his wages should not be increased by 25 per cent, making his remuneration on each piece turned out the same. That is, in fact, what is accomplished by the piece work system, but by the premium or bonus plan he would receive a certain amount of extra pay, but not at a rate corresponding to his pay for a regular day's work. It appears, therefore, that the piece work system is by far the most advantageous for the man, while at the same time it is entirely just to the employer.

An important point, however, in connection with the piece work system is that of establishing the rates for piece work on an equitable basis. This unquestionably entails very careful accounting methods covering several months' experience, but when once established, there should be no subsequent cutting of rates. However difficult it may be to determine, there is a fair and equitable price for every piece of work performed, and any extra work which is done by extra exertion should bring the same price as work done under less strenuous circumstances.

THE ARNOLD TRACTION REPORT AND THE SITUATION IN CHICAGO.

Every large city demands means for the local transportation of passengers that shall be efficient and adequate to the needs of the public, yet the municipal authorities too often fail to recognize, or at least refuse to act, on the fact that providing such a transportation system is purely a business proposition. It is well recognized that in the larger American cities the traffic is generally greater than the facilities and physical problems encountered in attempting to keep up with the demand are of themselves sufficiently great, without complicating the matter by permitting other than business considerations to govern.

For the last six years the street railway companies of Chicago have been desirous of effecting improvements in their systems, but it was recognized by all that as a condition precedent to making the necessary investments there would have to be some agreement with the city for franchise extensions. Successful negotiations with the city authorities have been made impossible because of the attitude of the mayor of Chicago, who has refused to consider the subject until after the state legislature had passed a law which would permit municipal ownership. The first practical step towards providing a basis on which negotiations could be conducted was made only six months ago when Mr. B. J. Arnold was retained by the council committee on local transportation, to prepare a report upon the situation, and advise concerning the engineering problems and the costs of various plans that might be deemed practical.

Mr. Arnold's report which was presented to the transportation committee Dec. 30, 1902, is a voluminous one, comprising over 300 printed pages, exclusive of maps and drawings, and this work is considered the most complete engineering investigation of urban transportation problems that has ever been undertaken. Elsewhere in this issue we have presented a statement of what the report was intended to cover, the summary of conclusions and recommendations as made by Mr. Arnold, the general discussion of street railway problems constituting Part I of the report, and an abstract of the other portions, which it is believed will give the reader a good idea of the plans recommended and the reasons for them as may be had without studying the whole report.

Having been retained as an engineer, Mr. Arnold confined his report to a discussion of the problem from engineering and transportation standpoints, avoiding excursions into branches of the subject that would involve him in discussions as to the policy to be pursued by the city. Neither time nor space was wasted in exploiting novel schemes, it being recognized that a large city is no place for trying experiments.

Taking into consideration the fact that there is a wide difference between the claims of the traction companies and the city of Chicago as regard to the dates of expiration of existing franchises, and in their views as to what would be reasonable in the matter of new grants, it is not to be expected that all of the conclusions of the

report will be accepted without question. The most that can be hoped is that the opinion of the able and disinterested engineers who prepared this report on questions of fact will furnish a solid basis for future discussion between the parties in interest.

According to the Arnold estimates, the cost of a new unified system comprising 745 miles of track would be \$70,000,000, exclusive of subways which it is estimated would cost from \$16,000,000 to \$20,000,000 more. The cost to reproduce new an equally extensive system of the same construction as is now in operation is placed at about \$56,000,000, while if depreciation be computed the present value of 745 miles of the existing systems is placed at practically 50 per cent of the cost of the new unified system. Thus it is evident that to adapt even the least expensive of the plans recommended would involve an expenditure of from \$14,000,000 to \$35,000,000, exclusive of subways.

No business man should need to be told that when investments of such magnitude are involved, agreement can only be reached when those furnishing the capital are made secure, which is another way of saying that a long-term franchise is one of the conditions involved in an "ideal" transportation system for Chicago.

We consider that time spent in trying to secure legislative action to enable the city of Chicago to own or operate street railways to be utterly wasted; aside from all economic questions we believe political party consideration will prevent such action. Were it not for the effect on the city itself it might be a good thing to try municipal ownership in Chicago, for the sake of the object lesson it would be to the rest of the country.

Of the various plans outlined in Mr. Arnold's report our preference is for the "Subway Plan No. 1" involving only high level subways. Low level subways would require the use of elevators, which we believe the experience of the London "tubes" has demonstrated to be very costly.

As to the action that will be taken on the Chicago situation it is perhaps idle to speculate. The mayor favors waiting for enabling legislation looking to municipal ownership, and has been quoted recently as saying that in event such an act was not passed and the traction companies did not meet the city's terms, he would be ready to demand receivers for the street railways. The mayor and the majority of the transportation committee of the council are not in accord as to their policy. At this writing the activity displayed by Chicago traction securities, both stocks and bonds, lends color to the persistent rumors that negotiations are well under way for the consolidation of the existing companies.

ADVERTISING.

The "Review" has always devoted considerable space to showing the desirability of advertising street railway lines, and has at different times described the methods of advertising used by various companies, reproducing striking illustrations and extracts from advertising literature. We are always glad to receive folders, pamphlets, and other matter of this nature, and to learn the details of plans for increasing street railway traffic that have proved to be effective.

It is probably not a difficult matter to convince a street railway man of the value of advertising, because he generally has advertising space in his own cars and knows the worth of it. The controversy is more likely to arise over the methods to be adopted in securing the desired publicity.

The local daily and weekly papers of a community are powerful factors, either for good or bad, and it pays to cultivate their acquaintance and good will. It is a mistake to think that usually this is to be done by bribery. Courteous treatment to reporters seeking information will accomplish a great deal, even if the desired information cannot be given. Acquaintance with the editors, reporters and advertising solicitors is sure to promote friendly relations between the company and the newspaper. Every editor is looking for new items, and a little care and trouble in preparing and sending to the newspapers announcements and notices of interest regarding the company's business or plans, will be appreciated at every newspaper office. It is often a good investment for a railway company to take advertising space at regular rate, from time to time, and this is coming to be looked upon as an excellent way of securing publicity. An interesting and successful experiment in this direction, made by the Chicago Union Traction Co. in 1900, was

described in an article in the "Review" for September, 1900, page 495.

Folders, pamphlets, booklets, illustrated time tables, etc., if well written and attractively prepared, are always good and can be counted upon to show good returns on the money expended. This kind of literature need not be confined to advertising parks and pleasure resorts, where its value is well recognized, but may be used with advantage to give correct and interesting information regarding the whole territory served by the company's lines, pointing out the attractions of pleasure riding, the places to be reached, the time it will take to go anywhere on the system, and the rates of fare.

A very effective means, not only for gaining publicity but also for fostering a more kindly feeling on the part of the public towards the company, has been found in the form of a small weekly publication, which can be issued under the supervision of the railway management. This idea of a company publication wherever tried has been found very satisfactory in every way. In this issue will be found considerable information concerning the "Weekly" published by the Detroit United Railway. The idea has been tried at Rochester, New Orleans and at other places, and in every instance the verdict has been that there is no better means of reaching and interesting the public.

PENNSYLVANIA RAILROAD'S TERMINAL IN NEW YORK.

One of the most interesting undertakings in connection with transportation in New York City is that of the Pennsylvania Railroad for securing a terminal on Manhattan Island. In view of the engineering problem involved in the construction of a double tunnel under North River, four tunnels across Manhattan Island and under the East River to connect with the Long Island terminal at Long Island City, the use of electric power on certain of the divisions, and the equipment of power houses, the company created a commission of engineers to design and supervise the construction of the tunnels and appointed architects for the buildings and engineers for the electrical and mechanical equipment. The work of bringing the railroad into connection with the new terminal properties is being carried out by the chief engineer's department of the Pennsylvania.

The commission in charge of the tunnel work comprises Col. Charles W. Raymond, U. S. A., engineer of the New York Harbor, chairman; Charles M. Jacobs, C. E., chief engineer North River section; Alfred Noble, C. E., chief engineer East River section; William H. Brown, chief engineer Pennsylvania Railroad in charge of tracks and terminal yard; Gustave Lindenthal, C. E., bridge commissioner of New York City; George Gibbs, M. E., first vice-president Westinghouse, Church, Kerr & Co., in charge of mechanical engineering, electric locomotives and traction. The architectural work is in charge of McKim, Mead & White. Westinghouse, Church, Kerr & Co. have been appointed mechanical and electrical engineers and constructors and have also been made engineers for the architects, and have been chosen by the Long Island Railroad to carry out the work of changing its Atlantic Ave. line for operation by electricity.

Up to the present time the active engineering work has consisted chiefly of investigations and determinations concerning methods, quantities, and the feasibility of different plans. The commission has been at work since last spring, and the architects and engineers have had a large force of men actively employed since June last. The engineers have substantially completed plans for the Long Island power house, upon which work can be soon begun, this station being needed to provide electric power for the Atlantic Ave. division of the Long Island Railroad. This power plant, together with the one in New Jersey, will serve the entire terminal system.

The terminal station in Manhattan is, in itself, a large undertaking, as it will cover a ground space of 1,800 x 500 ft. The foundations will have to be excavated some 40 ft. or 50 ft. deep. As the work progresses there will be ample opportunity for discussion of the technical features, but at the present time one of the most interesting points in connection with the undertaking is the thorough and efficient manner in which the work has been organized.

An interurban railway is being promoted to connect Des Moines, Ia., and Omaha.

BALL BEARING DOOR HANGER.

The accompanying illustration shows a door hanger in use at the shops of the Georgia Railway, Gas & Electric Co., Atlanta, Ga. The principal feature of the device is the use of a ball bearing in the sheave which reduces to a minimum the horizontal resistance in opening and closing. The hanger is made of $\frac{1}{8}$ in. steel plate riveted to the channel iron forming the top of the

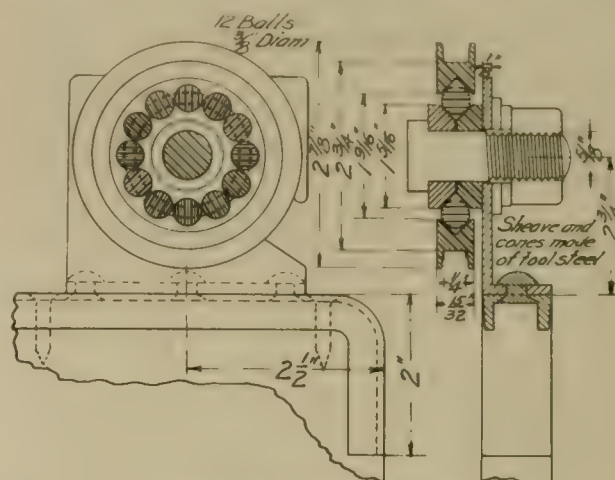


DIAGRAM OF BALL BEARING.

door. The sheave and cones are finished from tool steel. By having the slot in the hanger as shown at the right of the side view the sheave may be removed by slackening the nut. The cones are separated by a fiber washer.

BOURNEMOUTH (ENG.) TRAMWAYS.

On Saturday, Dec. 20, 1902, the tramway system of Bournemouth, Eng., was placed in operation. The conduit system was adopted by the Bournemouth corporation for the principal section of the tramway scheme and is the only system of its kind at present laid in England. It is known as the side slot system, it and the center slot as well, being perfected by Mr. A. N. Connett, who is now chief engineer for J. G. White & Co., Ltd., the contractors for the Bournemouth system.

While the road was opened for operation on December 20th, a trial trip was run on December 16th. At the official opening there were six cars, which were filled with invited guests. In speaking of the occasion of the opening the Mayor of Bournemouth said that he wished all those present to realize that the contractors, represented by Mr. Ross Hopper, had done their work ably; that the job had been completed with the idea of lasting; that it was a permanent job into which had been put not only the best workmanship, but the best thought and care, and that they were all proud of the undertaking.

MANSFIELD TECHNICAL SOCIETY.

The Mansfield Technical Society, of Mansfield, O., has been organized among the officers and employees of the Ohio Brass Co., of that city. The object of the society is the promotion of technical knowledge among its members. The regular meetings of the society are held on every third Tuesday, at which time papers pertaining to various branches of technical work are read and discussed. A reading and reference library has been established in connection with the society, and a number of technical papers, trade journals, etc., are kept on file for the use of the members. Any contributions in the way of scientific or trade papers will be thankfully received.

The Georgia Railway & Electric Co., of Atlanta, Ga., has placed orders for additional machinery and supplies which, it is expected, will be needed during the coming year. There was included an order for a 500-kw. steam turbine unit, and if this is satisfactory it is intended to install larger units of the same type in 1904.

Street Railway Park Development.—II.

A Discussion of Park Amusements—Description of Street Railway Parks in Various Localities—Some Opinions from Park Managers.

STREET RAILWAY AMUSEMENTS.

BY C. W. WADDELL.

It is a difficult matter to discuss street railway amusements. Each locality has its own conditions. Even in cities of the same size conditions may materially differ. An accurate knowledge of these local circumstances is indispensable to the discussion of street railway amusements to be conducted in that locality.

Of the persons who may be interested in this subject perhaps one may have an investment in a small community, it may be remote from or adjacent to a large city; another may be located in a large and prosperous city, he may have a very small enterprise or he may control all the lines in the city; others may be interested in large commercial centers under a variety of conditions. For these reasons the subject can not be discussed in a general way. We shall, therefore, assume that we have under consideration a specific locality, describe the locality and its peculiarities, and treat our subject from the standpoint of the conditions we assume. Interested persons may then deduce from the analogies they may find something that may apply to their own locality; perhaps in many cases it may be found impossible to apply our ideas.

Though local circumstances may require us to employ different methods in promoting street car travel, we have a common object—additional net revenue for our street car lines. This is the principal, almost the sole, reason that should actuate us. There may be also several more or less indirect advantages that may accrue. Good, clean entertainments if successfully conducted must have a tendency to improve the taste, elevate the standards and benefit the morals of a community. Credit for substantial benefits is worth seeking. The good opinions of the public have a cash value to street railway corporations. Successfully conducted amusements of the kind under consideration might also become a matter of local pride, and figure as attractive features of the city. We will not mention other indirect advantages at this time.

Small towns of from five to fifteen thousand inhabitants will seldom have more than one street car line and with so small a population to draw from must from necessity limit themselves to entertainments of small cost. It may be that the ideas that are applicable to larger cities can be trimmed to fit smaller ones, but we leave the application to those who may desire to employ them.

For the purposes of this article we will assume that we have under consideration a city of 200,000 inhabitants. It is growing and full of business enterprise and energy. It is strictly a business community. Its thoughts are of business and its dreams are of money. It has its full quota of churches and schools. Railroads radiate in every direction and it places no limit on its hope of future greatness. Its residence portions follow the street car lines in many directions. Its homes are beautiful and luxurious. It has a considerable amount of culture but no retired class. It has fine theaters, but those conducted on the plan of popular prices are the most prosperous. Its street railway business is conducted by one corporation. In this community we wish to conduct public entertainments for the purpose of increasing the net receipts of the Street Railway Co. How shall we do it? The field is rich enough and big enough for a large harvest, but how shall we cultivate and reap it? Not, certainly, by blindly opening a park anywhere we may chance to find sufficient ground for the purpose; not without consulting the convenience or the desires of our patrons. On the contrary, we should carefully study the situation thoroughly and find some reasonable ground upon which to predicate our expectations. If possible we should have a fixed policy to govern us. We should employ well considered business methods, that have first been reasoned out, and then consistently follow them. We should discover, if we can, those human traits, propensities and weaknesses which underlie and govern the actions of the people. If we can find a weak spot or trait especially one related to the ever present love of money, we should know it and make it our resort.

We will find in our city many well-to-do people and a larger

number of moderate means, and a still larger number who have small incomes. One trait at least belongs to all of them, every mother's son and daughter would like to get something for nothing, or at least a great deal for a little, which is much the same thing. This is the bargain idea that enterprising merchants use to destroy female sanity. There is also another weakness common to all. No one places a high value on 1-cent or 5-cent pieces; if they did the postoffice department of the Government would be a failure, and street cars would have to go out of business. Even a dime is lightly treated, but a quarter of a dollar, when viewed in a lump, makes anyone think. Separate the quarter into five nickels and they glide away without a thought.

Can we employ those traits in our business? If we do we shall have only 5-cent car fares to our place of amusement, and we must not charge more than 10 cents admission. And we must give such high grade attractions that we will seem to give them away.

In our case, if we create the impression of much for little, we will have to do it by actual and literal performance. This will mean a large outlay each season, and it will have to come back in nickels and dimes. Can we reasonably expect so much? Millions of dollars are invested in street railways and other millions are expended annually in car service, maintenance, etc. The universal fare is 5 cents. We seem to do a great deal for a little. The public does not think much about so little, it is only 5 cents. We know the results of aggregating large numbers of these small sums and we have invested our millions because we have faith in the results of these 5-cent transactions.

Why not apply the same ideas to our amusement business that we do to our street railway business and that the Government employs in its postoffice department. We can, if we regard the mathematical necessity for large capacity to transact such a business, and follow the lines of human nature in entertaining our patrons.

Our street railway lines must have ample capacity to transport as many persons as may be required to produce the results we expect. Our place of amusement must also have capacity to accommodate as many persons as are necessary to make our schemes profitable. Next to capacity is comfort. We appeal to the love of pleasure. We cannot mix discomfort and enjoyment, they are like oil and water. Discomfort is the oil and comes to the top and nothing else can be seen. Therefore comfort (physical ease) should have a principal place in our provisions for transportation and entertainment.

A place of amusement should be located at the most convenient place for the largest number of people, and also at a point that is accessible from all parts of the city, and where it may be reached by as many direct lines as possible. Some regard should be paid to the topography of the site, the more fresh air the better. The arrangement and construction of an amusement resort is very important. As we have already observed, it should have very large capacity, it should also be compactly arranged, but not so compact as to sacrifice comfort. There should be plenty of room for a very large crowd to move freely.

The seats should be arranged in amphitheater form, in order to facilitate the opportunity for every one to see and hear and to take advantage of the natural property of sound to rise.

The stage should be large and have a good sounding board behind it. Back of the stage there should be a large number of dressing rooms and two large storerooms and a music room. Every appliance that is ever likely to be needed on the stage should be provided and kept in the storerooms ready for use. A good shell sounding board is very important. If it is properly constructed, a great audience of man, then and can hear and understand a small child. A good pipe organ, though not indispensable, would be a valuable permanent fixture of the stage. A good attraction must be well staged to get the value out of it, for that reason stage arrangement and appliances should be as good as they can be made.

Such a place as we have in contemplation should aim to give an effect, and provide for the true circulation of outdoor air. There should be plenty of shelter from sun and rain.

The concessions should be grouped in attractive arrangement about and near the amphitheater, they should be on and in the midst of a broad promenade, paved with asphalt and well drained. The promenade should surround the amphitheater and be very roomy.

For the purpose of ornamentation, there should be scattered about in artistic design little patches of green sward, a few choice flowers and a fountain or two. This kind of ornamentation should not be overdone, only enough should be used to create a cool and cheerful appearance. Electric lights should be used for illumination and to ornament the stage and amphitheater.

The hardest problem in arranging for such a large audience is to get all of it seated within easy range of vision, so as not to lose, for instance, the facial expressions of an actor. Perfection in this regard may not be attainable.

The place we have described might be called a garden, to give it an outdoor sound.

The main features of the park idea have been abandoned. If an interested person will observe the patronage of many of the beautiful public parks in our large cities he can form a correct idea as to whether it would pay him to construct and maintain such a place to promote car travel. He will find that beer resorts and other amusements far exceed the parks in drawing qualities. It is the amusement feature, therefore, that should be elaborated.

We have described a place of entertainment providing accommodation for many thousands at such a place, and we must produce such attractions as are best suited to its dimensions and to produce the revenue results we desire. There are a large number of attractions that might be employed. Large bands, like Sousa's and the Banda Rosa, are ideal entertainments for such a place. Any high class production in which music is a feature would be suitable. An all star vaudeville show would do for a change. We might even have a circus sometimes. Everything should be the best of its kind. Cleanliness, freshness, newness and variety should be cultivated. With capacity and suitable facilities a high-priced show is a much more feasible proposition at 10 cents a seat than in an ordinary theater or opera house at \$1.50 a seat.

In selecting entertainments for so large a place regard should be paid to quantity as well as quality. The public has a sharp eye for relative proportions, for instance a great singer without a background to give him prominence would seem insignificant in such a place.

The concessions, if arranged as proposed, would be valuable and should produce a considerable revenue.

We do not think that intoxicants should be sold at the place we have described. The attractions should furnish sufficient inducement for the attendance. There is always a large part of the substantial element of society who would oppose it. Everything should be conducted in such a manner as not to raise or suggest moral questions.

Street railway corporations have to ask many concessions from the public, and for that reason should avoid needless exposure to criticism from any part of it.

In this connection a word about the amusement manager may not be out of place. He should be much more than an ordinary showman. He should combine with his knowledge of the show business all the qualities of a business man and a gentleman. He should have some artistic taste and understand the art of pleasing. He should understand the faults and follies of the public and know how to take advantage of them. Such a man may be hard to find, but he is essential to the success of an amusement enterprise conducted to promote street car travel.

The central ideas of this scheme for street car amusements may be summed up as follows:

- (1) Capacity to transport large numbers of people on street car lines.
- (2) Capacity to accommodate large numbers of persons at place of amusement.
- (3) A location easy of access, one that can be reached conveniently from all parts of the city.
- (4) High class attractions, judiciously selected, well staged and handled and intelligently advertised.
- (5) A 5-cent fare to the place of amusement.
- (6) An admission not exceeding 10 cents.
- (7) Ample provisions for comfort in transportation and at place of amusement.

Unless the ideas we have advanced are practical they are without value; as a test, we submit the following questions:

Would enough persons pay 10 cents to hear Sousa's band under such conditions as we propose to cover the cost of employing it and presenting it?

Would enough pay 10 cents to hear Banda Rosa to pay for it?

Would an all star vaudeville show pay for itself at 10 cents a seat?

Would a Grand May festival produced by local talent and assisted by imported celebrities pay for the cost of production at 10 cents a seat?

If these questions and similar ones can be answered in the affirmative then our scheme is practical, for it would be self-sustaining and our car business would be free from amusement expense, costing only the usual train service, etc.

As was at first remarked, our field is large enough and rich enough. We surely have plenty of room and enough material to insure success if we operate on right lines.

Our views are strictly from a street car standpoint. Our chief aim is to produce travel, to extract enough money from the public to pay for the inducements, and to cause them to patronize our cars to the fullest extent possible.

An amusement resort might be made profitable, considered as a separate enterprise and entertain a much smaller number of persons than we propose, but it would do so by selling beer, etc., exacting, in other words, much larger amounts from the individual than we should. This last mentioned idea seems at present the prevailing one, but its limitations cause it to fall far short of the results we desire.

In the management of so large an enterprise it is important to secure to every patron equal privileges. No seats should be reserved. A general admission should be the only entrance charge. The seats should be free to all on equal terms. Inability for any part of the public to draw exclusive or distinguishing lines is an absolutely necessary condition to the success of a great popular resort.

If we give the best and most expensive entertainments obtainable no one will regard them as cheap or common; they will be good enough for anyone and not too good for anybody. Every element of the public will mingle in mass without complaint if they have common inducements and common rights and are under reasonable restraints that bear on all alike.

RECENT DATA ON RAILWAY PARKS.

AUGUSTA, GA.

The Augusta Railway & Electric Co. owns and operates Monte Sano Pavilion, located five miles from Augusta; this is under the management of Mr. G. H. Conklin. At this resort vaudeville is the only entertainment ever tried. The theater has a capacity of 900. During the season of 1901 the bill was changed each week with a company of six artists. Admission to the pavilion is free; a charge of 10 cents for the bench seats and 15 cents for the opera chairs is made. Vaudeville has been tried for two seasons of 12 weeks each, but Mr. Conklin states that receipts from the door have barely paid running expenses. As the extra cars, train hands and power consumed add to the cost of operating, the company has not been satisfied, and is contemplating using a repertoire show for next season, joining with another city like Charleston to exchange companies after playing six weeks.

COLUMBUS, O.

The Columbus, Delaware & Marion Electric Railroad Co., of Columbus, O., will this winter open the theater building recently completed at Stratford Park, which is 20 miles from Columbus and 5 miles from Delaware. The attraction during the winter will be dancing. The park is operated by the company, the manager being Mr. H. A. Fisher, general manager of the railway company.

DUBUQUE, IA.

Mr. F. L. Dame, general manager of the Union Electric Co., Dubuque Ia., advises us that the company contemplates operating a park next season.

KANKAKEE, ILL.

Kankakee Electric Railway Co. owns Electric Park, $2\frac{1}{2}$ miles from the city, which is leased to Matthew Kursell. At the theater, which seats 800 people, melodrama with vaudeville acts interspersed has been the most satisfactory form of entertainment. Dancing and music have also proved attractive.

CARLISLE, PA.

The Carlisle & Mt. Holly Ry., of Carlisle, Pa., is the lessee of Mt. Holly Park, which is managed by Mr. C. Faller, superintendent and purchasing agent of the company. The principal attractions at this resort are boating in summer and skating in winter. The park is located in a gap in the mountain, and no attempt has been made to improve upon the natural scenery. This is a very popular place for picnics in summer, mountain walks and spring water seeming to be all the inducements required.

BANGOR, ME.

The Bangor, Hampden & Winterport Ry., of Bangor, Me., owns and operates Riverside Park, located four miles from Bangor, which is under the management of Mr. C. E. Stanford. A theater accommodating 900 people is located at the park, and the management reports vaudeville and Sunday band concerts as being the best attractions.

BAY CITY, MICH.

The Bay Cities Consolidated Railway Co. operates a pleasure park situated on Saginaw Bay and known as Wenona Beach Park, located about $5\frac{1}{2}$ miles from Bay City. During the summer the run from the city is made in from $22\frac{1}{2}$ to 25 minutes. The park is under the management of Mr. L. W. Richards.

Mr. E. S. Dimmock, general manager of the railway company, writes us that for the past three years the company has operated a very attractive theater. In October last this building was struck by lightning and burned to the ground. The company is now building what it considers one of the largest and handsomest casinos in the country. The size of the building is 120 x 130 ft. and it provides for about 2,000 reserved seats and about 500 free seats. The order for opera chairs has just been placed with the Grand Rapids School Furniture Co. The seats will be mahogany finished and folding, with hat rack, cane rack and foot rest. The roof of the building is supported on trusses, giving an unobstructed view of the stage from the auditorium. The opening of the stage, or drop curtain, is 50 ft. wide and 30 ft. high and every convenience for the performers

mer, one each afternoon and one each evening. Sometimes there are three on Sunday, according to the attendance. The company provide a very high class performance and the salaries of the performers last season amounted to about \$12,000. The other attractions are those usually found at summer parks, such as boating, bathing, fishing, dancing, balloon ascensions, aerial acts and band music.

Fig. 1 shows a view of the entrance to the park taken last October. The band stand and the casino are at the left, the conces-



FIG. 2 -BAY CITY, MICH., TOBOGGAN SLIDE, WENONA BEACH PARK.

sion building is at the right, and the boat house and Bay are shown in the distance. Fig. 2 shows the toboggan slide running into the water, but it will be noticed that the water was unusually low at the time the picture was taken. The slide is 50 ft. high and there is an observatory at the top.

The contracts for the new casino call for its completion by April 15th. One of the important features of the stage in this building is that all the scenery is to be worked from a gridiron and instead of sliding will be carried up to the top of the building.

NEW BEDFORD, MASS.

The Dartmouth & Westport Street Railway Co., with headquarters at New Bedford, Mass., owns and operates a resort known as Lincoln Park, in the town of Dartmouth, seven miles from New Bedford. Last season the park was opened for three days, May 30th and June 1st and 2d, before the regular park season, which did



FIG. 1 -BAY CITY, MICH., ENTRANCE TO WENONA BEACH PARK

in the way of dressing room, toilet and wash room, have been provided. Mr. Dimmock considers this one of the important features of a theater for the summer park, as it gives the park a good name among the performers, and they advertise it well.

There are fourteen performances per week given during the sum-

mer commencing till June 30th. The company has a theater with 200 seats and vaudeville and band concerts are reported as being the most remunerative entertainments. The minor attractions are first class orchestra concerts with free dancing, carousal, Punch and Judy shows, and patent swings.

The manager of Lincoln Park is Mr. I. W. Phelps, who writes us as follows on the subject of street railway parks:

"The advisability of street railway companies owning and operating summer parks is something that can not be governed by any general rule but by local conditions. There are many roads, both local and suburban, passing attractive spots where it would be profitable for the road to own and operate a summer park, but in a great many cases these parks are very poor assets. Especially is this true when it is necessary to make any considerable outlay for developing or maintaining the park.

"Crowded cars for a short time during park season is far from being a sure indication that a company is making money by operating a summer park, as many roads have already learned. Where a road passes a spot which is a natural summer resort, such as a shore front or attractive grove, and it is not necessary to make any considerable outlay for buildings or maintenance, it will generally be found profitable to encourage travel to that spot by some special attraction; such as band concerts or other popular form of entertainment, where this can be done at limited expense, but in our New England climate where the park season is short and with the possibility of considerable cool and wet weather, parks are apt to prove 'a snare and delusion.'

"The first cost of such parks, together with expense of developing and improving to the point of being attractive, the expense of maintenance which is always a considerable item in well managed parks, the additional rolling stock necessary to accommodate the increased travel for a brief period only, the necessity of using motormen and conductors of limited experience or of overworking regular men during rush travel and the additional liability to accidents on account of this necessity all make a combination which is worth considering before engaging in park business.

"If a road has a steady, profitable business, in the great majority of cases it will be found more profitable to confine the energies of the management to the subject of transportation and let the other fellow own and operate the summer parks."

We believe that many of our readers will be interested in the "conditions of every contract" made by Mr. Phelps, as park manager, with theatrical people. These conditions are printed on the park stationery with the injunction to "read conditions before reading letter." These conditions are as follows:

"The management positively reserves the right to annul and terminate an engagement, with forfeiture of all claims for services, any time before or after a single performance of any incompetent person.

"When writing for an engagement state the last time you worked New Bedford or Fall River, and where.

"Two shows each day; possibly extra shows Saturday and holidays.

"All performers engaged open on Monday and close Saturday night.

"Clean photographs for lobby must be sent in time to reach this office not later than Thursday before act opens. If photos are not received or a letter of explanation on or before Thursday before act is booked to open, act will be cancelled without further notice.

"Performers must report in person at office of Dartmouth & Westport Street Railway Co. not later than 9 a. m. on the day act is booked to open or contract will be cancelled.

"Baggage will be taken from depot to the park and returned to depot in New Bedford, provided check is left at office of Dartmouth & Westport Street Ry. before 9 a. m. the day act is booked to open.

"Rehearsal at 1 p. m. on day act opens, if management so elects."

COUNCIL BLUFFS, IA.

The Omaha & Council Bluffs Railway & Bridge Co. has for some years operated Lake Manawa Park, a tract of some 700 acres with a shore line of nine miles; the park is three miles from Council Bluffs and eight miles from Omaha. The company has erected a theater with capacity for 2,600 persons, but has not obtained satisfactory results. Band music and water are better attractions than the theater, although nearly everything in the way of theatrical entertainments has been tried. The park is under the management of Mr. E. H. Odell.

In the "Review" for July, 1901, we published a brief description of this park with a view of the lake shore. In reply to a recent inquiry Mr. W. B. Tarkington, general superintendent of the street

railway company, has added some further details to the information we have previously published. Mr. Tarkington says:

"The park has a very fine bathing beach and the lake is large enough for yacht racing. We have had a series of races between yachts brought from St. Joseph, Mo., and the yachts owned by the Council Bluffs Yacht Club, which has a fleet of 18 or 20 yachts. The Yacht Club and Rowing Association has built a very attractive private boat club house where are kept private row boats, racing shells and gasoline launches belonging to its members. This company owns two 42-ft. electric launches that will seat about 75 persons each, one steam launch about 30 ft. long and one gasoline launch about 25 ft.

"The Kursaal is on the south side of the lake and the cars run to Manawa Park, which is situated on the north side. We use the launches to transport across the lake passengers who wish to enjoy the bathing. A very fine table d'hôte dinner is served at the Kursaal and music for dancing is furnished. The lower story of this building is given up to the bath rooms and contains 200 large size rooms. It is complete in every particular, having shower baths and toilet facilities for both men and women, and is pronounced by those best able to judge to be finer and more complete than any of the bath houses along the Atlantic coast. Its cost was very close to \$15,000.

"Upon the north side of the lake at Lake Manawa Park is maintained during the months of June, July and August a first class band, consisting of 35 to 40 members. When I say first class, I speak advisedly. This is not a cheap organization, but is composed of men of reputation brought from various points, and who are above the average in musical ability. We also have a number of men who are artists upon their particular instrument.

"We have a large casino theater, seating capacity 2,600, given over to various entertainments. We also have a bowling alley, consisting of four regulation alleys, a shooting gallery and a large and very handsome merry-go-round.

"Every Saturday and Sunday afternoon there is a game of baseball between well known clubs.

"At a large pavilion conducted by Omaha's most famous caterer everything in his line can be obtained, and all are served in the very best style. The pavilion will seat several hundred people and the building is so situated upon the shore of the lake that its patrons have a view of the water and can also enjoy the music of the band.

"After the close of the summer season and during the football season we endeavor to have a game of football at the lake every Saturday afternoon. These have proved an attraction and have been liberally patronized. The average attendance during the months of June, July and August, 1901, was about 2,000 per day. The Sunday crowds of course are larger, and during the past season we handled on our heaviest day about 20,000 people. This number was increased about 10,000 by those who went to the park by conveyance other than the cars, people from the surrounding country who drove and also a large number from the cities who drove in their carriages.

"We are constantly improving the lake. A large steam dredge is in operation, dredging new channels and protecting and beautifying this body of water, which is the only lake of any size situated near the tri-cities of Omaha, South Omaha and Council Bluffs.

"Little effort has been made to have the place patronized during the winter months. In this country there are so many places where people can skate that we do not feel it would pay us to run a service for this purpose. We have erected a large ice house of a capacity of 2,000 tons and put up ice for the use of the caterer during the summer months, and there is every prospect that the ice business at the lake can be made very remunerative. We have just completed the erection of a large boat house for the protection of our flotilla during the winter months. After the season closes we take all the fleet from the water, including about 100 row boats, and they are stored properly in the building and repaired and painted for next season's use."

BINGHAMTON, N. Y.

The Binghamton Railway Co. has for several years operated pleasure resorts and now has two parks on its line: the Casino, at Endicott, eight miles from the center of Binghamton, and Ross Park, which is only one and one-half miles from the center of the city, both of which are under the management of Mr. J. P. E. Clark,

general manager of the company. At these parks the most remunerative class of entertainment has been vaudeville. Other attractions provided at the parks include fireworks, daily band concerts, riding galleries and numerous special features.

This company is, we believe, the pioneer in giving vaudeville entertainments in parks as a means of stimulating street railway traffic, having followed this practice since 1890. Mr. Clark, has always taken a deep interest in this subject, on which he is recognized as an authority; many will recall the article on "Parks and Free Entertainments as a Means of Stimulating Street Railway Traffic," by Mr. Clark, which was published in the "Review" for April, 1890, page 228, and has been frequently quoted.

In that article the methods then pursued by the Binghamton Railway Co. were outlined, and there has since been no change in policy. The company advocates parks for operation in conjunction with street railways, and the management is firmly convinced that the park should be operated by the railway company. It is considered eminently important that street railway parks shall be operated in a manner not to offend the most fastidious, catering especially to ladies and children; this necessitates the utmost respectability and the entire absence of all intoxicating drinks.

GRAND RAPIDS, MICH.

The Grand Rapids Railway Co. operates two parks called Reed's Lake Park and North Park. The former is operated by the railway company under the supervision of Mr. G. S. Johnson, vice-president and general manager of the company, and North Park is leased to Messrs. Zindel & Hart. In regard to the operation of the parks Mr. Johnson says:

"The two parks are entirely different in character and are located in opposite directions from the center of the city, each being about four miles from the center. Reed's Lake is southeast, and North Park is northwest of the city. The city also owns a park called the John Ball Park, covering 100 acres of timbered hills, laid out with flower gardens and drives and containing small streams, fish ponds, cages of animals and a large deer park. The railway company advertises these places under the name of "The Big Three." An agent is kept traveling through the towns within a radius of 100 miles from Grand Rapids during the whole summer, distributing pictures of the places of amusement and other advertising matter, posting bills for the theater at Reed's Lake and organizing excursions. The company finds this advertising service very satisfactory.

North Park comprises about 16 acres and is located on the bank

of freshment stands, a handsome dining room, kitchens, etc. On the second floor is one of the finest dancing floors to be found in use anywhere, with cloak rooms, promenades and every convenience required. At the river a good boat livery is maintained and it is well patronized. This park also receives a good deal of benefit from the elk and deer parks of the Soldiers' Home, which adjoin the company's grove.

"Reed's Lake is altogether a different place and is operated on different plans. Here a large theater is maintained during the



FIG. 4. GRAND RAPIDS, MICH., PICNIC GROUNDS, NORTH PARK.

whole summer. No admission is charged to the grounds or the theater, but a revenue is derived from the sale of seats in the theater and although people may stand and see the show nearly as well as in the seats, the seats are well occupied at prices of 10 cents for unreserved to 25 cents for reserved seats. Seat tickets may be purchased at the box office in the theater or at an agency down town. The refreshment privileges are leased and a fair revenue obtained therefrom. No intoxicating liquor is sold by the company or allowed to be sold on its grounds either at North Park or Reed's Lake. Beer gardens are operated by other parties at Reed's Lake near the railway company's resort, but those who attend the theater



FIG. 5. GRAND RAPIDS, MICH., DRIVEWAY IN JOHN BALL PARK.

of the Grand Rapids is the Michigan Soldiers' Home and the State Fair grounds. The latter is very pretty at this point and is about two miles north. The Grand Rapids Boat and Canoe Club has its club house there and the City of Grand Rapids has a pavilion also. The company owns a pavilion that cost about \$15,000, which it leases to a firm of caterers. On the first floor of the building are soda fountain, lunch and re-

freshment stands, a handsome dining room, kitchens, etc. On the second floor is one of the finest dancing floors to be found in use anywhere, with cloak rooms, promenades and every convenience required.

"Of course this resort being on the shore of a very pretty lake allows unlimited facilities for the operation of small boats of all kinds and there are two large size steamers which run there all summer. On the company's grounds there are merry-go-rounds, shooting galleries, photographic outfit, game racks and amuse-

amusements in considerable numbers. This winter a figure 8 roller toboggan slide is being constructed on the premises.

"On account of a village of considerable size being located near the ends of the car lines which run to these resorts a 10-minute car service is maintained the year around and extra cars are used as the traffic requires. The company is so situated that it can send one car a minute from the center of the city to either of these resorts and can operate the cars with or without trailers, thereby handling many thousands of people within a very short period. As many as 10,000 people have visited Reed's Lake Park at one time and 20,000 or more during a holiday. As many as 20,000 people

swinging two hundred at one time. We have a check room for taking care of the baskets of picnickers and an attendant in charge of a large gasoline stove, with about one and one-half dozen coffee pots of different sizes, who makes coffee for the picnic parties free of charge, the parties furnishing their own coffee and the attendant doing the rest.

"The results of operating the park during the season of 1902 were entirely satisfactory, and the indications are that the patronage for the season of 1903 will be materially larger than during the season of 1902. At the end of the same line where the company's park is located the city has acquired 115 acres for a public



FIG. 5 GRAND RAPIDS, MICH., ROLLER TOBOGGAN, REED'S LAKE.

have been carried to North Park and the Fair Grounds in a day, and from 10,000 to 15,000 to John Ball Park. The summer resort business is consequently, during its season, a very important feature in the company's operations and everything possible within reason is being done to increase it. The company has found this branch of its business to be a very gratifying success."

EVANSVILLE, IND.

Late in 1901 the Evansville Electric Railway Co. built an extension to some high land west of the city, the terminus of the new line being about four miles from the center of the city. At this point the Indiana Amusement Co., a subsidiary company which the railway company controls through stock ownership, acquired 10 acres of rolling woodland and erected buildings suitable for an outdoor pleasure resort. The manager of the Indiana Amusement Co. is Mr. H. D. Moran, general manager of the railway company. Concerning the equipment of the park, Mr. Moran writes as follows:

"We have a covered stage, no roof over the auditorium, the natural forest trees furnishing shade at any time of day the entertainments are in progress. The slope of the land is about the same as the slope given the auditorium of a theater, and the stage and auditorium are surrounded by lattice work, so constructed as not to interfere with the free circulation of air, but to obstruct the view of persons outside the enclosure. For admission to the vaudeville performances, which we give afternoon and night, we make a charge of 10 cents for an ordinary seat and 15 cents for a reserved seat, the idea being to make the show pay for itself. We also operate a merry-go-round, for which we make the usual charge of 5 cents. We lease the privilege of selling light refreshments, such as soda water, ice cream, lemonade, popcorn, peanuts, etc. The sale of intoxicants upon the premises is prohibited, and owing to favorable conditions we have been able to prevent the sale of liquors at any point within the distance of a half mile from our park. The absence of intoxicants appeals very strongly to a certain class of people, and the park immediately became a favorite place for outdoor family gatherings.

"In addition to the two paid attractions, we provide free two orchestrian concerts per day, and a free library and reading room, stocked with about two hundred books and magazines. We maintain a small zoo and an aviary stocked with about one hundred foreign birds; also free swings for the children (which, by the way, are well patronized by the older people), having a capacity for

park, and we anticipate that as the city makes improvements on its park we will be able to derive a good revenue from that source also."

SAN ANTONIO, TEX.

The San Antonio Traction Co. has a base ball park, but does not operate any pleasure resort. There are two city parks on the lines of the company.

BERLIN, N. H.

The Berlin Street Railway Co. owns a park of some 40 acres about half of which is cleared and half wood land, and has at present a casino 45 x 70. ft. which it is the intention to keep open all winter. This resort is known as Cascade Park and is 1½ miles from Berlin and four miles from Gorham. The road was only opened for operation last fall, so that the company has been unable, as yet, to carry out all its plans for improving the park. Mr. W. J. Jones, manager of the company, writes us as follows concerning the



FIG. 6—GRAND RAPIDS, MICH., SHORE VIEW, REED'S LAKE.

plans for the park. "The park has a natural amphitheater which we intend to utilize for a rustic theater and a grand stand for racing and ball games and also to lay out tennis court, croquet grounds, which latter will be on a higher level than the ball ground and race course. We have at the present time a casino 45 x 70, and which we intend to keep open this winter. We are well equipped with all the necessary utensils to serve banquets, which will be served on the third floor, the second floor being used for a ball room and the basement for kitchen, lunch counters, toilets and boiler room. There is a small sheet of water which we intend to open or clear off for skating purposes, and if this is not large enough we can flood the

lower level and make a lake of eight acres. This park is absolutely the only outlet for the people here unless they travel to Portland, a distance of 100 miles, and they are of a class that patronize such amusements as we can offer. The ride over the entire distance, eight miles, is one of the most attractive that I know of, as we are in view of the Androscoggin River for the entire distance and have the Presidential Range of mountains on our right and lesser mountains and hills on our left, going south."

ST. LOUIS.

The St. Louis & Suburban Railway Co. has located on its line, "Suburban Garden," some scenes in which were illustrated in the "Review" for March, 1902, page 157. This resort is owned and operated by the Suburban Garden Amusement Co., of which Mr. T. M. Jenkins, general manager of the railway company, is president and general manager. The park is about 25 minutes' ride from the center of St. Louis and the improvements include a theater with a capacity for 2,000 persons, scenic railway, electric fountain, merry-go-round, ostrich farm, baby rack, shooting gallery, cane rack and band stand. In addition there is an excellent cafe and a point is made of band concerts. Mr. Jenkins advises us that high class vaudeville has proved to be the most remunerative theatrical attraction. The road to the garden is along a private right of way which is known throughout the county for its picturesque scenery.

BALTIMORE, MD.

The United Railways & Electric Co., of Baltimore. The company owns and operates two pleasure resorts, which were described at some length in the "Review" for August, 1901. They are both under the management of Col. Robert Hough. Lakeside Park is located four miles north of the city and Gwynn Oak Park six miles northwest. At the latter is an open-air theater and at Lakeside Park dancing, merry-go-rounds and similar attractions have been most satisfactory. This is a popular resort for picnic parties. At Gwynn Oak there is what is considered the finest dancing pavillion in the state and free vaudeville entertainments, balloon ascensions, high wire performance, etc., have been most satisfactory in attracting crowds.

WOODSTOCK, ONT.

The Woodstock, Thames Valley & Ingersoll Electric Railway Co., of Woodstock, Ont., owns and operates Fairmount Park, located five miles from Woodstock. The resort is under the management

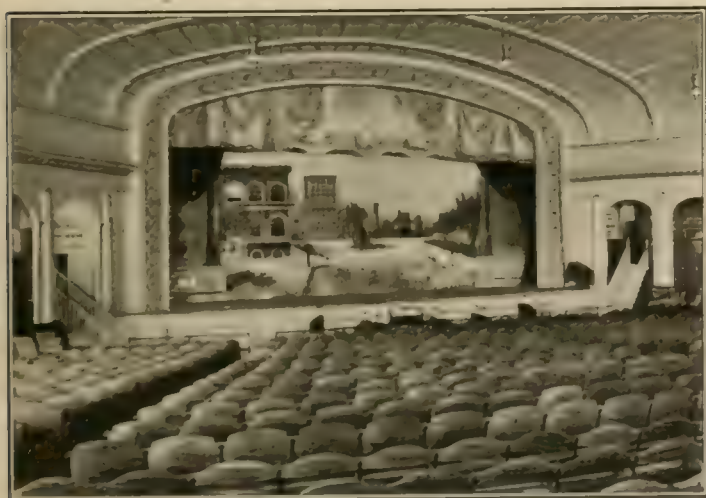


FIG. 7. GRAND RAPIDS, MICH., RAMONA AUDITORIUM, REED'S LAKE.

of Mr. Thomas Ward, who reports that a stock company theater has been the most remunerative and satisfactory park attraction. The theater at this park has a capacity for 600 persons.

AUSTIN, TEX.

The Austin & East Electric Railway Co. owns and operates Hyde Park, 2 1/2 miles north of the city, which is managed by Mr. F. E.

Scovill, superintendent of the railway company. The experience of the company with this park, at which there is a theater that will accommodate 1,100 people, has been extremely unsatisfactory, and Mr. Scovill writes us that nearly everything in the way of attractions has been tried without results. No entertainments can be given at the park on Sunday because it is in close proximity to a church. It is very probable that the theater and other buildings at Hyde Park will be removed to the grounds of the Austin



FIG. 8. GRAND RAPIDS, MICH., RAMONA AT NIGHT, REED'S LAKE

Fair Association, which would obviate the difficulty due to the unfavorable location.

NEW ORLEANS.

The New Orleans Railways Co. has three pleasure parks known respectively as Athletic Park, Base Ball Park and West End, which last is a lake resort about six miles from the center of New Orleans, the other two each being about three miles from the center of the city. Athletic Park is leased to the Orpheum-Athletic Park Co., C. E. Bray, manager; Base Ball Park is leased to the Base Ball Association, Abner Powell, manager; West End is operated by the Railways company and is in charge of Mr. John G. Woods, general manager of the railroad department. The entertainments last season were as follows: Light opera at Athletic Park, which is the only one having a theater; base ball, foot ball and all other kinds of outdoor sports at Base Ball Park; band concerts and variety specialties at West End. West End is on the shore of Lake Pontchartrain, which is some 25 miles wide, and has the best of facilities for boating, fishing and yachting. The resort is also made popular by the excellent restaurant accommodations.

EL PASO, TEX.

Washington Park, located about three miles from El Paso, on the line of the El Paso Electric Railway Co., is operated by the Boone Athletic Association, J. H. Boone being the manager of the park. Last summer theatrical entertainments were given, a tent serving as the auditorium.

MIDDLETOWN, CONN.

The Middletown Street Railway Co. owns and operates Lake View Park, some three miles from the city, the park manager being Charles H. Chapman, superintendent of the railway company. At the park is a theater which will accommodate 700 people, and Mr. Chapman states that vaudeville is the most remunerative attraction. In this connection he also states that the company finds it greatly to its advantage to be in a theatrical park circuit which, by giving the theatrical performers a whole season's work under one management permits the different parks forming the circuit to realize large savings, the performers being willing to accept smaller salaries when their contracts are for 12 weeks instead of one. Billiard and pool tables, a half mile track, dancing pavillion and facilities for boating are also found at this resort.

PIECE WORK.

A paper on this subject was recently read before the Canadian Electrical Club by Mr. C. J. G. T. in a detailed report of the Canadian Pacific Ry., in which the author takes the ground that the day system does not offer sufficient incentive to the working man. So long as it is only a matter of putting in a certain number of hours daily at a fixed rate it is easily seen that the average man will hardly be likely to exert himself to become expert in any particular branch. The worker under the day system frequently does not care about the next job he is to get and will stand idle until the foreman gives him another job, for he reasons that this is the foreman's business and is what he is paid for. In some instances a man will ask for a job, and the foreman, not having one ready at the moment, will often, in the rush of work, give him something to do that will necessitate making a complete change that might have been avoided had this been planned beforehand and work been given the man that was adapted to his previous arrangements.

The introduction of the piece work system frequently makes a complete change in the whole atmosphere of the shop for the reason that old practices are hard to change when the workmen have been accustomed to the day system. Most workmen are inclined to be more or less suspicious or prejudiced against any new or modern system, and anything lacking in the proper management of the system will be at once charged against the system instead of against the management. The author quotes some striking examples of mutual interest which were the outcome of introducing the piece work system. One case mentioned was that in which a planer hand came to his foreman after working piece for a short time and showed that a certain casting had too much stock to plane off. He suggested having the pattern altered so that it would make just as good a job and a larger number of castings could be put through the planer daily. The pattern was altered, the planing was done in less time and the man's wages consequently increased. The company benefited by the smaller cost in castings, the increase in the output of the machine and the largely reduced cost of production. The author doubts if under the day system the man would have suggested anything about the matter.

It is very desirable that when the piece work system is introduced the preliminaries be carefully looked into so as to avoid further changes after it is in force. The system should not only have the support of the shop manager, but of the superior officers, and time and consideration should be given to study every operation in detail. It will frequently be necessary to instruct the men as to how to improve their manner of doing work, for men who have been accustomed to doing their work in their own way and time under the day system do not generally believe they can improve and do work in less time.

A very important point is that of basing rates, not on what the job has cost under the day system, but on what it is worth, and it should not be forgotten that those who have had experience at handling piece work on certain systems and have generally found that the time can be greatly reduced from what it was under the day system. When the shop changes from day to piece work system it should be put into the hands of a thoroughly competent man who should devote his time to improve shop facilities and instruct and help the foreman and men, preparing all necessary data concerning the proper rate of pay for each operation so that it can be presented for approval to the proper authorities. To accomplish this the shop should be put on the slip system and checked up each day for three or four months so as to arrive at a fair average. Proper consideration must be given to men who do vise or erecting work and those running machines, for the reason that in the first case it is muscular work, while in the latter, the greater part of the work is done by the machine.

The author believes that if rates were adopted after due consideration by a board, and this board were held responsible for the rates there should be little or no necessity for future cutting. If such necessity should arise full particulars should be submitted and the rate approved by higher authority. No foreman under the day system would think of raising the men's wages without giving full particulars and having it approved by higher authority, and the same rule should be followed in raising or lowering piece work prices. The method of time keeping should also be carefully considered and

the time kept in such a way that it can be easily checked. It should be made up in harmony with the piece work and show the total wages of each man at any time.

A HOPEFUL VIEW.

The New York Sun at the beginning of the new year submitted a number of questions to many prominent business men inviting their opinions as to the commercial and financial situation, the outlook for a continuation of the present condition of prosperity and the measures which should be adopted to prevent a recurrence of bad times.

The Sun's questions were submitted to the Hon. W. Caryl Ely, president of the International Railway Co., of Buffalo, N. Y., and his reply is of more than passing interest. Mr. Ely said:

"I do not see any reason to apprehend that the prosperity of the country in general or in the lines with which I am especially familiar is slackening, but in the fair consideration of this question due regard should be had to the results always flowing from over-building and over-production. If the present situation is wisely handled, the prosperity of the country in general should continue for a number of years.

"I consider that the chief business danger immediately before us is the seemingly universal desire to get rich quick. This encourages the gambling instinct at the expense of painstaking labor and honest thrift. The consequent evils, speaking in a business sense, are the general overdoing of things, over-building, over-production, over-capitalization and over-speculation, from which, if unchecked, must flow a long train of attendant evils.

"The tendencies in business life at present most to be encouraged would seem to be the seeking of broader markets for better things more cheaply produced.

"I consider the money supply of the country adequate to its legitimate needs.

"I consider the Canadian system of banking on the whole superior to our own, but one must admit that our own is at present very safe and very secure, and as it would seem that all must concede that the system of branch banking along the Canadian lines is not possible in this country at this time, the changes to be made in our system should be few and conservative. Changes which would facilitate the actual doing of the business of banking, and tend to make government moneys available for the purposes of business, would seem most desirable.

"The tariff, generally speaking, needs revision, but we want no horizontal reduction and no hasty, ill-conceived political attacks upon the tariff. A careful investigation should be made by a wisely selected commission, and such reductions should be made in over-protected industries as will bring customs receipts down to the level of government revenue requirements and remedy existing inequalities. It should always be remembered that the tariff is a business question, going deeper and deeper every day to the root of business prosperity, and not to be permitted by the people to be tampered with by indiscreet and ill-advised persons for political purposes.

"The export trade of the country should increase during the coming year over that of the present year."

INTERURBAN FREIGHT AND EXPRESS TRAFFIC.

The freight and express business of the Rockford (Ill.) & Interurban Railway Co. on the line between Rockford and Belvidere is increasing at a rate that is exceedingly gratifying to the company. The service was inaugurated several months ago under the direction of Mr. J. H. Groneman, general passenger and express agent of the company. The express car makes two or three trips daily and handles a large amount of material for the Rockford Woodworking Co. consigned to the sewing machine factory at Belvidere. An average of one ton of meat is carried into Belvidere daily besides a large amount of beer, apples, bananas, milk, etc. A freight house has been erected on Fourteenth Ave., Rockford, where the factory shipments are received.

The Georgetown & Lexington Railway Co., of Lexington, Ky., has put up waiting stations at convenient points along the lines.

Report on Chicago Street Railways.

Report of B. J. Arnold on the Engineering and Operating Features of the Chicago Transportation Problem Submitted to the Committee on Local Transportation of the Chicago City Council.

May 29, 1902, the city council of Chicago passed an ordinance authorizing a contract with B. J. Arnold for his services in advising the council committee on local transportation and July 19, 1902, a contract was executed in accordance with the ordinance. The services Mr. Arnold agreed to render were defined as follows:

Such services as may be required by the local transportation committee of the city council, as expert engineer so far as may be necessary in procuring information and furnishing estimates, designs, plans, appraisals and opinions in all matters connected with the existing or possible traction companies, and in the preparation of a general report for said committee in relation to the cost of operation and earnings of any traction company or traction companies, the capitalization of existing companies, all financial and scientific facts, theoretical and practical matters and statistics in relation to the same for the accomplishment of the following results:

- (a) To make a valuation of present plants;
- (b) To make estimate of cost of production of new system adequate to serve the public and designed along the lines of the best practice in vogue;
- (c) To make estimate of net earnings to be derived from the operation of such new system based on present business, with estimate of probable increase in business in periods of five years formulated from past performances, from which rates of compensation or adjustment of rates of fares can be computed;
- (d) To make estimate of passengers carried during different hours of the day for the purpose of computing compensation;
- (e) To make a report, based upon the best information he can secure, on rates of wages paid and rules and regulations under which employees are at present working, with recommendations for changes or concessions which it would be practicable for the companies to make should a demand for changes or concessions be made and the matter be brought before the committee, and for the use of the committee should it desire to embody in its report to the council any material on this question;
- (f) To submit a design for rails for future use which will best protect the street pavement, and which will be practicable for the operation of cars under Chicago conditions, presenting arguments supporting such design and also presenting draft of rails adopted in other cities after investigation by municipal authorities, such investigations being brought about from similar causes as obtain in Chicago;
- (g) To report on the feasibility and desirability of an underground conduit system in the down-town district, and on all trunk lines, within prescribed limits, with proper arrangements for transferring from underground to overhead trolley and vice versa without any disarrangement of the required headway of cars in either trunk or branch lines;
- (h) To estimate the cost of constructing and operating a conduit system;
- (i) To re-route the present lines outside of the business district so as to obtain in the best manner the very best transportation facilities to the patrons of such lines, maps to be prepared which will graphically display the re-routing;
- (j) To make statements showing wherein the present system is inadequate, the causes for it, the maximum capacity of the present terminals in the business center;
- (k) To furnish maps showing the present arrangements of terminal facilities in the business center and recommendations for a rearrangement of facilities to best serve the purposes, and showing tracks which it would be advisable to abandon, and tracks necessary to construct, eliminating grade crossings and provide for the operation of through lines between the north and south sides of the city through the business center and in conjunction with the loop terminals from all divisions;

It is further recommended that a new system of transit in the business center, which, coupled with the surface system of terminal facilities or operated independently and without such surface system, will adequately accommodate the traveling public, provide for

an increase of traffic in the years to come, relieve the congested condition and create a much larger area available for use by all lines of business; these plans to show a feasible disposition of all existing underground improvements, so disposed of as to permit of easy access for future repairs, renewals and reinforcements without disturbing the street surface;

(m) To show the necessity for and the entire practicability of the abandonment of the practice of operating cars in trains and substituting therefor single cars;

(n) To report on a universal system of transfers;

(o) To stand in readiness to attend personally or by a competent representative any meetings of the committee at all times;

(p) To verbally report on any question arising, not covered in the foregoing and pertaining to transportation and construction matters, and to act as engineer in a consulting and advisory capacity when any question may come before the committee or be submitted to it during the continuance of this contract;

(q) To make an estimate of the value of all lines the franchises of which do not expire in 1903;

(r) To report on the relative merit of through routes as against downtown terminals;

(s) To report on joint use of tracks whenever such joint use may be necessary in his judgment;

(t) To report on the feasibility and cost of transforming the present cable lines into underground electric systems;

(u) To report on the rearrangement of the Union Loop;

(v) To report on a plan for the prevention of electrolysis;

(w) To provide an estimate for laying cement roadbed for street car tracks and report on the advisability thereof.

In transmitting his report, Mr. Arnold said:

"The situation has been thoroughly canvassed. The operating statistics of the Chicago City Railway Co. and the Chicago Union Traction Co. have been willingly submitted, and an exhaustive study of them has been made. All facilities have been extended to me by the officials and departmental heads of these companies, and the officials of the several elevated railroad companies, as well as the several companies controlling the underground utilities, all of whom have very kindly, and with considerable trouble to themselves, furnished me with the data required in my investigation. The officials of several railway companies operating roads in other cities have courteously furnished me with valuable statistics.

"All recorded information contained in the several bureaus of the city government and the personal knowledge on all subjects pertaining to the transportation matter possessed by the several bureau chiefs has been freely placed at my disposal, for all of which assistance rendered and courtesies extended I desire at this time to express my thanks and appreciation.

"I have not assumed it my place to take sides in the report one way or the other on questions of municipal policy concerning which there may be differences of opinion, except where the questions are in their nature clearly engineering or transportation questions. The franchise policy of the city with reference to these matters I have conceived to be outside of my province. The plans for a comprehensive system of street railways suited to the needs of the community as set forth in the report would be the same whether the system be owned and operated by a private corporation, or owned and operated by the city, or owned by the city and operated by a private corporation under lease. So far as engineering features alone are concerned, it is immaterial whether the subway systems as outlined be owned by the city or by a private corporation.

"In connection with my investigation of this problem I have considered many plans, such as movable sidewalks, elevated sidewalks, sub-sidewalk railways, and elevated structures for carrying railways, pedestrians, and the present underground utilities, some of which plans originated with me and some with others, but after a careful study of the situation the magnitude of the problem as evidenced by the great number of passengers which must be taken in and out of the business district in very short periods of time, night and

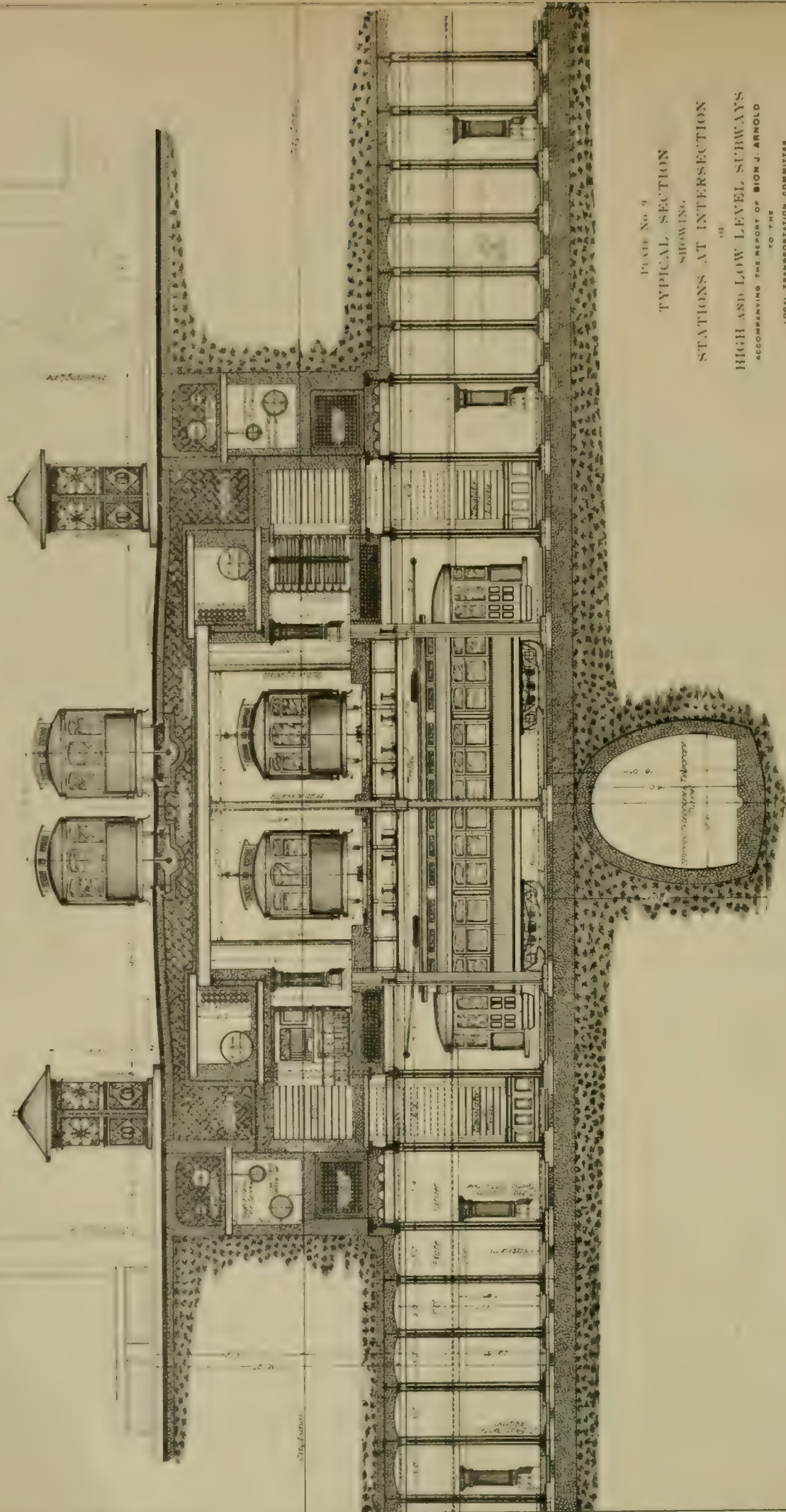


PLATE No. 9

TYPICAL SECTION

SHOWING

STATIONS AT INTERSECTION

OR

HIGH AND LOW LEVEL SUBWAYS

ACCOMPANYING THE REPORT OF SION J. ARNOLD

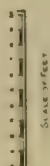
TO THE

LOCAL TRANSPORTATION COMMITTEE

OF THE

CITY COUNCIL OF THE CITY OF CHICAGO

1902



morning, has forced me to abandon some of my preconceived ideas, and it is my opinion that a full realization on the part of others of the exact conditions which must govern a comprehensive solution of this problem would show the advocates of the other plans the inadvisability of their adoption. It is possible, however, that some of the suggestions relating to super-surface structures may some day prove advisable to adopt in Chicago, but probably not until the capacities of the systems recommended in this report, or other similar systems, have been reached.

"The question of the utilization of the water power of the Sanitary District Canal for generating electricity and transmitting it to Chicago for the operation of its street railways has also been considered, but inasmuch as a decision regarding it need not be made at present, and from the further fact that the question was not involved in my commission, I have not submitted a discussion of it.

"I have endeavored to outline not only one plan but several plans, some of which if adopted would give to the citizens of Chicago the best surface railway transportation facilities capable of attainment under the conditions. These facilities cannot be attained at once, and the transition will probably be gradual. In order to make it possible to get immediate relief a plan of surface tracks, which could ultimately become a part of a combined system, has been outlined. This plan provides for ample facilities on the surface for the present needs, permits of through traffic between all divisions with the joint use of tracks, and makes it possible to immediately abandon the river tunnels for street car purposes, thereby permitting the river channel to be immediately deepened for the accommodation of lake traffic, and portions of the tunnels to be still retained for future subway uses.

"In closing, I desire to acknowledge the valuable assistance rendered me by Messrs. Charles V. Weston, C. E., Augustine W. Wright, C. E., Oren Root, Jr., and George C. Sikes in the preparation of this report, and to thank the respective office forces of Mr. Weston and myself for faithful and efficient services rendered."

SUMMARY OF CONCLUSIONS AND RECOMMENDATIONS.

I. The One-City-One-Fare Idea.

Chicago, with respect to transportation as well as other things, should be regarded as one city, not three. Divisional lines ought to be obliterated, as far as possible. A street car passenger should be carried over the most direct route between any two points within the city limits for a single fare. Complete unification of ownership and management is the best plan for realizing the one-city-one-fare idea. The same end can be accomplished, however, but in a less satisfactory manner, under divisional ownership, by a plan of through routing of cars, joint use of tracks and interchangeable transfers. To a still less satisfactory degree the same end can be accomplished by the interchange of transfers between companies without joint use of tracks.

II. The Through Route Principle.

Routes through the business district ought to be substituted for down-town terminals, wherever possible. Outside the business district, too, the best results would follow from connecting the detached lines now found on several streets, and operating cars over such lines from end to end on the through route principle.

III. Subways.

A system of subways should be and eventually must be, built to accommodate the street car traffic of Chicago and relieve the street surface congestion in the business district. Galleries should be provided in connection with such subways for the accommodation of present and future underground utilities. Two subway plans are outlined in the report. One plan, referred to as Subway Plan No. 1, shown on map No. 11, calls for three north and south subways, from 14th St. on the south to Indiana St. on the north, and two subways entering the business district from the West Side, utilizing the present Van Buren and Washington St. tunnels and looping back at Clark St. This is a system of high level subways throughout, with no dips. (The high level subway is shown in cross section in the upper part of Plate No. 9.) Its estimated cost is \$10,000,000. The other subway plan, known as Plan No. 2, shown on map No. 5, calls for practically the same north and south high level subways in combination with three or more low level subways from the West

Side passing under the north and south subways and reaching Michigan Ave., and should future developments warrant, under Lake Front Park as far as it may be extended. (The deep level subway is shown in transverse section on Plate No. 9.) The low level subways would require the use of elevators. The estimated cost of subways built according to this plan is \$20,000,000. Plan No. 2 is recommended as best for the city from an engineering and transportation point of view, but in case this plan is deemed inadvisable for business or other reasons a system of single-decked high level subways, as outlined in Plan No. 1, can be constructed, which will to a large extent accomplish the results. No subways should be built in such a manner as to preclude the operation of cars through them on the through route principle. Under either of the plans as outlined, the whole system of subways need not necessarily be constructed at once. One or more of the subways could be built at a time, and utilized separately, but with a view to their ultimately forming a part of a comprehensive system. The subway plans as submitted do not necessarily call for the removal of all tracks from the street surface in the business district, and Subway Plan No. 1 necessitates some surface loops. Under either plan there could be a street surface system connecting the depots and designed to accommodate short haul traffic in the business district. Under Plan No. 2 there could also be a low level subway system for connecting all depots, and by using it in connection with this subway all tracks could be kept off from the surface of the streets in the business district for some years to come.

IV. The Present River Tunnels.

It is inadvisable to attempt to lower the present river tunnels and at the same time retain them for surface railway use, for the reason that lowering the tunnels to a sufficient depth to accommodate future river traffic would involve extending the tunnel approaches at least a block further into the business district. In the interest of navigation, therefore, the tops of the tunnels ought to be promptly removed, leaving the lower parts of one or perhaps two of the tunnels for utilization later as parts of a future subway system.

V. Plan for a Unified Combined Surface and Subway Street Railway System.

A plan is presented for a new, reorganized and unified combined surface and subway street railway system, comprising the lines of the City Railway Co., the Union Traction Co., the Chicago General Railway Co. and the Chicago Consolidated Traction Co. within the city limits, the new lines necessary to properly connect the now disconnected parts of the system. The total single track mileage of this system as outlined would be about 745 miles, and its estimated cost, if constructed new, with everything first-class throughout, but exclusive of subways, would be \$70,000,000. Adding \$20,000,000, the cost of the subways constructed according to Plan No. 2, would make the total cost of the new system complete \$90,000,000. With Subway Plan No. 1, instead of Subway Plan No. 2, the total cost of the new unified system would be \$85,800,000.

VI. Plans for Immediate Improvement of Terminals and Service.

Plans are presented for the re-routing of surface terminals in the business district, (1) under the present divisional ownership and operation, (2) under the joint use of tracks in the business district under divisional ownership, and (3) under unified ownership and management. Immediate improvement of Chicago's local transportation facilities may be effected by substituting electric for cable power and routing cars according to any of the plans outlined, all cars from the West and North sides to enter the business district over bridges until such time as subways shall be constructed.

VII. Electric Underground Conduit System.

The operation of cars in Chicago by the electric underground conduit system is practicable and feasible. Overhead trolley construction should be prohibited within the area bounded by 12th St. on the south and the river on the north and west. Outside of the district named the objections to the overhead trolley are esthetic in nature, and it is for the city authorities to say,—after a balancing of financial against esthetic considerations,—how much, if any, underground conduit construction should be required. The cost per mile of single track (track alone, including feeders), of electric conduit road construction would average \$81,300 for a system covering the city at large, but exclusive of the cost of power, rolling

track and paving. Conduit construction, outside of the business district, should not exceed \$70,000 per mile, but within the business district the cost would be about \$100,000 per mile, due to the numerous curves, large amount of special work required and the extra cost of labor, due to the congestion within the district in which the work must be prosecuted. To either of the above figures should be added the cost of paving, as follows: Brick, \$12,650; asphalt, \$12,880; dressed granite, \$18,400. Overhead trolley road construction would cost \$28,000 per mile of single track, using the same weight of rail. It would cost nearly as much to convert the Chicago cable into electric conduit roads as to build new electric conduit roads.

VIII. Grooved Rails.

A grooved girder type of rail, of special design, is recommended for well-paved streets upon which cars operate often enough to properly clear the groove of dirt and ice. On outlying streets and on poorly paved and poorly maintained streets the girder type of rail should be maintained as best for team traffic and the railway companies.

IX. Electrolysis.

The destruction of underground utilities from electrolysis is now well in hand by the city, and if the present ordinance governing the subject is enforced no serious difficulties may be anticipated from this source, and when the underground conduit system is adopted there should be no further injury from electrolysis in the area served by the conduit system, because this system uses a complete metallic circuit.

X. The Financial Aspect of the One-City-One-Fare Plan.

A unified company could afford to conduct the transportation business of Chicago on the basis of a single fare for a continuous ride anywhere within the city limits. The present divisional companies, by the interchange of transfers, could afford to do the same thing, provided they were properly protected against the fraudulent use of transfers, but it would be at a somewhat greater cost to themselves, and with greater inconvenience to passengers, than would be the case under unified management.

XI. Growth of Population and Traffic in the Past and Estimates as to the Future Increase of Street Car Traffic.

The population of Chicago has increased since its incorporation in 1837 to 1902 at the rate of 8.6 per cent per year compounded, and is now increasing at the rate of 7.7 per cent per year. For the nine years from 1892 to 1901, inclusive, the number of revenue passengers carried by the surface and elevated lines combined has increased at the rate of 5 per cent per annum compounded. The increase for the surface lines during the same period has been at the rate of 1.5 per cent per year compounded. The increase for the combined surface and elevated lines from 1894 to 1901 inclusive, a period of seven years, has been at the rate of 6.3 per cent per year compounded. The increase for the surface lines alone during the same period has been at the rate of 3.9 per cent per year compounded, and the increase for the elevated lines alone has been for the same period at the rate of 26 per cent per year compounded. The population of Chicago has increased more rapidly than that of any other city in the world, but it is improbable that this rate of increase should continue indefinitely. Figures and curves are presented showing the past growth of Chicago as compared with other cities, also the future results if present rates of increase should be maintained, but as this is improbable curves are shown representing the increase in population and gross receipts that may reasonably be expected for the combined surface and elevated railways during the next fifty years.

XII. Estimated Cost of Reproduction and Present Value of Existing Plants.

The cost to reproduce the following properties complete with new construction and equipment throughout would be: Chicago City Railway Co., about \$17,200,000; Chicago Union Traction Co. (not including the Consolidated Traction Co.), about \$22,200,000. The actual present value of the physical properties for electric railway purposes of the following companies, taking into consideration the obsolete equipment and construction which must be discarded, but not taking into account any franchise rights or earning capacity of the properties, is estimated as follows: Chicago City Railway

Co., about \$12,000,000; Chicago Union Traction Co. (not including Consolidated Traction Co.), about \$15,000,000.

XIII. Need for Regulation of Team Traffic.

At the present time team traffic interferes with street cars to an unwarrantable extent. A reasonable regulation of team traffic is essential to the improvement of street car service.

XIV. The Union Elevated Loop Problem.

The junction points are the ultimate limiting factor of the capacity of the Union Elevated loop. At the present time, however, the platform stations are the limiting factor. The first and simplest way to increase the capacity of the loop is to lengthen the platforms so that two trains can load and unload at a station at the same time. When the capacity of the junction points is reached, added facilities can be provided by building stub-end terminals just outside the loop. The terminal capacity of the loop could be increased by dividing the loop into four smaller loops, but presumably there would be public objection to such a plan, because it would involve encumbering more down-town streets with elevated structures, and it is therefore, not recommended. The ideal solution of the elevated loop problem would be to utilize the loop structure as sections of through routes between the different sections of the city.

PART I.—GENERAL DISCUSSION OF STREET RAILWAY SYSTEMS AND CONDITIONS GOVERNING THEM.

Nearly all of the large cities of the United States are laid out and developed on one of three distinctive plans, each plan requiring a different general system of transportation routes to serve its population.

First.—The peninsula plan, with water front on both sides, such as that of New York City and San Francisco.

Second.—The valley plan, with a river running through the center, population and business district on both sides of the river, such as Pittsburg.

Third.—The radiating plan, with territory on one side of the water front, such as St. Louis, Boston, Brooklyn, and many other cities. To the third plan Chicago belongs.

The peninsula and valley plans usually call for comparatively small street railway track mileage, and great traffic density is found on that mileage, together with large gross earnings per capita served, per mile of track, and per car mile. For example, the elevated and surface transportation systems of New York City, serving a population of 2,050,000, earn about \$13 per capita, with a track mileage of 393 miles, and that of San Francisco nearly \$14 per capita, with a mileage of 229 miles, serving a population of 350,000.

The radiating plan means greater street railway mileage for the population served, with much smaller gross receipts per capita. The Chicago surface and elevated lines, for example, earn less than \$10 per capita on a track mileage of 610 miles, serving a population of two million, and the surface lines of St. Louis hardly \$8 per capita on a track mileage of 301 miles, and serving a population of 750,000.

It can be easily seen how different is the transfer problem in a peninsula and valley city than from that of a radiating city. In the former there may be a few long through lines with heavy traffic, with many short cross-town feeder lines. The transfers in such a city might mean no additional expense to the company, and little or no complications. In a radiating city, on the contrary, there is a large number of through trunk lines of great length, and many cross-town lines, increasing in length as they are farther removed from the point of radiation. On such a system long rides are granted, and dishonesty in the use of transfers is easily possible, with resultant great loss in earnings to the operating company.

Population and population density have an enormous influence on street railway earnings and profits.

A knowledge of these differences in city plans, and their bearing on the earnings of transportation companies, is so absolutely essential to the proper understanding of the theory of conducting transportation, that this brief explanation is deemed advisable.

While Chicago has been classed among those cities laid out on the radiating plan, and, consequently, is one of those cities wherein an ideal system of transportation is difficult of attainment, an added obstacle to such realization is found in the fact that the city is divided into three divisions by the unfortunate course of the Chicago River. From the earliest period in the development of the city

down to the present time this water barrier has been the fixed condition that has been recognized and deferred to. Town governments were established on its lines; it is the boundary line of wards throughout its course; the water, gas and sewerage systems are laid out with reference to it; diagonal streets or avenues to the business center are determined by its course. It is primarily responsible for the congested condition of the business center, limiting, as it does, by its movable bridges, the area to a little more than a square mile; the manufacturing district has grown up along its course, and naturally all lines of business that can be more profitably conducted through contact with navigation have sought its frontage.—all of which growth has so increased the value of the dock frontage that the Chicago River, with its movable bridges, must be considered as a permanent and fixed condition,—especially so as the natural dockage of Chicago, the lake shore, is being continually and continuously appropriated for park and pleasure purposes. Following out the divisional idea, forty-four years ago, when the city had grown to such proportions that some method of transportation was deemed necessary, street car companies were named, chartered and received grants in divisions, and to this mistake, made in the infancy of the transportation business, can be traced the primary cause for the present demand for a change in transportation facilities. Chartering companies and granting privileges by divisions to separate ownership not only saddled upon the people a multiplied system of fares within the limits of the city, but made it impossible to traverse the small area in which the divisions converged without payment of two fares. To this double fare in the business district can mainly be charged all the extraordinary congested condition not occasioned by the course of the river.

As population increased and additional territory was annexed the owners of the divisional transportation companies were called upon to extend their lines for the accommodation of the increase. Naturally, each division ownership, not being in any manner interested in the operation of any other division, guarded its territory jealously and laid out extensions and new lines with a view to perpetuating the travel in each division over that division's lines to the common center, there to take the lines of the other divisions. When cross-town lines were inaugurated they were only cross-division lines. As the diagonal avenues were laid out with reference to the course of the river, they were confined to some one division, and when they were appropriated by the transportation companies it was only for the acceleration of the movement of the residents of each division to the common center.

As in the case of all cities laid out on the radiating plan, Chicago has a common point where all lines of traffic concentrate and which is the objective point of its population, commonly designated as the business center. This point was fixed and has grown up, by and from the causes outlined above, and must be considered in a large degree as governing the transportation situation.

It is true that as the area of the city grows and population increases, new centers are created at different points in the separate divisions, around which centers population masses, and there is a growing demand for transportation between divisions without reference to the general down-town business center. This demand, which did not exist in the infancy of the city when there was only one business center, will continue to grow as the city grows, and as former residents of one division move to other divisions, and carry with them the desire for communication with their former neighborhood.

Problems to Be Solved.

The problems to be solved in relation to transportation facilities for the whole of Chicago and its suburbs are, therefore:

First.—To devise some method of operation which will relieve the congestion of the overcrowded thoroughfares in the central portion, or business district, of the city and tend to render available an increased area in that district.

Second.—To furnish a more ready means of intercourse between the separate divisions of the city, through the business district and outside such district.

Third.—To furnish a means of distributing passengers brought in at the several railroad stations, for transferring them from one station to another, and to facilitate intercourse between different portions of the business center.

It is obvious to the most casual observer that the primary cause

for the existing unsatisfactory condition and multiplied fares is found in the diversity of ownership of the corporations charged with furnishing transportation facilities.

A unification of ownership or a consolidation of management on some basis is a condition which must be precedent to any really satisfactory and lasting solution of the problem, although an equitable arrangement for the joint use of tracks would effect a temporary solution, and probably result ultimately in unification. Each of the divisional companies has given due attention in the past to the securing of privileges to construct tracks in its own division and in the down-town district—every concession granted tending to perpetuate divisional operation. The idea has taken firm hold on a large proportion of our citizens that Chicago should be one large city, in fact as well as in name, and rapid strides are being made tending in the direction of eliminating the separate town governments, taxing bodies, etc. It would seem, therefore, that now is the time to eliminate the divisional lines in its surface transportation facilities, and all other considerations should be subservient to the accomplishment of this one feature, viz.: One fare within the city limits. Whether this be accomplished by universal transfers between the separate companies at all junction and connecting points, or by the operation of through lines of cars routed over the tracks of the three divisions, is a question of expediency. There should be no difference of opinion as to the latter method suggested being the more desirable. It could be accomplished by a unification of ownership or management of the several companies interested, which would be the best way, or by the joint use of tracks by the separate companies. The same results could be obtained by the transfer method, but with considerable inconvenience to the traveling public and expense to the operating companies, but this method should be adopted in case unification of management or joint use of tracks cannot be effected.

Existing Diversity of Ownership.

The surface lines serving the city are either owned or operated by eight companies, viz.: Chicago City Railway Co., Chicago Union Traction Co., Chicago General Railway Co., Chicago Consolidated Traction Co., South Chicago City Railway Co., Calumet Electric Street Railway Co., Chicago Electric Traction Co., and Suburban Railroad Co. The mileage of the three former companies is entirely within the city limits. The mileage of the remaining five companies is partly within the city limits and partly in adjoining territory. There are four companies operating elevated railroads, all of which roads operate to the business center and around one common loop, controlled by a fifth company.

It is claimed that a part of the ordinances of the Chicago City Railway Co. and of the North Chicago City Railway Co. and the Chicago West Division Co. (the two latter companies being subsidiary companies of the Chicago Union Traction Co.), expire in July, 1903. The ordinances and grants under which the remaining companies are operating do not expire in the near future.

The Chicago City Railway Co. serves that portion of the South Division contiguous to the business center, but has no affiliation with or control of the companies serving the outlying southerly territory, although some of their lines are in close connection for easy transfer of passengers. None of the lines of the outlying companies have terminals north of 63d St.

The Chicago Union Traction Co., by virtue of leases, controls the operation of the lines of the North Chicago Street Railroad Co. and the West Chicago Street Railroad Co., and their subsidiary companies, viz.: the Chicago Passenger Railway Co., the Chicago West Division Railway Co. and the North Chicago City Railway Co.

The West and North divisions are served by these companies except where the lines of the Chicago Consolidated Traction Co. are built through the territory contiguous to the business center and where operating privileges are exchanged between the Union and Consolidated companies. The Union Traction Co. also practically controls the operations of the Chicago Consolidated Traction Co. by virtue of an operating agreement and also by control of a majority of its capital stock.

The Chicago Consolidated Traction Co. is in possession of ordinances covering a large number of streets which are reserved to streets on which the Union Traction Co. is now operating cars and also covering streets that are section and half-section lines, within the present city limits, which condition precludes the possibil-

ity of future extensions of the Union Traction Co. lines to the present city limits or to any extensions thereof. The Chicago Union Traction Co. charges one fare of 5 cents and the Chicago Consolidated Traction Co. charges another fare.

(Since the foregoing was written the Supreme Court of Illinois has handed down a decision confirming the position taken by the city that by the agreement existing between the two companies and by the control of the stock of the Consolidated company by the Union company, the two companies were one, and consequently one fare only must be charged by the two companies and transfers must be issued between the lines of both companies to enable a passenger to complete a continuous trip within the city limits for one fare. At the present time the companies are attempting to comply with this decision, although it is understood that they intend to appeal to the federal courts, and since from this it seems that the question is not yet settled I have thought best to leave the discussion here as well as that in Part 2 relating to transfers stand as originally written.)

The Consolidated Traction Co. is also in possession of ordinances covering some streets that traverse the inner territory of the Union Traction Co., and its cars reach a terminal in the business center by traffic agreements with the Union company, but there is no interchange of transfers on these streets between the two companies. While these two companies are separate and distinct and while the ordinances running to the Consolidated company do not expire at the present time, and consequently are not under consideration, it would be very desirable—if such a thing were possible in the adjustment of the Union Traction Co.'s ordinances—to eliminate the double fare within the territory at present served by the Union company and also in the entire territory within the present city limits, served by both the Union and Consolidated companies. The North Western Elevated Railroad Co. is furnishing service to a few favorably located residents contiguous to its line on the last most northerly mile and to those clustered around its terminus, for one fare, while other residents further removed from the elevated line and served by the lines of the Consolidated Traction Co. are compelled to pay 10 cents to reach the business center.

The Lake Street Elevated Railroad Co. serves, with a 5-cent fare, a small district outside of the present city limits in the territory also served by the Consolidated company, thus giving those residents immediately contiguous to the elevated line a 5-cent fare, while others in the same territory, but not so fortunately located, are compelled to pay 10 cents to reach the business center. It is only a question of time—and that of very short duration—when Chicago, in its rapid growth, will absorb more territory to the North and West, and this seems to be the opportunity to secure for all of those prospective citizens the great benefits of a low fare to their objective point, which a few of them are now in possession of. The desirability of such a concession cannot be overestimated, and it is equally desirable in the territory within the present city limits, south of the territory served by the lines of the Chicago City Railway Co. and also of the territory adjoining the city limits on the south; but unfortunately the Chicago City Railway Co. has no affiliations with or control of the several companies serving that territory, and consequently the same vantage points are not in possession of the city as exist with regard to the territory to the north and west. It might be argued that the much greater distance involved in reaching the southerly suburbs would preclude the possibility of securing a single fare for their residents; but the argument would not hold good in reference to the northerly and westerly suburbs, as an elevated road is already furnishing service for 5 cents to a portion of the residents in the very center of the district.

The Chicago General Railway Co.'s ordinances and leases cover, among other streets, one mile between 22d and 31st Sts., on both Kedzie Ave. and Ashland Ave. This company has no affiliation with either the Chicago City Railway Co. or the Chicago Union Traction Co., and its occupancy of the streets as above stated precludes the possibility of connecting the trackage of the City Railway Co. and of the Union Traction Co., now being operated both north and south of the Chicago General Railway Co.'s tracks, for the purpose of connecting the West and South divisions across the south branch of the river, unless some arrangement is made to secure the trackage of the Chicago General company, or the right to operate over it.

Underlying Ideas of Report.

Viewing the situation from the standpoint of the best interests of the whole city of Chicago, these ideas should prevail at all times and be guiding and determining factors in arriving at conclusions, viz.: That Chicago is one city, not three; that there are no divisional lines traversing the district embraced within its boundaries; that the citizens have the right to expect and demand that they be transported in, through and about the whole district in one general direction for one fare and with as little inconvenience attendant upon the use of transfers as practicable. With these ruling ideas held firmly in mind, this report has been formulated.

In my opinion, in the adjustment of this transportation question, the amount of cash compensation to be secured by the treasury from the street railways should be of secondary consideration to the attainment of one fare within the city limits and the very best transportation facilities known at the present time, with the guaranteed assurance that the service be kept up to modern standards and that the citizens would receive all the benefits from all future developments of the art.

The report is very voluminous, comprising with the appendices, over 300 printed pages, and is accompanied by 15 plates and 14 maps. We have reproduced in full the summary of conclusions and the general discussion constituting Part I of the report, and abstracted the principal features of the other portions which are as follows:

Present Service.

Part II deals with the present conditions which prevent the street railways from operating a sufficient number of cars during the rush hours. The reasons assigned are:

First.—The present terminal facilities, as arranged, are utterly inadequate.

Second.—The operation of cars by cable power prohibits the use to their maximum capacity of the terminal facilities that are provided.

Third.—The lack of electric power in the business district.

There are now in operation during the hours of maximum traffic on the lines that enter the business district, 1,379 cars, consisting of:

772 cable cars.

97 electric motors trailed on cable trains.

510 electric cars.

The 869 cable cars and electric cars trailed on cable are operated around five loops.

The 510 electric cars are operated around one loop and on five stub end terminals—34 of them being hauled by horses eight blocks each, every round trip.

A review of the conditions under which the cars are operated leads to the conclusion that very little improvement can be made in surface transportation unless a radical change is made.

The recommended changes are:

First.—All cable operations should be abandoned and the cable trackage converted to either overhead trolley or underground conduit for electrical propulsion of cars.

Second.—The territory embraced by the river on the north and west, and 12th St. on the south should be used in common by all companies for the proper location of loop tracks for terminal facilities, all these business center tracks to be of the underground electric conduit type.

Third.—Cars should be routed, so far as practicable, via trunk, avenue, and cross-town lines combined, in such manner as to serve the maximum amount of travel with the minimum use of transfers.

Fourth.—Sufficient cars of the double truck pattern, equipped with brakes operated by other than hand power, adequately heated during cold weather, and operated singly, should be provided for all through lines, although lighter cars could be used on the cross-town line service.

Fifth.—On all well paved streets all rails on new track built and on all tracks when renewed, should be of the grooved type, designed on such lines that the groove will be cleaned by the passage of the wheel flange and presenting the least obstruction to crossing vehicles, and extending the least invitation to tracking vehicles. Where such rails are laid the pavement should be kept clean.

For terminal loops two plans are suggested. One constituting "Surface Plan No. 2" is for a rearrangement of the surface tracks in the business district which eliminates grade crossings of one loop with another but on eight of the eleven loops proposed the traffic on

each loop crosses itself at the entrance to the loop. These intersections are preferred to the opposition to vehicle traffic that would result from using a left-hand track in streets where there are portions of two loops. According to this scheme the south side lines have three loops, the west side lines five loops and the north side lines three loops, all of the loops being entirely within the area now bounded by the Union Loop, excepting that for the Wabash Ave. line of the Chicago City Ry. By the suggested arrangement only one of the loops is more than two blocks from the Post Office block, the exception being three blocks distant.

The second scheme constituting "Surface Plan No. 3" is a rearrangement of surface tracks in the business district recommended with the idea of providing for through service also, and several of the tracks being used jointly by the different companies. In this arrangement it was assumed that grade crossings would be permitted. The plan is presented as serving the largest street mileage by all lines of cars that could be devised, and making possible the delivery of almost all passengers to State St., and of all to Dearborn St. The plan leaves Michigan Ave. and La Salle St. free of tracks.

"Surface Plan No. 1" is a suggested arrangement of surface loops for the West Side lines in connection with "Subway Plan No. 1." Seven loops are provided, each encircling a single block and occupying seven of the eight blocks between Madison and Adams Sts., Michigan Ave. and Clark St.

An estimate based on the business of 1901 and 1902 places the rush hour traffic to be carried into and out of the business district per hour for 90 minutes, morning and evening, at 48,135 for the south division, 23,346 for the north division and 40,821 for the west division. Assuming double truck cars carrying 60 passengers each would require headways as follows: Three south side loops, a little closer than 15 seconds. Five west side loops, 25 seconds. Three north side loops, about 25 seconds.

A plan of routing cars under a unified system of roads is worked out and shown by maps and schedules, the idea in which is to eliminate transfers so far as possible.

Large double truck cars are recommended for trunk lines, the smaller single truck cars being retained on the cross-town lines and for local distribution in the business center.

Attention is called to the necessity of adopting and stringently enforcing ordinances for the better regulation of team traffic in the streets. The average schedule of all electric cars operated in the city is given as 8.22 miles per hour, as compared with an average schedule of 6 miles per hour for the old horse-car lines.

Part II of the report concludes with a recommendation as to additional tracks that should be laid in the near future.

Compensation.

Part III comprises an extended discussion of population and traffic statistics leading to the following deductions and conclusions:

"First.—That the normal increase in population up to and including 1892 was at the rate of about 11.2 per cent per annum compounded, and that since and up to 1901 the increase has dropped to less than 5 per cent per annum, although the figures for 1901 and estimated figures for 1902, bring the average for this last year up to 7.7 per cent.

"Second.—That the elevated competition, labor disturbances and depressions in the industrial world at the several periods during the past ten years, and the earnings of the mileage built by the Chicago Consolidated Traction Co., have practically offset any benefits which might have accrued to the surface lines of the Union Traction company in the north and west divisions from the increase in population,—its gross receipts during the past year being approximately equal to what they were in 1892.

"Third.—That the Chicago City Railway Co. in the south division has met all competition and depression and shows an increase of passengers carried during the year of 1901 of thirty million passengers over the number carried during the year of 1892, or about 34 per cent increase in nine years.

"Fourth.—That in a city the size of Chicago the increase in population per year as recorded since 1892 does not seem to have a much influence in increasing the earnings of the transportation business as do the depressed times in decreasing them, or prosperous times in augmenting them."

"For these reasons I cannot see my way clear to recommend any fixed percentage of increase for any great length of time, but have

endeavored to give as complete an analysis of this subject and set forth the information derived from this analysis in as clear and scientific a manner as practicable, hoping thereby to form the basis for intelligent discussion of this subject, and that an equitable adjustment of the matter can be reached, which adjustment must be based upon the judgment of past and future business and industrial conditions, rather than upon any scientific law which can safely be deduced from the figures of the past, for, as has been previously pointed out, a financial depression of the country has a greater tendency to decrease the gross receipts of street railways than an increase in population has to raise them.

"It is, however, clear to me that if money compensation is to be required by the city for franchise rights the only equitable and just basis of compensation to the city should be based upon a percentage of the gross receipts, whatever they may be, of each of the companies, payable annually, owing to the fact that any general law, even though it might be correct, which was deduced from the past records of the combined receipts of the surface and elevated railways of the city, could not equitably be applied to any individual road for the reason that industrial conditions, due to the loss of population from the territory of one road to another, or to competitive roads entering the territory of any given road, the gross receipts of the road so affected might be greatly decreased, thereby preventing it from paying a fixed amount into the city treasury, which amount had been previously fixed and based upon a fixed percentage of the past records during prosperous times.

"In case the city should see fit to require a fixed amount per annum, this amount being a certain percentage of some future predetermined gross earnings based upon past earnings, it is clear to me that any such arrangement should be only for short intervals of time, and that readjustments should be made between the city and railroads in periods not over five years apart."

Transfers.

Part IV discusses routes and transfer systems with a view of securing one fare within the limits of the territory served by companies at present affected by the franchise renewal question. In conclusion Mr. Arnold says:

"It is my opinion, after a careful canvas of the matter, that a unified company could afford to furnish transportation facilities to the entire territory embraced by the lines of the Chicago City Railway Co., the Chicago Union Traction Co. and the Chicago Consolidated Traction Co. within the city limits for a single fare, and I am also of the opinion that companies operating under divisional ownership or management could, if properly protected against the fraudulent use of transfers, grant the same privilege, but at a slightly increased expense to themselves over what it would be to a unified company. Furthermore, I believe that no one thing that could be done for Chicago would tend more to enhance its growth and prestige than the securing of such concession in the settlement of the transportation question."

A Unified System.

Part V deals with a unified system of street railways for Chicago which is considered a condition that must be precedent to any really satisfactory and permanent solution of the transportation problem.

The plan submitted to meet the request of the committee for a means to eliminate grade crossings and provide for through lines is as follows:

"The north and south tracks of the three divisions, at present built, including those west of the river, should be connected, and through north and south lines of cars be operated on each street, these lines to be designated as the 'Trunk System.'

"Upon the east and west tracks of the three divisions, at present built, through east and west lines of cars should be operated on each street, these lines to be designated the 'Cross-Town System.'

"Upon the diagonal avenues radiating from the business center and paralleling the north and south branches of the Chicago River, there should be operated lines of cars between the northeast and southwest, and between the southeast and northwest sections of the city, through the business center,—designated the 'Avenue System.'"

Conforming to the fundamental principle that through traffic should be given the right of way and recognizing that the greater portion of through traffic will be between the north and south divisions, Subway Plan No. 1 is submitted. The details thereof are as follows:

"Through the business center, the subway system of Chicago should consist of subways between 14th St. and Indiana St. under the north and south streets best adapted to serve the north and south through traffic, with east and west connections from the most westerly subway, to the two tunnels leading to the west division, for the accommodation of the avenue through traffic. The avenue through traffic from the north and south division should be routed—outside of the subway district—to the tracks leading into the most westerly subway. As quite a proportion of the traffic from the westerly portion of the south division and from the west division designed to terminate in the business center will naturally be brought in over the avenue lines, and from lines leading into the avenues, two subway loops for the joint use of this traffic terminating in the business center, should be constructed, using the most westerly north and south subway for the east side of each loop. All other cars from the west division and from the westerly portions of the south division, should be brought into the business districts over the bridges, and returned via surface loops. To provide terminal facilities for the divisional traffic of the north division and that portion of the south division lying east of Halsted street, terminating in the business center, a cross subway should be constructed in the center of the business district,—with reference to the north and south,—connecting all the north and south subways. This lateral subway, in connection with the north and south subways, would provide six loops, three for the north division and three for the south division traffic. To carry out this general plan it will be necessary to construct two more tunnels to the north division to supply an outlet to the north for each transportation highway, entering from the south. By this plan the following results will be obtained:

"First.—The greatest possible capacity of the limited area in the business district would be utilized for terminal facilities.

"Second.—All through traffic via the business center would be taken through the congested district, underground, saving time to the passenger, and relieving the congestion in this district.

"Third.—All subways would be on the high level without grade crossings, thus cheapening the construction and not interfering with existing low-level improvements.

"Fourth.—All river tunnel approaches within the business center would be closed.

"Fifth.—As all traffic from the north and south divisions would be underground, if 'Surface Plan No. 1' were used, grade crossings of surface loops would be eliminated, except those incident to the operation of the local distributing system."

In connection with the subway an independent business center system would be needed, for which are recommended double tracks in three north and south streets, State St., Clark St. and Fifth Ave., with east and west lines in the 12th St. viaduct and in a street north of the river.

The estimate of the cost to provide a system of street railways as described in this part, involving 746 miles of single track, alternating-current power plant and sub-stations, 2,000 double truck cars seating 52 persons each, necessary shops, car houses and real estate, is \$69,800,000.

Estimated gross earnings are \$14,763,000 per year, and net earnings based on past performance of existing companies, are \$5,124,000. No fixed charges are deducted in estimating net earnings, but a deduction of \$943,000 is made for taxes.

In addition the subways in "Subway Plan No. 1" are estimated to cost \$16,000,000 exclusive of land damages.

Subways.

Part VI is devoted to discussion of technical problems, valuations and estimates.

The "Subway Plan No. 1" which is entirely a high level system located as shown in the upper part of Plate No. 9 is presented as the best to fulfill the conditions necessary for the successful operation of a combined surface and subway railway system which is practicable without interfering with existing low level improvements.

Objections to the plan are: To eliminate grade crossings as in "Surface Plan No. 1," all north and south traffic would be underground and almost all cars from the West Side would be on the surface in the business district. If either of the other surface plans were adopted passengers arriving on West Side subway cars would have to transfer to surface cars if they desired to ride east of Clark St.

This system creates conditions most favorable to the misuse of transfers.

To overcome these objections "Subway Plan No. 2" is submitted as an ideal solution of the problem. In this plan the high-level subways of "Subway Plan No. 1" are retained, and three or more low-level east and west loops added, the typical section of a station at an intersection being shown in Plate No. 9.

The chief objections to this plan are:

First.—Its cost of \$20,000,000 as compared with \$16,000,000 for Plan No. 1.

Second.—The passengers in the low level subways would be about 40 ft. below the surface of the street, thus necessitating the use of elevators between low level and high level subways at station points, a distance of about 20 ft.

Third.—The engineering difficulties and risks that would be encountered in its construction.

Fourth.—The fact that it would interfere, and to a large extent destroy, existing and contemplated low level improvements. This last is considered difficult to overcome, but it is believed that an arrangement with the Illinois Telephone & Telegraph Co. to use its subways as the low-level street car subways or to construct the two systems jointly and at the same time would to a large extent relieve these difficulties.

The recommendations on the terminal problem in their order of merit from an engineering and transportation standpoint are:

"First.—Subway Plan No. 2 in connection with

(a) Surface Plan No. 3; or,

(b) Surface Plan No. 2; or,

(c) Surface Plan No. 1, with suitable connections for accommodating through cars.

"Second.—In case it is found for business reasons impracticable to construct Subway Plan No. 2, I recommend

Subway Plan No. 1 in connection with

(a) Surface Plan No. 3; or,

(b) Surface Plan No. 2; or,

(c) Surface Plan No. 1, with suitable connections for accommodating through cars.

"Third.—If for any reason it is found inadvisable to at present construct the entire subway system as outlined in Subway Plan No. 2, or Subway Plan No. 1, one north and south subway, and one low level east and west loop could be constructed at present, which, if used in connection with any one of the surface plans, would largely relieve the present congestion, and leave the future subways to be constructed when needed, it being understood that whatever subway work is done should be done in such a manner that it follows one or the other of the general plans recommended.

"Considering the surface terminal problem by itself, I recommend the adoption of Plan No. 3 and the immediate lowering of the tops of the tunnels to such an extent that marine traffic will no longer be impaired, and the preserving of portions of the tunnels for use in connection with future subways."

Electric Conduit Lines.

Plans for an underground electric conduit system for the downtown district are included. The cost of building the conduit lines inclusive of feeder wire and exclusive of paving is estimated at \$81,300 per mile of single track. It is considered there would be little saving possible by trying to utilize existing cable construction.

The Union Elevated Loop is briefly discussed and the following recommendations made for possible improvements to accommodate increased traffic on the Union Loop are as follows:

First.—The extension of the present platforms.

Second.—The provision of stub end terminals for each independent company.

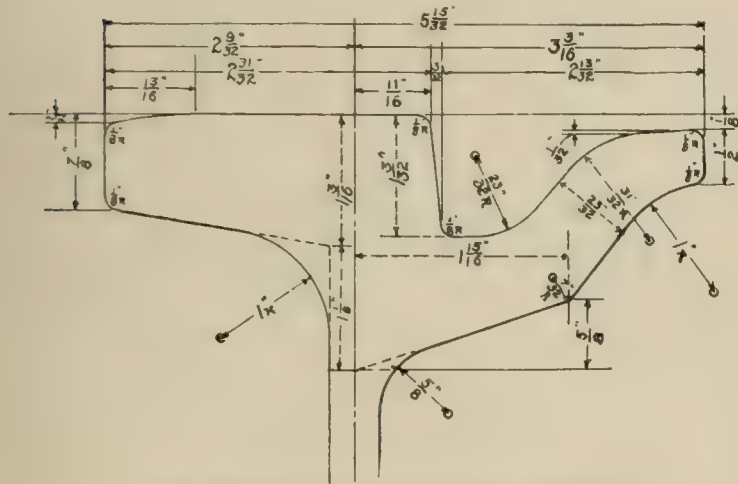
Third.—That if further loop capacity is demanded after the above recommendations have been put into execution, it could be secured by the extension of the Union Loop south on Fifth Ave. to Polk St., thence east on Polk St. to Wabash Ave., and north on Wabash Ave. to a connection with the present structure at Harrison St., and dividing it into four parts by means of a north and south line on Clark St.

Fourth.—The ultimate utilization of the entire Union Loop, either as it is now constructed, or as it may hereafter be extended, as a part of a through line system for the combined operation of through cars over all the elevated structures between all divisions of the city.

The first and second methods are considered practicable and desir-

able under the present diversity of ownership, and the fourth is recommended should it become possible by means of joint ownership or traffic agreement between the elevated companies.

A 9-in., 120-lb. girder rail the head being as shown in the line drawing is recommended for streets paved with asphalt, brick or granite, and kept clean; the cost of this construction laid on concrete beams is estimated at \$24,000 per mile of single track.



9-IN. 120-LB. GIRDER RAIL FOR PAVED STREETS.

For unpaved or poorly maintained streets the present girder tram rail section is recommended.

Valuations.

Estimates of cost are made on two bases, concerning which it is said:

"A.—The cost to reproduce the properties today.

"The figures are based upon what it would cost to furnish and install the materials entering into the construction of the properties today, and in considering these prices it should be borne in mind that the state of the art is now such that a large amount of the physical part of the properties, as they exist, could be built now much cheaper than was possible at the time they were built."

"B.—Present value of the physical property for electrical railway purposes.

"This gives the present values of the physical properties for electrical railway purposes so far as I am able to estimate them. In deducing this it has been necessary to take into consideration the fact that the cable systems complete, exclusive of track, real estate and buildings, must be considered as practically obsolete, and that, therefore, the only amounts that they can be credited with is what salvage can be obtained from their disposition. I have, however, considered that some portions of the cable tracks, outside of the business center, where underground conduit construction would not be required, could be used to operate electric cars over, provided the tracks were surfaced up and brought into good physical condition. For these reasons I have credited the cable systems, in each case, with the estimated value that it would cost to reproduce these cable tracks as new electric car tracks, taking into consideration the weight of the rail in each case, and allowing a suitable depreciation from the figure thus obtained, depending upon the condition in which the track and paving have been maintained by the respective companies. I have endeavored to estimate this depreciation as fairly as possible, and while it may seem difficult to understand how it can have been so great, it should be accepted as one of the conditions due to the advancement of the art in street railways, and is illustrative of the conditions which must be faced by any corporation or municipality which engages in the transportation business. The same statements are largely true regarding a large part of the electrical equipment of some of the present companies, for the reason that the electrical art has so far advanced that some of the present properties were built that a part of their electrical and steam equipment is, from the standpoint of economical operation, obsolete today. In considering this valuation it must be understood that it does not in any sense purport to be the actual value, from a business standpoint, of the properties estimated, for the reason that ordinarily from a business and finan-

cial standpoint the value of all properties having franchise rights would be based largely upon their earning capacity, and not upon the mere physical value of the tangible property."

The valuations for the two companies are:

| | A. | B. |
|----------------------------------|--------------|--------------|
| Chicago City Ry..... | \$17,172,425 | \$11,747,819 |
| Chicago Union Traction Co.*..... | 22,214,635 | 14,937,088 |

* Not including Van Buren St. tunnel.

Valuation Under Expiring Grants.

An attempt is made to value existing tracks subject to the contention of the city that franchises for certain lines expire on or before July 10, 1903. The dates of expiration are taken from the report of the Special Council Committee dated March 28, 1898. The estimated value of the tracks for which grants are claimed to expire subtracted from the estimated value of all tracks gives the following:

| | |
|--------------------------------|--------------|
| Chicago City Ry..... | \$4,045,443. |
| Chicago Union Traction Co..... | 5,306,550. |

Appendices.

The appendices to the report include a list of the present routes, giving length of round trip, time of round trip and maximum number of cars operated by both of the companies; the routes recommended by Mr. Arnold for operation with the unified system; the routes recommended for the business district under divisional ownership with joint use of tracks; schedules of the transfer points under the present operation; lists of streets in which tracks are now laid, and a list of the tracks necessary for the system as recommended by Mr. Arnold.

REGULATIONS WITH REGARD TO VESTIBULES.

In view of the agitation for vestibuled cars now being carried on in certain localities it is instructive to note that the Boston Elevated Railway Co. has found it necessary to issue general orders instructing motormen that they must lower the glass in the vestibule sufficiently to secure a clear vision whenever the glass becomes clouded by fog, rain or snow. This evidence on the vestibule question is valuable as showing that much as the railway companies may desire to cater to the comfort of its employees, its duty to provide first for the safety of the public, and in fact for the safety of its employees themselves, will not permit it to operate cars with the vestibules entirely enclosed except in absolutely clear weather when there is no possibility of obscure glass obstructing the vision of the motormen.

The new order regarding vestibules reads as follows:

"Motormen are instructed that at all times when owing to fog, rain or snow, the glass in the front vestibule obstructs the vision, they must lower the glass sufficiently to secure a clear vision. No excuse will be accepted for accidents occurring under such circumstances when this precaution has not been taken.

"Under these conditions the front door may be closed, except at important stations and in the subway.

"At all times after dark or during the night motormen must keep both doors of the vestibule of the front end of the car closed, except while cars are in the subway, at either level of the Dudley Street or Sullivan Square Terminal Stations, or at times when considerable numbers of persons wish to enter or leave the car at once.

"The general practice in the evening and at night must be for passengers to make use of the rear door for entrance and exit."

DINNER OF THE MICHIGAN ELECTRIC CO.

A year ago the Michigan Electric Co. of Detroit inaugurated the practice of giving a dinner to its employees, and the second entertainment of this company was given at the Cadillac Hotel on January 3d. After the dinner, which was attended by 50 employees of the company, the party attended the theater.

The Schuylkill Valley Traction Company's Employee's Relief Association recently engaged the Washburn Minstrel company to give a performance in the opera house at Norristown, Pa., for the benefit of the association.

"TROUBLE" AT STREATOR, ILL.

Mr. G. J. A. Paul, manager of the People's Light & Railway Co., of Streator, Ill., recently had an experience with the employes of the company which is described in the Streator Daily Free Press as follows:

"For a time last night things around the street car power house had a deep blue tinge streaked with red, but the trouble was finally fixed up in a satisfactory manner.

"When the motormen and conductors had finished their day's work they called a meeting in the office of Manager Paul. He was not present at the time, but soon appeared after being notified of the meeting.

"Then the men made a demand for a raise of wages, shorter hours of labor, no cars to start running before 7 o'clock in the morning, soapstones for the use of the motormen, and a few other small concessions.

"As each new proposition was presented Manager Paul's wrath arose, and after he had expressed himself in no uncertain terms and was near exploding with anger, Conductor Pool stepped to the front and said there was one more demand the men had to make, and that was that Mr. Paul would accept the handsome office chair which the men had purchased for him, and which was then brought in.

"Then Mr. Paul caught on to what the 'demands' meant, and when he had composed himself he made an appropriate reply, and then there was 'something doing' for the next half hour. All of which shows that the utmost good feeling prevails between the manager and the employes of the company, which is as it should be with all corporations."

PITTSBURG & ALLEGHENY VALLEY RAILWAY CO.

This company was recently incorporated under the laws of Pennsylvania and its charter covers practically every street and highway in the Kiskiminetas Valley from Apollo to Leechburg. It also owns all of the capital stock of the Apollo Electric Light, Heat & Power Co., the Leechburg Electric Light & Power Co., the New Kensington Electric Light, Heat & Power Co., and the Parnassus Electric Light & Power Co., and has retired all the indebtedness, both bonded and floating, of these corporations. The company also owns all of the capital stock of the Kiskiminetas Bridge Co., a combined highway and railway bridge connecting Leechburg with Hyde Park. The company's railway line, except in towns, is located entirely upon private rights of way owned by the company, and the local franchises in the towns through which it passes are extremely liberal.

The present population in the territory served by this company is approximately 40,000 and is rapidly increasing. At New Kensington the line will meet the Tarentum Traction Passenger Railway Co., and the construction of six miles additional would connect New Kensington with the Pittsburgh Railways Co., at Oakmont, giving a continuous trolley service to Pittsburgh. The capital stock of the company is \$1,500,000 and its authorized bonded indebtedness is \$1,100,000. Its stock has been deposited with the Public Trust Co., of Pittsburgh, Pa., trustee, as security for the bonds, of which \$250,000 worth are offered for sale. The bonds now offered constitute a portion of the \$1,100,000 authorized and are secured by a first mortgage on all the property now owned or that may hereafter be acquired by the company, and the bonds can only be redeemed at maturity.

Messrs. Sanderson & Porter, after examining the conditions, reported that the estimated gross earnings and net earnings under good management would be \$214,000 and \$100,000 respectively.

PROPOSED TUNNELS FOR NEW YORK CITY.

During the past month three of the important tunnel projects for New York City, which were outlined in the "Review" for Feb. 15, 1902, have received the necessary final sanction of the Board of Aldermen, and there is stated to be now no legal obstacle to prevent their rapid completion.

First in importance is the franchise granted to the Pennsylvania

R. R. providing for at least five 18½ ft. tubes, three under the North River for bringing the Pennsylvania lines into the heart of New York City, and two under the East River for giving direct New York connections with the Long Island R. R., which is owned by Pennsylvania interests. The five tunnels will converge at a central station in 32d St., between Seventh and Ninth Aves., Manhattan.

Next is the ordinance passed early last month giving the New York & Jersey Railroad Co. permission to construct a tunnel under the North River, running from the Jersey City Terminal station to a station at Greenwich and Christopher Sts., Manhattan. The object of this project is to give physical connection between the electric lines converging in Jersey City and the surface electric lines of Manhattan.

The third tunnel will run under East River from Fourth St., Long Island City, to 42d St., Manhattan, and will connect the lines of the New York & Queens County Electric Ry. in Long Island City, with the Rapid Transit subway, Manhattan.

We are assured by a high official of the Rapid Transit Subway Construction Co. that unless the entirely unexpected happens electric trains will run through the rapid transit subway on Jan. 1, 1904.

OHIO NOTES.

Residents of towns near the Cincinnati, Georgetown & Portsmouth Railway, recently converted for operation by electricity, have asked the management to make an extension to Felicity.

The lower court has pronounced invalid an ordinance passed by the City of Dayton, O., to prevent the traction companies from loading and unloading freight in certain streets. It is believed that this decision will result in the eight electric railway companies securing a larger share of freight traffic.

The Columbus Street Railway Co. and several of the interurban companies entering Columbus, on Christmas presented each of the married men in their employ with turkeys, and each of the single men with \$1 in lieu of the dinner.

The Scioto Valley Traction Co. has been granted until July 1, 1903, for the completion of its lines. The difficulty in getting steel is the principal reason assigned for the delay.

It is generally believed that the plans of the Cincinnati & Columbus Traction Co. which has a franchise from Washington Court House to Norwood will be carried out. The Appleyard interests will arrange for the connection from Washington to Columbus and arrangements have been made with the Cincinnati Traction Co. for entrance into Cincinnati.

IMPROVEMENTS ON THE ST. LOUIS & SUB-URBAN.

The St. Louis & Suburban Railway Co. has reconstructed its main line along its private right of way with 80-lb. T-rails and in the city with 94-lb. girder rails, and has purchased a large number of new cars which are equipped with four Westinghouse No. 49 motors, Westinghouse standard traction air brakes, Hunter signs and fenders. The cars are 46 ft. in length with inside mahogany finish and are mounted on St. Louis Car Co's. No. 7 trucks; all other cars on the system are being reconstructed to meet the standard of the new equipment. Some of these have been completed and are now in operation and all will be in operation by early spring. Extensive improvements are being made in the power stations and car houses.

A CORRECTION.

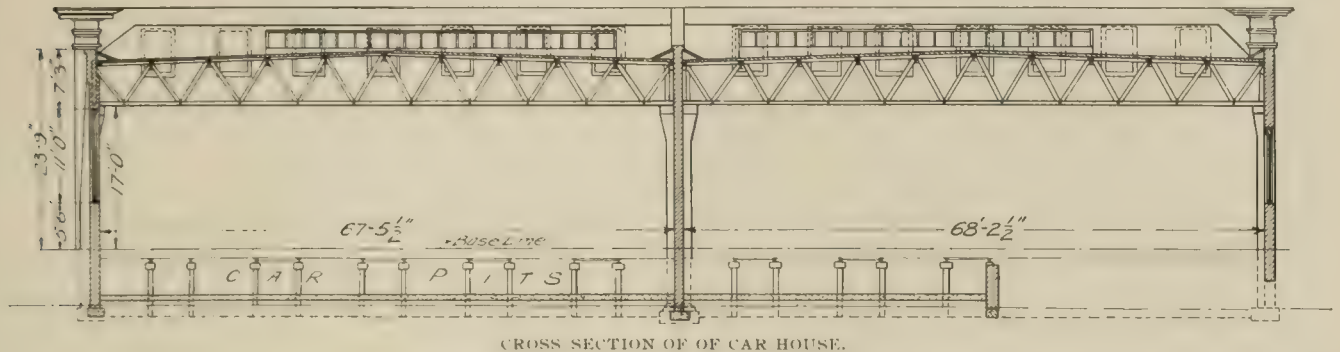
In describing the new shops of the Chicago City Ry. on page 885 of the "Review" for December, 1902, reference was made to the tools furnished by Bement-Miles, and by an oversight Bement was made to read Bennett.

United States mail service was established on January 1st on the Cleveland, Elyria & Western Electric Ry., between Oberlin, Florence, Berlin Heights, Berlinville, East Norwalk and Norwalk. Two trips are made daily in each direction.

New Car House and Repair Shops of the Birmingham Railway, Light & Power Co., Birmingham, Ala.

The present system of the Birmingham Railway, Light & Power Co. is composed of several different lines, which from time to time have been absorbed by the present company, which now controls and owns all street car lines in Jefferson county. Each line before it was acquired, of course, had its respective car barn and repair shop, thus making five different places where cars were housed and repaired. This being the case, it is naturally a little inconvenient to have car repairs going on in so many different places and where all cannot receive the attention of the master mechanic,

the edge of the street. There will be nine tracks running entirely through the building and one track half through, and there will be space enough to accommodate one hundred of the largest cars. The walls of the building are to be red pressed brick, with red mortar, and the roof, which is to be composition, is to be supported by steel roof trusses. The floor is to be rolled cinders, which, after the treatment it receives, makes it practically the same as concrete. The pit floor will be concrete. The pit space is eight tracks wide and 160 ft. long, and the track over this is built on pipe track sup-



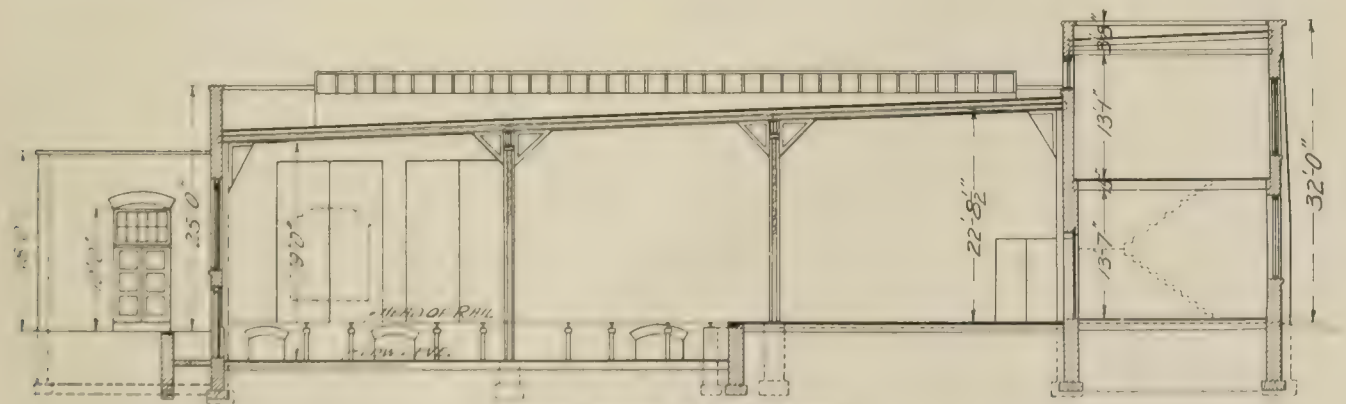
CROSS SECTION OF OF CAR HOUSE.

so it was decided by the mangement to erect a large car house and repair shop at one central point, to take care of all the cars and do all the repair work in one place. With this idea in view, work has been commenced on a mammoth car house and repair shop in the western extremity of the city. Some of the other barns will be kept up to store summer cars in winter and to leave a few cars in over night at the end of the long suburban lines, in order that they may start on the first trip in the morning without having to run a great many miles empty before reaching their scheduled starting point.

Accordingly the engineering firm of Ford, Bacon & Davis, of New York, who have charge of the extensive improvements being made here, and of which Mr. J. A. Emery is the chief engineer of the local office, has prepared plans and is superintending the con-

ports. The two tracks running half through the building and situated on the side next the alley are designed especially for washing cars, and the necessary appurtenances for same will be arranged on this side, so that cars may be thoroughly and rapidly cleaned. The whole building will be well lighted by numerous windows on both the 4th Ave. and the alley side.

A very desirable and attractive feature of the car house will be a set of fire doors situated in the center of the building, so that in the event of the cars in one end of the house getting on fire, by lowering these doors the cars in the other half would be as safe as if they were in some other place. In the corner of the barn on 11th St. and the alley will be located the office of the barn foreman. Just back of his office will be a very comfortable reporting room for the motormen and conductors. This room will be well heated and



CROSS SECTION OF REPAIR SHOP.

struction of the new car house and shops. To Mr. D. O. Whildin, of this firm, we are indebted for the very complete drawings which are shown herewith.

The car house is situated on 4th Ave. between 10th and 11th Sts., and occupies the whole space back to the alley, half-way of the block. The dimensions are 140 ft. wide by 292 ft. 10 in. long, and it will house cars on both north and 11th Sts. Height to be 48 ft. from head of rail to under side of roof trusses.

The length of the block is 400 ft., to insure a straight track entering the house and to accommodate the special work leading from the main line, it was necessary to set the front back seven feet from

lighted and thoroughly up-to-date toilet arrangements will be provided with complete and approved sanitary fixtures. The newest and most convenient transfer racks, boards showing runs, bulletin order boards and such other arrangements pertaining to this department as may be needed will be placed here.

Just back of the men's reporting room will be situated the sand drier. A car loaded with wet sand may be brought into the barn, checked into a bin, and from that bin let down into the drier, and turned out into the dry sand bin on the other side in a short time. The arrangement is designed to provide for five days' supply at a time.

A thoroughly reliable fire system has been arranged for the building independent of the city fire department. This consists of a 10,000-gallon tank placed out to one side of the building, and dis-

tributed at frequent intervals throughout the building will be coils of hose with nozzles attached, so that in the event of a fire breaking out the fire doors may be lowered, the water turned on, and the car house employees can start fighting the fire immediately.

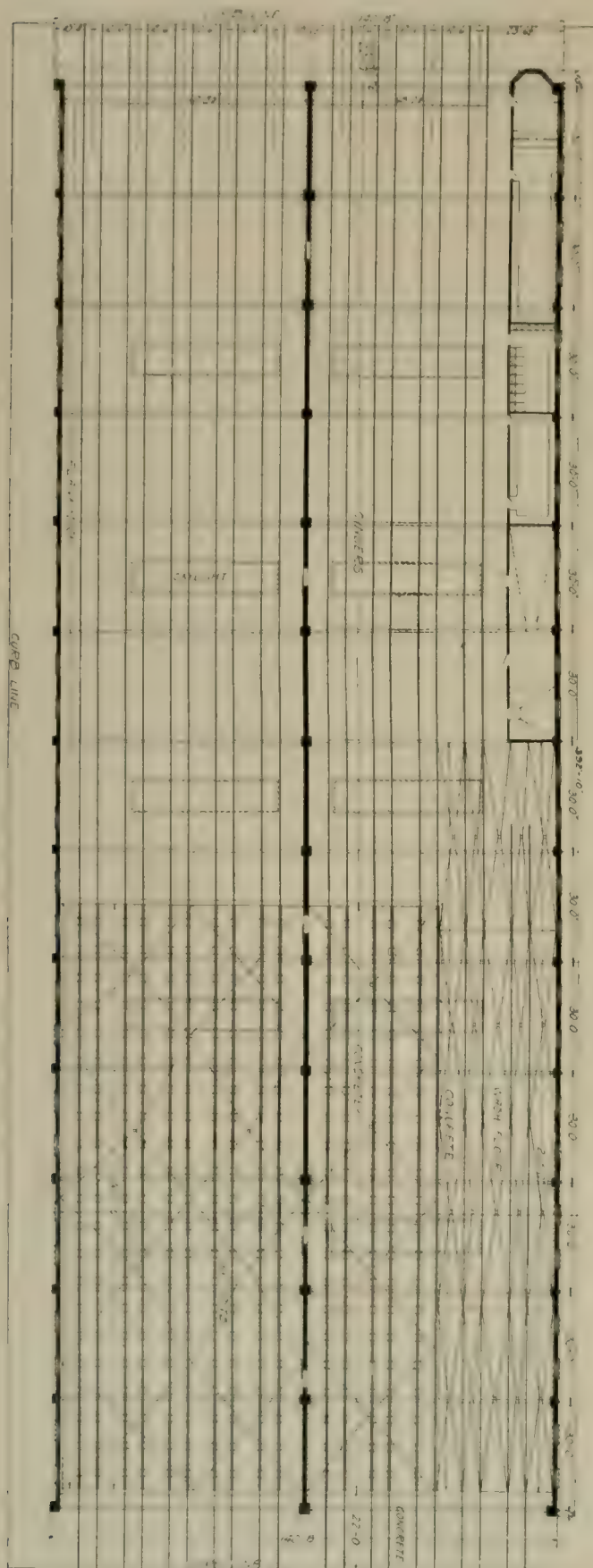
The house is not to have any doors at present, but should it be desired in future to have them, ample provisions have been made for them. It is the belief at present that the barn will be ready for occupancy by the last of this month, at which time the cars of all divisions will go here when they finish their runs at night, except the few early-morning cars, which will be disposed of as above stated.

Immediately across 4th Ave. from the car house and occupying a space 114 x 400 ft. will be the repair shops. This building is practically completed, and was expected to be ready for work by Jan. 1, 1903. Like the car house, this building is to have a steel frame, composition roof and the walls are to be red brick with red mortar. There is to be a second story 20 ft. wide and extending the full length of the building. This is reached by two outside staircases, which are provided with fire doors, so that in case the upper story should catch on fire and one stairway be cut off, the occupants of the second story could get down the other stairway. It has not been decided as yet just what will be done with this second story. It is contemplated turning it into a club room for the motormen and conductors, but this will be decided on later.

Near the 10th St. end of the building will be located the office of the master mechanic, and all entrance to and from the shop will be made through a passageway by his office. Before closing time in the evening all doors leading to the streets will be closed and all shop employees will be obliged to ring out on a clock in the passageway above named, and on going to work in the morning they will ring in in the same manner. The door leading from the passageway to the main shop will be controlled by an automatic lock operated by a push button from the office inside. To the left of the entrance to the shop will be located a window, where the men will report for their orders and for material. Just back of the master mechanic's office and extending all the way back to the 10th St. end will be the store-room, and it is the intention of the management to carry a 12-months supply of repair parts at all times. On the other side of the passageway above mentioned is to be situated the armature room, where all work necessary for the rewinding of armatures will be carried on. The armature baking will be a special feature and will be accomplished by electricity. This company has always had very great success with the repairing and rewinding of its armatures and is very proud of its success in this connection, which is largely due to the very careful attention and management of the same by Mr. George H. Harris, superintendent of equipment, and with all other facilities requisite for good work, flattering results are looked for. Adjoining the armature room are the lavatories and lockers. This room is to be supplied with stationary marble washstands and the necessary sanitary closets. Next to this is the cleaning room, which is to be built with a sloping floor and connecting with this is the drying room, which is practically dust proof and in which blinds and small parts will be placed, after being painted and varnished, to dry. Adjacent to the drying room is the paint room, which is made of brick with iron fire-proof doors. This was done so that if a fire should start in this room the door could be shut and the fire confined to this room alone.

There will be three tracks running entirely through the building and four tracks running half through. The blacksmith shop is located at the 10th St. end of the building and is to be supplied with down-draft forges and all the latest appliances identified with this department.

The machine shop is located next to the blacksmith shop and is to be furnished with all the necessary tools requisite to carry on the work of this shop. Underneath the floor is a place in which wheels on axles will be kept. A jack for lifting car bodies clear of the trucks is also to be supplied. An areaway from the street to this shop has also been provided. Next to this shop is the carpenter shop, where all wood working machinery that is desired will be found, and this shop is designed to be one of the most complete in the United States, as no expense will be spared to put in the most modern machinery available. There will be plank floors in these shops, with rolled cinder floors in the cellars, and underneath the mill and carpenter shop will be placed all shafting for the machines both in this shop and the machine shop, thus saving the



FLOOR PLAN OF CAR BARN.

space above the floor usually occupied by shafting for something else.

Extending from the 11th St. end back to the carpenter shop is the paint shop. This shop was located in this manner so that in

one shop to the other, finally emerge from the 10th St. end practically a new car. A traveling crane is to be erected, running from the carpenter shop to the blacksmith shop and capable of carrying the heaviest car.

Half of the space over the tracks running by the mill and carpenter shop, the machine shop and the blacksmith shop will be platformed and half without. This is to permit work being done on any part of a car without the inconvenience of step ladders and temporary scaffolds.

All the machinery in the building is to be operated by electric motors. Heavy wooden doors are to be provided for each end of the building.

Heavy galvanized iron fire doors extending from the ceiling are to be put in, and should a fire break out in any one shop these doors may be lowered and the fire confined to the shop in which it originated. These doors will also be provided to shut off the office and store-room from the other part of the shop.

For heating the building a boiler will be placed in the boiler room just back of the building, and is to be 18 ft. 4 in. x 37 ft. It is to be built of brick, with concrete floor and roof, which will be supported on steel latticed columns with eye beams.

The building will be lighted with numerous windows and skylights and well ventilated. The same perfect fire system prevailing in the car house will be found here, which consists of coils of hose distributed throughout the shop and water supplied from a 10,000-gallon tank situated independent of the building. The shop force will be drilled so that should a fire break out each man will know just what he is expected to do; one man will lower the fire doors, another turn the water on, and others will get out the hose line, and it is believed that much of the confusion incident to fires will be avoided.

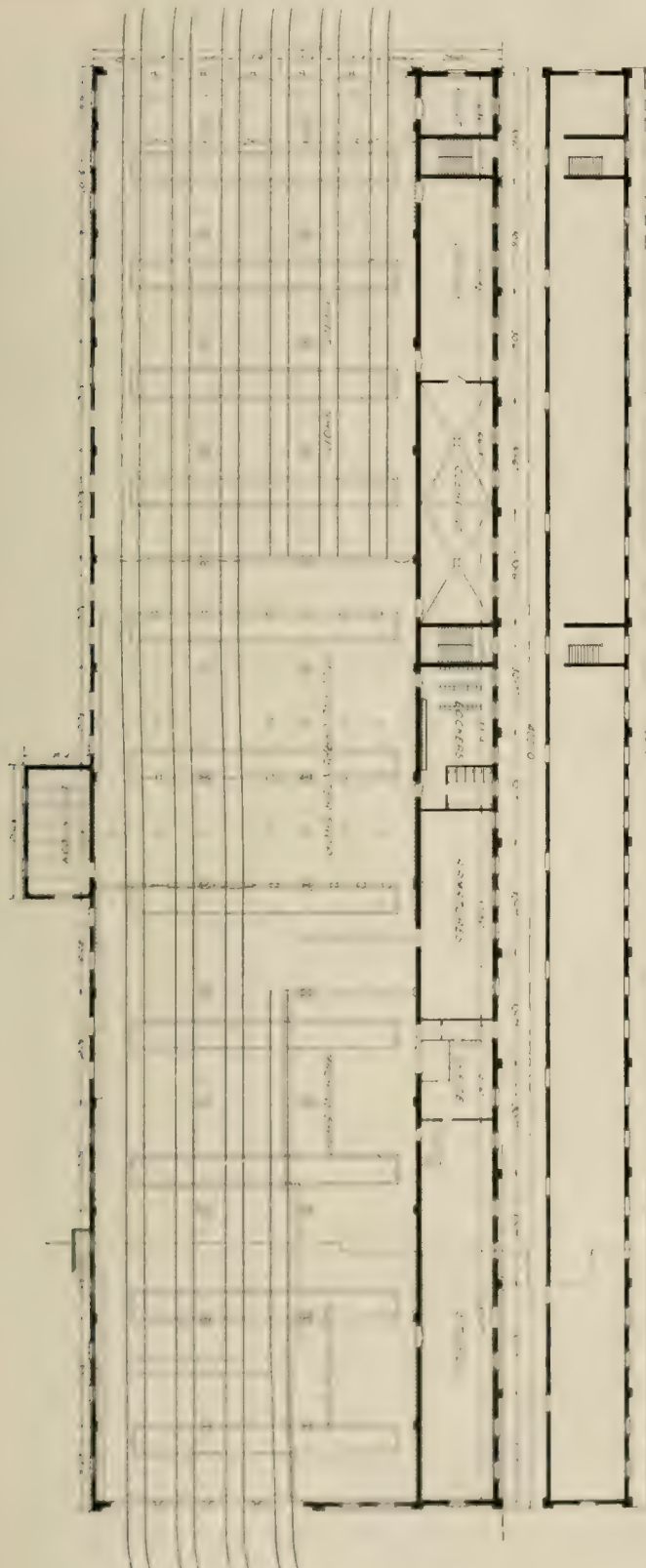
The idea of rendering fire proof as nearly as possible both the car house and the shops has been faithfully carried out, and with all the fire-proof doors separating one department from another and with a fire protection system as complete as can be, it is believed that a fire, if not extinguished very soon after its discovery, can be confined to one room. Messrs. Ford, Bacon & Davis deserve special credit for the very carefully thought-out plans to further this end and for the very convenient arrangement of the repair shops and car house.

When these two buildings have been completed, the 14-mile electric line to Bessemer finished and the other suburban and cross-town lines laid with heavy rails, the system of the Birmingham Railway, Light & Power Co. will be second to none in the United States, and with the rapidly increasing population and the many new industries growing up in this district, this property should be one of the best paying roads found anywhere.

THE CONESTOGA TRACTION CO.

The Conestoga Traction Co. and its subsidiary companies including both railway and lighting interests on January 1st paid in interests and dividends the sum of \$74,840. Mr. Wm. B. Given, president of the company, states that the affiliated companies have had a most prosperous year notwithstanding the many disappointments and delays of the various contractors in delivering machinery and equipment for the company's new power plant. Considerable trouble and delays have been experienced both in the electric railway and electric lighting departments caused by the inadequate amount of power, but these difficulties are expected to be over within 60 days after the completion of the new station which the company is building. Notwithstanding the unfavorable conditions the company carried for the year ending Dec. 1, 1902, 4,967,901 passengers, an increase over the 12 months previous of 1,266,176, and the company is to be congratulated upon the fact that notwithstanding this large passenger traffic, not a single accident has occurred throughout the year.

The board of railway commissioners of Massachusetts has not been active in the matter of granting hearings and deciding cases before it, having been working on the annual report of the legislature. It is generally believed that the board will ask for legislation requiring street railway companies to immediately report to it all accidents that occur, and will also ask for authority to regulate the speed of electric cars.



FLOOR PLAN OF REPAIR SHOP

one car only, needed painting it could be run in from the 11th St. end, painted and run out without having to pass through the other part of the shop. Under the present arrangement a car may be run in the 10th St. end in any bad shape, and after passing from

Roads Under Construction.

The Latest Information Concerning the Roads Listed as Being Under Construction in 1902.

Indian Territory Traction Co. proposes to build 20 miles in the course of the next year connecting South McAlester, Krebs, Alderson, Bache, Dow, Haleyville and Hartshorne. The grading has just been commenced. President, Lawrence P. Boyle, Chicago; secretary, M. M. Linley, South McAlester, I. T.; treasurer, A. U. Thomas, South McAlester, I. T.; general manager, Samuel Grant, Fairbault, Minn.; civil engineer, M. J. Smith; general contractors, D. Grant & Co.; consulting engineers, Thomas Hall & Co.

Zanesville, Adamsville & Coshocton Electric Railway Co., of Zanesville, O., has made no progress in construction but is engaged in securing franchises.

Florence Electric Street Railway Co., Florence, Col. President and general manager, Thomas Robinson, Florence, Col.; secretary, Harry Robinson, Florence; vice-president and treasurer, Harley A. Cook, Florence; chief engineer, R. L. Kelly, Florence; electrical engineer, T. B. Whitted, Denver. Twenty-seven miles of track are to be built and Mr. Robinson advises that construction work will commence in four months.

Doylestown (Pa.) & Easton Street Railway Co. President, Isaac R. Rosenberger; secretary and treasurer, Harry J. Shoemaker; general manager, Lewis P. Muthart; electrical engineer, A. J. Weaver; general contractors, H. M. Herbert & Co. Ten miles of this road was opened for traffic in June, 1902, and during the coming season the remaining portion, 22 miles, is to be built.

The Toledo & Indiana Railway Co., Toledo, O., reports having 30 miles open for operation Jan. 15, 1903. A total of 55 miles is proposed, the rest of which is to be built during 1903. The officers are: Vice-president and treasurer, George G. Metzger; secretary, C. H. Masters; general manager, H. C. Warren; chief engineer, Riggs & Sherman; electrical engineer, T. B. Perkins; general contractor, Toledo & Indiana Construction Co.

Urbana, Mechanicsburg & Columbus Electric Railway, Columbus, O. Officers: President and general manager, H. A. Axline; secretary, Colin McDonald; chief engineer, W. A. Ginn. The company had one mile of double track in Columbus completed Jan. 1, 1903, and about six miles outside of Columbus graded. It is proposed to build 46 miles and expected to have the remainder in operation by Oct. 1, 1903.

Columbus, London & Springfield Railway Co., Columbus, O. President J. A. Harshman; secretary, W. F. Merrick; treasurer, Arthur E. Appleyard; general manager, Richard Emery; superintendent, William W. Aires; chief engineer, C. A. Aldeman; electrical engineer, W. P. Hazen; general contractor, Great Northern Construction Co.; consulting engineers, Stene & Webster. Total mileage operated, 64.25. Completed and opened for traffic Oct. 22, 1902.

People's Traction Co., Galesburg, Ill. President, Lake W. Sanborn; vice-president, E. B. Hardy; secretary, M. A. Peterson; general manager, F. W. Latimer; chief engineer, George W. Knox, Chicago. This road was completed and opened for traffic Dec. 1, 1902, 12 miles of track being operated. The road is single track throughout, of which one-third is within the city.

Wilkesbarre & Hazleton Railway Co., Hazleton, Pa. President, John B. Price; secretary, D. T. Evans; treasurer, N. C. Yost; general manager, A. Markle; superintendent, George W. Thompson; chief engineer, F. M. Smith; electrical engineer, C. A. B. Houck; consulting engineer, L. B. Stillwell, of that city. The general contractor of this road is the Keystone Improvement Co. The road is 25 miles long and operated on the third-rail system. The company expected to open the road for traffic about Jan. 15, 1903. It is also proposed to build about two miles additional, making a total of 27 miles.

Columbus, Delaware & Marion Electric Railroad Co. This company is a consolidation of the Delaware Electric Street Railway Co., the Columbus, Delaware & Northern, the Worthington, Clintonville & Columbus and the Columbus, Delaware & Marion railways. President, T. A. Simons; secretary, O. W. Aldrich; treasurer and general manager, H. A. Fisher; electrical engineer, Lee D. Fisher. The general contractor for the road is John G. Webb and the total

mileage now operated is 29 miles, from Delaware City and Delaware to Columbus. For two-thirds of the distance from Delaware to Marion the road is completed and it is expected to be in operation to Marion by April 1, 1903. There are seven miles of city track operated in Delaware; the total proposed length of this road is 61 miles.

Newark & Marion Electric Railway Co., Newark, N. Y. President, W. H. Stansfield; secretary, F. D. Burgess; treasurer, E. V. Pierson; chief engineer, T. H. Mather; electrical engineer, J. E. Kelley; attorney, E. I. Edgcomb. The Syracuse Railway Construction Co. is the general contractor for this road and its total length will be 10 miles. The company expects to open the road for operation by June, 1903.

Greenfield & Deerfield Street Railway Co. and Greenfield, Deerfield & Northampton Street Railway Co., Greenfield, Mass. The officers of both companies are: President, F. E. Pierce; secretary and treasurer, D. B. Abercrombie, jr.; superintendent, J. A. Taggart; chief engineer, C. W. Clapp. The Bay State Construction Co. is the general contractor for these roads, which have a total length of 23 miles. It was expected that both roads would open for traffic about Jan. 10, 1903.

Scioto Valley Traction Co., Columbus, O. President, W. F. Burdell; secretary and treasurer, E. R. Sharp; general manager and chief engineer, A. W. Jones; consulting engineers, W. E. Baker & Co., of New York City. The total proposed mileage of this road is 78, of which 57 miles is to be completed by August, 1903. The company has already 55 miles graded and all the masonry has been built.

The New Orleans & Southwestern Railway Co., of Thibodaux, La., is not yet under construction, but all rights of way have been secured and profile maps, the prospectus, specifications and drawings have been completed and the company expects to begin actual construction work in the early part of this year. Mr. C. P. Young, general manager of the company, states that the organization is at present being perfected.

The Interurban Railway & Terminal Co., of Cincinnati, O., is a new company which effected a consolidation of the following properties on Nov. 1, 1902: Cincinnati & Eastern Electric Ry., the Suburban Construction Co., the Rapid Railway, and the Interurban Terminal Co. The officers of the consolidated company are: President and general manager, G. R. Scrugham; first vice-president, Lee H. Brooks; second vice-president and general counsel, Ellis G. Kinkead; secretary, B. E. Merwin, and electrical engineer, F. H. Talbot. The company now operates 96 miles of track opened for traffic Nov. 19, 1902. Of this 16 miles is double track and 12 miles is city track. The company proposes to build 8 miles more of road, all of which will be completed by February, 1903.

The Springfield & Xenia Traction Co., Springfield, O., operates 20 miles of track, of which 3½ miles is located in the city. The road was opened for traffic June 17, 1902, and its construction work is entirely completed. The officers of the company are: President, J. R. Nutt; secretary, R. E. Inskeep; treasurer, Will Christy; general manager, William Nutt; superintendent, J. M. Cotton; attorneys, Martin & Martin, Springfield, O.

Fond du Lac & Oshkosh Electric Railway Co., Fond du Lac, Wis. This road is still under construction and is being built by the Columbia Construction Co., general contractor. The officers of the company are: President, George Lines; secretary, Carl Geilfuss, and the road is under the management of the Fond du Lac Street Railway & Light Co.

La Fayette & Indianapolis Rapid Railway, La Fayette, Ind. This road is not yet under construction, but the rights of way are being secured. President, William C. Mitchell; secretary, A. Orth Behm; treasurer, Henry Taylor; superintendent, Robert A. Clark; chief engineer, J. R. Brown; consulting engineer, B. J. Arnold, Chicago.

The Marlborough & Westborough Street Railway Co., Marlborough, Mass. This road is consolidated with the Worcester & Westborough Street Railway Co. and operates 13.2 miles of track, which was built and opened for traffic May 1, 1901. President, William N. Davenport; secretary and treasurer, W. R. Dame; superinten-

dent, H. C. Garfield; chief engineer, J. B. Miller; electrical engineer, George Bannister; consulting engineer, C. R. Stearns, Boston. The general contractor for the road is M. A. Coolidge, Fitchburg, Mass.

Columbus, Buckeye Lake & Newark Traction Co., Newark, O. This company now operates 41 miles of track, which was opened for traffic June 1, 1902. The road is completed between Columbus and Newark, and a branch has been built to Buckeye Lake. It has five miles of city track, which was completed Jan. 1, 1902, and it will build 25 miles of road during the coming season, from Newark to Zanesville. President, Reed Anthony; secretary and treasurer, Chauncy Eldridge; general manager, J. R. Harrigan; chief engineer, Walter Casler; electrical engineer, A. C. Ralph. The general contractor for the road is the Great Northern Construction Co.

Rochester & Eastern Rapid Railway Co., Canandaigua, N. Y. This road is still under construction. There are 25 miles of the line graded, with the necessary bridge abutments in place, between Canandaigua and Rochester, N. Y. The material for the construction is all on hand or under contract to be delivered during early spring, and it is the intention of the company to push the road to completion at once. The power house building is completed and the shipments of machinery will start on March 1st. The company expects to be in operation between Rochester and Canandaigua by Aug. 1, 1903. From Canandaigua to Geneva the line will be completed and in operation by December, 1903. The officers of the company are: President, W. B. Comstock; secretary, W. A. Comstock; treasurer, Henry A. Haigh; chief engineer, F. W. Walker. The total length of the line between Rochester and Geneva, N. Y., is 42 miles, and the general contractor for the road is the Comstock-Haigh-Walker Co.

Monroe County Electric Belt Line Railway, Rochester, N. Y. President, Andrew H. Brown; secretary, M. E. Lewis; treasurer, P. R. McPhail; engineer, A. J. Grant. The company proposes to build about 10 miles of road, for which the location and surveys have been completed and the right of way is being purchased. No actual construction work has yet been done. It is expected the line will be completed in 1903 and the work will be done by the Syracuse Railway Construction Co., general contractor.

Cumberland & Westport Electric Railway Co., Cumberland, Md. President, R. H. Kock; secretary, L. P. Bane; treasurer, Walter H. Bryant; superintendent, I. D. B. Spatz; attorney, D. J. Blackeston, Cumberland, Md. This road was opened for traffic Apr. 24, 1902, with 16 miles in operation. The total proposed mileage of the road is 24 miles, and the remaining 8 miles will be built this season.

The Alton & East Alton Railway & Power Co., Alton, Ill. This road is operated by the Alton Railway, Gas & Electric Co., and has, at the present time, one mile of track completed. The rest of the proposed four miles is now under construction. The section completed was opened for traffic Jan. 1, 1903. The president of the company is James Duncan, and secretary, J. F. Porter.

Rockville, Broad Brook & East Windsor Railway Co., Broad Brook, Conn. This company, which has been organized to build 12 miles of road between the places named in the title, is not yet under construction and contracts have not been let nor officers chosen.

Joliet, Plainfield & Aurora Ry., Joliet, Ill. This company has not done anything in the way of grading, but expects to begin construction work early in the spring. It has completed all of the preliminary engineering work and secured franchises and private right of way where required. The arrangements for financing the road have also been completed and a basis agreed upon for terminal tracks at Aurora and Joliet. The line when completed will be 22 miles from Joliet to Aurora and will pass through the town of Plainfield, located about half-way between these cities. From Joliet to Plainfield the line will be constructed on one side of an 80-ft. highway, and from Plainfield to Aurora on private right of way paralleling the Elgin, Joliet & Eastern Ry. The construction is to be first class in every respect and the road will be equipped for high speed. It is expected that the line will be completed and in operation by Sept. 1, 1903. The president and general manager of the company is F. E. Fisher; vice-president and general counsel, E. Meers; secretary and treasurer, F. E. Stoddard; chief engineer, J. W. Rickey.

Inter Urban Railway Co., Davenport, Ia. The company commenced operation on Sept. 11, 1902, to Altoona, and on Nov. 8,

1902, to Mitchellville, 18 miles from Des Moines. The line is also completed to Colfax and was expected to be in operation during this month. The officers of the company are: President and general manager, H. H. Polk; secretary, W. I. Haskitt; treasurer, G. B. Hippee; chief engineer, James Carss; electrical engineer, Edward Cunningham; consulting engineers, Sargent & Lundy; attorney, N. T. Guernsey.

Topeka & Vinewood Park Railroad Co., Topeka, Kan. The company has under construction 7 miles of interurban track and 12 miles of city track, which will be completed within 30 days and put in operation Apr. 1, 1903. It has also secured a new franchise for 9 miles of additional track in the city, which will be built in 1903. President, E. W. Wilson; secretary and general manager, F. G. Kelley; treasurer, John Wilson; superintendent and electrical engineer, A. L. Ward; chief engineer, V. R. Parkhurst. The general contractor for the company is the L. E. Meyers Construction Co., of Chicago.

Kansas City, Lawrence & Topeka Railway Co., Kansas City, Mo. This road is a consolidation of the Lawrence & Emporia Railway Co., the Lawrence Street Railway Co., the Kansas City, Bonner Springs & Topeka Railway and the East Side Circle Ry. The total mileage to be operated is 65 miles, which is now under construction. The officers of the company are: President, Henry G. Pert; secretary, C. H. Chapin; treasurer, W. A. Baker; general manager and purchasing agent, Willard E. Winner; chief engineer, J. G. Hughes. The general contractor for the company is the Leavenworth Construction Co.

Moline, East Moline & Watertown Ry., Moline, Ill. President, C. H. Deere; secretary, W. H. Rank; treasurer, Joshua Hale; general manager and chief engineer, Blake A. Mapledoram; electrical engineer, J. C. Hoffman; attorneys, Wood & Peck. The general contractors of the road are Blood & Hale, of Boston. The company opened 5 miles for operation Nov. 15, 1902, of which two miles is city track. The total proposed length of the road is 25 miles, but the amount to be built during the coming season has not yet been determined.

The Washington, Baltimore & Annapolis Electric Railway Co. reports that its line is still under construction and that the work of grading was commenced about October 1st. The company expects to have the line complete and in operation by November, 1903. The officers of the company are: President, H. W. Lamprecht; vice-president and general manager, James Christy, jr.; assistant general manager, C. S. Gladfelter; secretary and treasurer, Otto Miller. The general offices are in Cleveland, O.

The Omaha & Council Bluffs Railway & Bridge Co., Council Bluffs, Ia., which controls the Lake Manawa Park & Manhattan Beach Railway Co., advises us that the latter road has not been constructed. The company purchased the right of way, but before construction of the road was commenced negotiations were closed whereby the Omaha & Council Bluffs Railway & Bridge Co. secured control of the Omaha, Council Bluffs & Suburban Railway Co. running to Lake Manawa. The Lake Manawa & Manhattan Beach Ry. was to have been a parallel road in opposition to the latter.

Southern Indiana Interurban Railway Co., New Albany, Ind. The line of this company, which is still under construction, extends from New Albany to Jeffersonville, a distance of about five miles; the road is all graded and the contracts partially let. Most of the pole line is also erected. The company will secure its power from the United Gas & Electric Co., of New Albany, and expects to be in operation about Apr. 1, 1903. President, Samuel Insull, Chicago; secretary, treasurer and general manager, R. W. Waite; superintendent, C. Wustefeld; consulting engineers, Sargent & Lundy, Chicago. The Tennis Construction Co. is general contractor for the road.

Indianapolis & Plainfield Electric Railway Co., Indianapolis, Ind. The company operates 14 miles of track, of which 12 miles is city track. The road was completed Sept. 12 and opened for traffic Sept. 16, 1902. The officers of the company are: President, Albert Liever; secretary and treasurer, Henry L. Smith; superintendent, M. Bonner; chief engineer, H. A. Mansfield.

The Interurban Railway & Power Co., of Hot Springs, Ark., expected to have begun operation in October last, but work has been unavoidably delayed and no further progress has been made up to

the present time. The officers of the company are: President, C. B. James; vice-president, H. Williams; secretary, F. D. Ward; treasurer, C. N. Rix.

Jersey Shore Street Railway Co., Jersey Shore, Pa., reports that about two miles of track are built and that the last proposed 13 1/2 miles will be completed during the coming season. J. H. Cochran is president of the company and Ernest H. Davis general manager.

The Waltham (Mass.) Street Railway Co., under date of Jan. 7, 1903, reports that its line is still under construction. The officers are: President, Fred C. Hinds; secretary, Henry S. Milton; treasurer, Charles E. Dresser, and superintendent and general manager, H. G. Lowe. The general contractors for the company are James F. Shaw & Co.

The Metropolitan Railway Co., of Oklahoma City, Okla., reports that it will have eight miles of city track built and in operation Jan. 20, 1903. The officers of the company are: President, Anton H. Classen; secretary, John W. Shartel; treasurer, George H. Brauer; superintendent and electrical engineer, Charles W. Ford. The Knox Engineering Co., Chicago, is the consulting engineer.

RAILWAY SYSTEM AT PUEBLO, COL.

The Pueblo & Suburban Traction & Lighting Co. on December 1, 1902, took over the property of the Pueblo Traction & Lighting Co., a corporation organized Jan. 1, 1901, to consolidate the street railway, light and power systems of Pueblo, which had been operated by the Pueblo Traction & Electric Co., the Pueblo Electric Street Railway Co., and the Pueblo Light & Power Co. During the last two years the greater part of the property of the consolidated company has been rebuilt and the whole is now in first-class physical condition.

Current is furnished from a central power house which has five engines of a rated capacity in the aggregate of 1,700 kw. There are 26 miles of railway track, and 26 new double truck cars built by the American Car Co. of St. Louis, and the Woeber Carriage Co., of Denver, all mounted on Brill trucks and equipped with General Electric No. 58 and No. 60 motors, have been put in service. For extra service and summer travel to the parks and other resorts the older equipment consisting of 9 and 10-bench open cars is used.

The company owns patented lands on and along Beaver, West and East Beaver Creeks, which drain an area of 70 square miles and on these several streams have located three power stations known as "A," "B," and "C," which, when completed, will furnish 10,300 h. p. Station "A" is now in operation and transmitting current for light and power to the Cripple Creek mining district. The dam and reservoir are located 5 1/2 miles east of Victor. Water is conveyed from the dam to station "A" through a 30-in. redwood pipe, 23,200 ft. long, a portion of which, 1,535 ft., is laid through a bore in the rock known as Skaguay tunnel. The Pelton water wheels in the station are operated under an effective head of 1,160 ft., the output of the station being 2,700 h. p. The capacity of station "B" is to be 5,500 h. p. and of station "C" 2,100 h. p.

Two high-tension transmission lines connecting station "A" with the steam plant in Pueblo via the sites of stations "B" and "C" are under construction.

The officers of the company are: President, M. D. Thatcher, Pueblo, Col.; vice-president, Warren Woods, Colorado Springs, Col.; secretary, F. M. Woods, Victor, Col.; treasurer, H. E. Woods, Pueblo; general manager, John F. Vail, Pueblo.

FRANCHISE DECLARED VOID.

The Supreme Court of Wisconsin on December 30th rendered its decision declaring void the franchise granted by the Milwaukee Council to the Milwaukee, Burlington & Lake Geneva Railway Co., which was incorporated in February, 1901, to build an elevated line in Milwaukee. The point involved in this case was that the road to be built was a commercial railroad and not a street railway. It is believed that the incorporators of the company will endeavor to secure a new franchise from the city which shall avoid this objection.

The Tri City Railway Co., operating in Davenport, Ia., and Rock Island and Moline, Ill., has adopted the merit system of discipline.

THE DETROIT, MONROE & TOLEDO SHORT LINE.

The Detroit, Monroe & Toledo Short Line Railway Co. was organized Nov. 19, 1902, with a capitalization of \$6,000,000, one-half stock and one-half bonds. This company is to take over the Toledo & Monroe Railway, the Michigan & Ohio Railway and the Monroe Traction Co. and will extend the line from Monroe to Detroit; \$1,000,000 of bonds and stock is to be retained in the treasury of the company for future extensions and improvements, such as double tracking. It is the intention of the company to have a private right-of-way 66 ft. wide for the entire distance from Detroit to Toledo. There yet remains some 30 miles of the line to be constructed. Work has been started and rights-of-way procured; stone work for the piers and abutments for bridges is under way and grading will be started as soon as the frost is out of the ground. Contracts for rails, poles, wire and overhead material have been let. The directors of the company are Eldredge M. Fowler, Pasadena, Cal.; Arthur Hill, Saginaw, Mich.; Chas. R. Hannan, Council Bluffs, Ia.; S. J. Murphy, C. A. Black, J. M. Mulkey, A. E. F. White, E. A. Flinn, C. J. Really, Detroit, and Matthew Slush, Mt. Clemens, Mich. Matthew Slush is president, and Chas. R. Hannan, treasurer; Elisha A. Flinn, secretary.

CONSOLIDATION AT MONTEREY, MEX.

The Monterey Electric Railway Co. of Monterey, Mex., has acquired the Compania Urbanos Ferrocarriles de Monterey which operates about 13 miles by mule power, having 33 cars and 164 mules, and a franchise that runs for 66 years with a 6-cent fare authorized; the Monterey & Santa Catalina Railroad, commonly known as the Slayden lines which operates 15 miles having 29 cars and 130 mules, and has a franchise with 80 years to run and permitting a 6-cent fare, and the Mackin and Dillon concession for all the other streets of Monterey which is a 99-year franchise, permitting 10 cent first-class and five cent second-class fares within the city limits and double on outside lines.

This last franchise exempts the company from taxation for 20 years. After that period there is a tax of 1 per cent on the gross receipts for 10 years and 2 per cent thereafter for the next 20 years.

It is the intention to electrically equip 30 miles of the best lines. The company also has a 20-year lease on the baths and park property at Topo Chico, Hot Springs, a famous health resort about three miles from Monterey. The company is also planning to give a freight service, which, it is estimated, will bring gross receipts of \$79,000, as against \$438,000 passenger receipts. The Monterey Electric Railway Co. is represented in this country by Sperry, Jones & Co., bankers, of Baltimore.

A PUBLIC UTILITIES CORPORATION.

The public utilities of Ft. Scott, Kan., are all operated by the Ft. Scott Consolidated Supply Co., which was organized Jan. 1, 1901, as a successor to the Ft. Scott Electric Light & Power Co., the Citizens' Electric Street Railway Co., the Ft. Scott Gas Co. and the Ft. Scott Steam Heating Co. The steam heating service is on the Holly system, installed by the American District Steam Co., of Lockport, N. Y., and about nine-tenths of the business houses along the lines installed use the heat. The street railway comprises nine miles of track. The gas plant furnishes an output of about 20,000,000 cu. ft. per year, the company having 18 miles of mains. The officers of the company are: President, Grant Hornaday; vice-president, C. F. Martin; secretary, F. A. Hornaday; treasurer and superintendent, F. D. Martin.

The snowstorm on December 20th caused a good deal of trouble to the Montreal Street Railway Co., and 300 extra men were put at work to keep the tracks clean.

It is announced that the United States minister at Seoul, Asia, has demanded the prompt payment of the \$1,500,000 due the American firm Colbrau & Bostwick for the construction of the Seoul Electric Co's. line.

RECENT STREET RAILWAY DECISIONS.

EDITED BY J. L. ROSENBERGER, ATTORNEY AT LAW, CHICAGO.

HOLDER OF PRIOR MORTGAGE FROM LESSOR HAS NO LIEN ON FEED WIRE PURCHASED BY LESSEE.

Kansas Loan & Trust Co. v. Electric Railway, Light & Power Co. of Sedalia, Mo. (U. S. C. C., Mo.), 116 Fed. Rep. 907. July 14, 1902.

A feed wire furnished by a lessee of an electric railway may be removed by the latter where its only obligation is to take, maintain, and restore the leased property in the condition in which it found it, and a holder of a prior mortgage from the lessor, with a subsequently acquired property provision, the United States circuit court holds, does not acquire any lien thereon.

CONDUCTOR'S DUTY TO MAKE PASSENGERS STANDING ON STEPS GET OFF OR RETURN INTO CAR.

Brace v. St. Paul City Railway Co. (Minn.), 91 N. W. Rep. 1099. Oct. 31, 1902.

There was evidence in this case tending to show that the plaintiff was standing upon the steps, refusing to get off or go back into the car, and the supreme court of Minnesota says that it was proper for the court to instruct the jury that it was the conductor's duty to use such reasonable force as might be necessary to make him get off or return into the car. The conductor was charged with the duty of conserving the interests of the other passengers. It would be unreasonable for a person to take possession of the steps, thus preventing the closing of the gates, and hold the car in waiting, and the duty devolved upon the conductor in charge of the car to use reasonable means to prevent undue delays and interruptions.

INJURY TO BOY RUNNING INTO CAR WHEN LET LOOSE AFTER BEING HELD AND LECTURED.

Palmisano v. New Orleans City Railroad Co. (La.), 32 So. Rep. 364. March 17, 1902. Rehearing denied June 30, 1902.

Where urchins have been stealing rides by hanging onto the rear end of a gravel train or gravel car drawn by an electric street car on the street of a city, the supreme court of Louisiana holds that the employe in charge of the train, as, for example, the motorman, who has in vain tried to make them desist by warnings and threats, is entirely justified in catching hold of one of them and lecturing him. If the employe's lecture has been temperate, and he has not rough-used the boy, but has merely held him, and no longer than was necessary for the purpose of the lecture, he or his employer is not responsible if the boy (a child eight years, lacking three months, old), on being turned loose, runs blindly in a direction converging with that of a coming car, and collides with the car and is injured.

STRIKING OF PERSON NEAR TRACK BY BODY OF CONDUCTOR PASSING ALONG FOOTBOARD OF MOVING CAR.

United Railway & Electric Co. of Baltimore City v. Fletcher (Md.), 52 Atl. Rep. 608. June 19, 1902.

A city employe standing on the side of a ditch which was three feet from the railway track was injured by coming in contact with the body of a conductor who was passing along the footboard at the side of a moving open summer car. The court of appeals of Maryland holds that it was improper to let the case go to the jury to be determined by surmise and conjecture, in the absence of reasonable evidence of any act of negligence or failure of duty on the part of the conductor. It says that the evidence went only so far as to show that the body of the conductor, while passing along the footboard of the moving car, struck and injured the man. The conductor not only had the right to pass along the footboard of the car when it was in motion, but the discharge of his duty required him to do so very frequently. It is a well known fact that the footboard is a narrow one, and a conductor, in order to pass along it in safety, especially if he has to lean in between the moving car to collect fares, must, in passing by the upright standards of the car,

give to his body a swaying or swinging motion. There was no evidence that the conductor in this case acted in a negligent or unlawful manner when passing along the footboard. The entire space between the railway track and the ditch was but three feet, a considerable part of which must have been occupied by the overhanging part of the car and the footboard. Under these circumstances the mere fact that the man, while standing in the narrow space between the car and the ditch, came in contact with the body of the conductor, was not per se or in and of itself even prima facie evidence of negligence on the part of the latter.

DUTY OF MOTORMAN ON CAR DESCENDING GRADE IN CITY TO LOOK OUT FOR YOUNG CHILDREN—CHILD RUNNING INTO PASSING CAR—ORDINANCE REQUIRING CAR TO BE STOPPED IN SHORTEST TIME POSSIBLE ON APPEARANCE OF OBSTRUCTION.

Gray v. St. Paul City Railway Co. (Minn.), 91 N. W. Rep. 1106. Oct. 31, 1902.

Where street railway tracks occupy a street at the foot of an incline which, in conjunction with other streets, forms a system of crossings in a populous part of the city, the supreme court of Minnesota holds that it is the duty of the motorman in charge of a car coming down the grade to keep a lookout for young children approaching the crossings or standing near the tracks, and to take reasonable precaution to prevent injury to them, by sounding the gong, checking the speed of the train, and holding it under control. Moreover, it says that it could make no difference in this case that the front part of the car had passed the children, and that the boy, who was 5 years and 9 months of age, came in contact with the second part or rear of the train, for the evidence tended to show that they were either standing in close proximity to the cars at the time the motorman passed them, or that they were approaching it with the intent of crossing the track, either upon a walk or running. It was for the jury to say whether it was reasonably to be apprehended that such young children might run into or come in collision with the car as it was passing.

An ordinance providing that "No person having the control of the speed of a street railway car passing in a street shall, on the appearance of any obstruction to his car, fail to stop the car in the shortest time and space possible," the court holds is not unreasonable, in that it requires the stopping of the car without regard to the safety of the train and persons therein. It is no more than a declaration of the law, and only requires the person in charge of the car, upon the appearance of an obstruction, to stop the car as soon as possible under the circumstances, with due regard for the safety of the passengers.

NOT AN ATTEMPT TO CONDEMN AND APPROPRIATE A PUBLIC STREET OR TO BUILD AN ELEVATED RAILROAD THEREIN.

State v. Superior Court of King County (Wash.), 7 Pac. Rep. 484. Oct. 15, 1902.

Where a dedicated and platted street had never been improved and could not be used for the purposes of a public street by reason of the fact that it was merely a vacant strip of tide land, 66 ft. in width, over which the tide regularly and freely ebbed and flowed, and it was sought to ascertain the amount of compensation which should be paid to an abutting property owner on account of building a railway line and roadway along said street, under a statute granting the power of eminent domain to electric railway corporations, but providing that said right of eminent domain should not be exercised with respect to any residence or business structure or structures, public road or street, it was argued that the company was endeavoring to appropriate a public street for the purposes of its railway, in contravention of the statute, or that it was at least undertaking to build an elevated railway in a public street of the city, which it had no right to do, in the absence of direct legislative sanction. But the supreme court of Washington does not think that

the company was either attempting to condemn and appropriate to its own use a street, or to construct an "elevated railroad" on a street, within the meaning of that phrase, as understood in localities where such railways are in common use. An elevated railroad, properly speaking, it says, is one which is placed above the surface of the street which is used by the general public; but such was not the character of the structure which the company was required by the city to erect in this case, where the city, by ordinance, granted to the company the privilege of laying its tracks in this platted and dedicated street—as it was clearly empowered to do by law—and required the company, as compensation for such privileges, to construct a plank roadway or bridge (designated in the record as a "trestle and bridge") not less than 22 feet in width, and upon a grade at a height specified in the ordinance, and to maintain the same for the use of the public as a street as well as for its railroad tracks. It would seem, the court says, that what the company was really seeking to do, and what the city required it to do, under its franchise, was, not to condemn and appropriate a street, but virtually to make a street where none had theretofore existed.

CARE REQUIRED OF PERSONS CROSSING TRACKS—ORDINARY CARE DEFINED—WHAT PHRASE "LOOK AND LISTEN" MEANS.

Beerman v. Union Railroad Co. (R. I.), 52 Atl. Rep. 1090. July 2, 1902.

A railroad track, whether steam or electric, the supreme court of Rhode Island holds, is a place of danger, and a person crossing it, whether on foot or in a vehicle, must exercise ordinary care for his own safety to exonerate him from the charge of contributory negligence, and what is ordinary care under one set of circumstances might amount to negligence under a different set of circumstances. Ordinary care is such care as a person of ordinary prudence exercises under the circumstances of the danger to be apprehended. The greater the danger the higher the degree of care required to constitute ordinary care, the absence of which is negligence. It is a question of degree only.

In this case, a one-horse carriage, going at a slow pace, so slow that it could be stopped within a distance of a very few feet, and a heavy electric street car, authorized to go at a speed not faster than nine miles an hour, collided when approaching one another through intersecting streets. The carriage reached the crossing first, and the court holds that it had the right of way if, proceeding at a rate of speed which, under the circumstances of the time and locality, was reasonable, it could safely go upon the tracks in advance of the approaching car, the latter being sufficiently distant to be checked, and, if need be, stopped, before it should reach the carriage. When the driver of the carriage approached the intersection of the streets, he was required to do for his own safety and protection what ordinarily careful persons are accustomed to do under like circumstances. The exercise of ordinary care and prudence required him to look and listen for the approaching car before attempting to cross the track, and his failure to do so would be the result of his own thoughtless inattention, and must be regarded as negligence on his part. Whatever the fault of the motorman, it was the duty of the driver of the carriage to have looked both ways and to have listened before attempting to cross the track, and to have done so immediately before crossing the track. One using a vehicle must use due care no less than a pedestrian, and the same is true of the motorman of an electric car, if each would be free from negligence.

The phrase "look and listen," used in the books, is simply synonymous with using one's senses to inform the mind of danger that, being liable to threaten, must be guarded against.

INJURY TO NEWSBOY REMAINING ON CAR AFTER BEING ORDERED OFF WHEN HE COULD HAVE GOT OFF WITH SAFETY—INJURY TO TRESPASSER.

Indianapolis Street Railway Co. v. Hockett (Ind. App.), 64 N. E. Rep. 633. June 24, 1902.

A newsboy over 12 years old got on the running board of an open car while it was standing still. He did this for the purpose of selling a newspaper in accordance with what he claimed was the custom of the company to allow passengers to be supplied with newspapers by boys vending same upon the streets. The conductor was

on the back platform, and ordered the boy to get off before the car started. He also ordered him to get off just after the car started, when it had gone 25 or 30 ft., and was moving at the rate of 2 or 3 miles an hour. Then the conductor in going toward the front end of the car, as it was necessary and as it was his duty to do to collect the fares of passengers, went in the direction of the boy, and ordered him off. The boy fell and was injured so that his foot and ankle had to be amputated. The appellate court of Indiana, division No. 2, reverses a judgment rendered in his favor, and orders that the company's motion for judgment on the answers to interrogatories notwithstanding the general verdict be sustained. It says that if it be conceded that the boy was on the car by permission of the company, that permission was withdrawn when he was ordered to get off, when he could have done so with safety, and thereafter remaining on the car he became a trespasser. The law protects a trespasser from willful injury only, and willful injury was not claimed or shown in this case. The special findings affirmatively showed that going in the direction of the boy to collect fares, as above stated, was all that the conductor did that could have influenced his actions. It could not be said as a matter of law to be negligence to order one who was sui juris or legally capable of acting in a matter in his own right and not a passenger to get off a car when that order might have been complied with with safety. Admitting that it was possible that it might have shown by a pertinent question that the boy did not hear he order of the conductor, such finding would only go to the question of his contributory negligence, and the question remained, did the facts show that the company was guilty of negligence? The judgment, in view of the special findings, could only have been affirmed upon the ground that the company was guilty of negligence in ordering one who was in no sense a passenger, who remained upon the car in violation of an order, to get off, when such person might have obeyed the order with safety, or to hold that the conductor owed it as a duty to the boy to ignore his presence, or in silence to allow him to remain upon the car until he should choose to leave it.

LIABILITY OF TRUSTEE FOR NEGLIGENCE OF MOTOR-MAN.

O'Toole v. Faulkner (Wash.), 70 Pac. Rep. 58. Sept. 2, 1902.

This was an action for damages for personal injuries alleged to have been sustained through the negligent and careless handling of a street car by a motorman in charge of the same employed by the party sued, the alleged trustee and operator of the street car line. The latter contended that he was simply an agent and was therefore not responsible for the negligent acts of the motorman. Whatever connection he had with the operation of the street car line was under and by virtue of an agreement in writing whereby he acknowledged and declared that he bid for the purchase of the property, plant and franchise and assets of a light and power company at a sale thereof in pursuance of a decree of court as the agent of and in trust of a certain-named committee of bondholders of said company; that the money and bonds paid for said property were the proper money and bonds of said committee; and that in consideration of the terms and one dollar to him paid by the chairman of the committee, he covenanted, promised and agreed to hold said property as the agent of and in trust for said committee to manage, and administer the same and operate the plant exactly according to the orders and instructions of said committee, and without further or additional compensation than his salary as bookkeeper, and to deed, convey, transfer and relinquish the possession of all and singular said property, plant, franchise and assets of every name and nature to such persons, firms or corporations as might be designated by said committee, immediately upon its written request, signed by its chairman or a majority of the members, without any delay or evasion.

From this agreement the supreme court of Washington thinks that he was in control of the operation of the street car line. It says that it was true that he was in no sense the real owner, as shown by the agreement. The committee was the owner; but his purchase was in trust for the committee, and his agreement was to hold the property in trust for the committee, and to manage and administer the same. He was the legal owner of the property in possession, and was operating it for the benefit of the cestui que trust, or beneficiary. It seems to the court that this constitutes exactly under the law, a trustee. He was operating a public franchise as the legal owner. Street car companies must be operated by some

one who is responsible. The committee was not responsible, and the responsibility must rest upon the operator, who is the legal owner of the property. Neither public policy nor the plainest principles of right will permit this responsibility to be evaded. Being the legal owner, and operating the road, he stood in relation of master to the motorman. And it is well settled that a trustee is responsible for tortious or wrongful acts of a servant, while the beneficiary of the trust is not.

LIABILITY FOR EJECTION OF PASSENGER GIVEN WRONG TRANSFER BY MISTAKE.

Lawshe v. Tacoma Railway & Power Co. (Wash.), 70 Pac. Rep. 118. Sept. 15, 1902.

A passenger who requested a transfer to one line was by mistake of the conductor given instead a transfer to another line. Not noticing the mistake, he presented this transfer to the conductor of a car on the line to which he asked for the transfer, but the latter refused to accept it and demanded fare. He declined to pay fare, and was put off the car. Thereafter he brought this action for damages on account of the ejection. The supreme court of Washington says that an examination of the authorities satisfies it that not only is there an irreconcilable conflict in the authorities, but that the weight of authority and the better reason sustain the passenger's right to recover. It is true that the company has right to make regulations governing its traffic; but those regulations are for the benefit of the company, they are to a certain extent technical, and are understood only by the officers of the company and by travelers who are exceedingly familiar with them.

But outside of all authority, the court says it seems to it that in accordance with the general principles of law the party should recover. It is too plain for argument that only the right to sue for the recovery of the fare or portion of the fare received by the company will be totally inadequate, and, through the plain, everyday law governing agency, the company is responsible for the acts of its agent and for his mistakes. This mistake it was the duty of the company to correct. It must necessarily correct it through its agents. It makes no difference, in reason, that the agent who was called upon to correct the mistake was another and different agent from the one who made the mistake. They were both agents of the company, and the act of the first conductor was in effect the act of the second conductor, because the acts of both were the acts of the company; the company having, for its own convenience, intrusted its business to two agents instead of one. The contract was made when the passenger paid the fare, and it was a contract not with any particular agent of the company, but with the company through its agents. The first conductor, who made the mistake, was not the agent of the passenger, but was the agent of the company, and his mistake was, therefore, the mistake of the company. If any other rule prevailed, the result would be that the company would be allowed to deprive the passenger of part of the benefit of his contract on account of the mistake made by the company, and for which he was in no wise to blame, for he had a right to assume that the conductor furnished him with the transportation for which he asked and for which he paid; it being absolutely impracticable for passengers to make technical examination of the transfer slips which they receive. And he ought to have redress for the company's violation of the obligation which it assumed.

STATUTE DEFINING LIABILITY OF RAILROAD COMPANIES APPLICABLE TO STREET RAILROADS—ORDINARY AND REASONABLE CARE DEFINED—WHAT MAY BE PRESUMED AS TO PEDESTRIANS—DUTY TO PERSONS ON OR APPROACHING CROSSINGS—NO RIGHT TO RUN INTO CROWD.

Consumers' Electric Light & Street Railroad Co. v. Pryor (Fla.), 42 So. Rep. 707. Feb. 18, 1902.

The supreme court of Florida says that the act of 1891 defining the liability of railroad companies in certain cases (Rev. St. Append., p. 1002 & 1071) had been regarded by it, in unwritten opinions, as applicable to street railroads, but it has not been considered as changing the rule of alleging negligence in such cases to the extent of requiring only an allegation of injury or damage by the running of locomotives, cars or other machinery of the defendant company.

The statute does not undertake to fix arbitrarily liability for an injury done, but there is a presumption of negligence under it, arising from the injury or damage.

The measure of duty under the act of 1891 is all ordinary and reasonable care and diligence, which means care proportionate to the dangers to be avoided, so that what will constitute the amount or kind of diligence required will vary under different circumstances, as the terms "ordinary" and "reasonable" are relative, and what under some conditions would be ordinary and reasonable diligence might under other conditions amount to even gross negligence. Street cars, regardless of the power by which they are impelled, have no superior rights to other vehicles or pedestrians at regular street crossings, in the absence of a specific legislative grant, but their rights are equal and in common, and impose correlative duties on the respective parties.

The employees of a street car company in operating cars have the right to presume that a pedestrian will exercise ordinary and reasonable care to avoid injury from moving cars, and they are not required to stop a car until it becomes evident to a person of ordinary and reasonable care and prudence that the pedestrian has failed in his duty, and has placed or is about to place himself in a perilous situation. The duty, however, devolves upon the employees to keep a vigilant lookout for persons on or approaching the track, especially at street crossings, and, when they are discovered to be in danger or going into danger on the track, to use every effort consistent with the safety of passengers to avoid injuring such persons. Where the employees could have seen by the exercise of ordinary care a crowd of people coming out of a church and crossing the track at a regular crossing, while the car was at least 200 feet away, it was their duty to see the crowd of people in a situation of danger, by approaching and going across the track in front of the car at a regular street crossing, and it then became the duty of the employees to use every effort consistent with the safety of passengers to avoid injuring the crowd of people. Conceding that the car could have approached the crossing under the assumption that the crowd would leave the track, still the presence of human beings thereon, and the apparent situation of danger to them, imposed upon the agents of the company the duty to so approach the crowd as to avoid injury, if possible—even to the stopping of the car if necessary. The company has no right, of course, to run into a crowd of people, though they disregard their duty and do not leave the track.

EXTRA CARE REQUIRED APPROACHING STREET CROSSINGS IN CROWDED CITIES—RATE OF SPEED—DIM HEADLIGHT—CIRCUMSTANCES MAY EXCUSE FROM LOOKING AND LISTENING.

Chicago City Railway Co. v. Fennimore (Ill.), 64 N. E. Rep. 985. Oct. 25, 1902.

A woman who started at a street corner in Chicago to cross the street diagonally to take a car looked twice for coming cars and after waiting for a cable train to pass on the nearer track started to cross behind it and was struck by the grip car of a train on the farther track. The evidence tended very strongly to show that whatever headlight there was on this grip car was very dim in its character, and insufficient to enable a person at even a short distance ahead of the train to see its approach upon a dark night. The supreme court of Illinois affirms a judgment in the woman's favor.

It is the doctrine of this court, it says, that drivers, gripmen, and motormen of street cars are obliged to exercise a more exacting attention when they approach street crossings in a crowded city, where vehicles and pedestrians may always be expected in front of them. Although no ordinance limiting the speed at which cable cars were allowed to run in the streets of Chicago was introduced, yet in each case it must be a question for the jury to decide whether or not, under the facts and circumstances of that particular case, the speed is or is not a dangerous or unreasonable rate of speed. A railroad company in the running of its trains is always required to use ordinary care and prudence to guard against injury to the persons or property of those who may be rightfully traveling upon the public streets, and this is true whether there is a statutory regulation upon the subject or not.

Where a cable train is running along the street in a city like Chicago on a dark and somewhat foggy night, with a headlight so small and dim as scarcely to be noticeable, or, if noticeable, likely to be mistaken for some other light, the court is not prepared to

say that it is error to submit to the jury the question whether the company propelling such train under such circumstances is or is not guilty of negligence. The question did not arise here whether the speed of the car might have been justifiable if the headlight had been in good condition, but with such a headlight as the evidence showed, it would seem to have been the duty of the persons propelling the car to run it at a reduced rate of speed.

The question whether or not it was negligence not to look a third time, after the train on the nearer track had passed, was one for the jury to determine under the instructions of the court. Anticipation of negligence in others is not a duty which the law imposes. In this case the company owed it, as a duty to this woman and to the public generally, to equip its trains with proper headlights. When she started across the street she had the right to assume that it would perform this duty, and had a right to rely upon the belief that no train would approach without a proper headlight. If she saw no headlight, she had a right to assume that no train was approaching. It has been held that the traveler is not at fault in failing to look and listen, if he is misled without his fault. There may be various circumstances which excuse him from stopping to look and listen, and, if the evidence tends to show that there was such an excuse, the existence of it is a matter for the determination of the jury, and to be submitted to them.

CITY CANNOT COMPEL REMOVAL OF HEAVIER RAILS
LAID WITHOUT PERMISSION ON TRACK HAVING
LIGHTER ONES THAN THOSE ON THE OTHER—
CONDITIONS AS TO PAVING AND REPAIRS
ABROGATED BY MASSACHUSETTS ACT
OF 1898—NATURE OF LOCATION.

City of Springfield v. Springfield Street Railway Co. (Mass.), 64 N. E. Rep. 577. July 15, 1902.

A grant of a location for the extension of tracks was conditioned, among other things, that all materials used and all the details of the construction of the tracks, should be to the acceptance of the supervisors of highways and bridges, who, under the city ordinances, had general supervision of all public highways, streets, avenues, and bridges of the city. The tracks were constructed in accordance with the terms of the grant, T-rails being used, which were approved by the board of supervisors. Subsequently, on account of the rails used on one track being of somewhat greater depth and weight than those used on the other track, the company took up the lighter rails, and laid some of the same type, size and weight as the others, these being rendered necessary to provide for the safety and comfort of the public, in consequence of increased travel. In making the change it expended a large sum of money and dug up a portion of the surface of the street, but restored it to the same condition in which it was before the change. It did not apply for or obtain permission from the board of supervisors to dig up the surface of the street or substitute the new rails, but the omission to do so was accidental and without any purpose to evade or violate the law, and, for aught that appeared, the city authorities stood by and saw the work go on without objection. Under these circumstances, the supreme judicial court of Massachusetts holds that the city was not entitled to have the rails removed. It says that the only reason urged why the company should be compelled to take up the rails because it did not obtain the permission of the supervisors was that, for the purpose of improving the avenue, the supervisors intended to harden its surface, and to require a grooved rail to be laid when the old rails were removed. But this does not seem to it to be an adequate reason. It says that if it assumes that the supervisors could have required a grooved rail to be laid, it is nevertheless of the opinion that, under the circumstances shown, the city was not entitled to an injunction compelling the removal of the rails that were laid.

Chapter 578 of the Statutes of 1898, which was intended to commute into money payments to cities and towns the burdens imposed upon street railways in regard to the care of streets, the court holds abrogates conditions in other than grants of original or first location with regard to paving and keeping in repair the surface material of streets. It holds this constitutional, because, for one thing, it seems to it that the locations given to street railway companies in public streets by cities and towns in Massachusetts do not constitute contracts, or, if they do, that they are of such a nature that the legisla-

ture can modify or annul them without thereby violating the constitutional provisions. Except over private premises, they are, it seems to it, in the nature of a privilege or permit to use the public ways given by cities and towns by virtue of authority from the legislature for the purpose of facilitating public travel and accommodation. They are analogous to licenses given to run omnibuses along certain routes, though, of course, to make the analogy complete, the omnibuses would have to be built so as to run on rails laid in the streets. They convey no exclusive rights in the highways or streets in which they are granted, but are to be used in common with others having occasion to use the public ways. The public authorities retain, in the main, full control over the streets or ways in which they exist, and may revoke the location, or alter or discontinue the ways, without liability to damages therefor, and subject only to such limitations, if any, as the legislature may see fit to impose.

LIABILITY OF RAILROAD FOR INJURY TO CONDUCTOR
GETTING ON CAR WITHOUT LOOKING AGAIN AFTER
SIGNALING IT TO ADVANCE AT CROSSING.

Doud v. Delaware, Susquehanna & Schuylkill Railroad Co. (Pa.), 52 Atl. Rep. 249. June 4, 1902.

This action was brought to recover damages for injuries which a conductor on a street car sustained by a locomotive running into same just as he had got upon the car, after he had, according to his testimony, gone over to the railroad track, looked and listened, and neither hearing or seeing an engine, it being a wet, foggy, dark night, signaled the car to come forward. The supreme court of Pennsylvania affirms a judgment in his favor, against the railroad company, on the opinion of the court below, which held that the evidence did not present a case of contributory negligence on his part in attempting to cross the railroad company's tracks, so clear and unmistakable that, notwithstanding the verdict of the jury in his favor, the court must so pronounce it as a matter of law, and enter judgment for the company. The court below said that, after a thorough review of the testimony, it was satisfied that whether the conductor was negligent in attempting the crossing, under all the circumstances, was a question of fact for the jury. He had a right to assume that due notice would be given of the approach of the engine by whistle and bell, and, if necessity required the engine to run backwards, that a sufficient light would be displayed to warn him of its coming. While great responsibility rested upon him, as upon his care and vigilance depended the lives of forty or more passengers, still the court thought he was not so plainly chargeable with negligence as he would have been had he been a pedestrian, with his own safety alone to look out for, and no car to engage his attention. There could be no doubt that he would have saved himself had he turned and looked just before taking hold of his car and mounting the step. Was he bound to do this, or be charged with negligence? The court did not think so. He had a right to assume that the railroad company would do its duty, and give him notice of the approach of a train in time for him to make the crossing in safety with his car, if he had before the warning signaled his motorman to come ahead, which signal was being promptly obeyed, and the car on its way across the tracks. If, therefore, he had the right to assume that his car loaded with passengers would get across in safety, he could not be charged with negligence in attempting to cross upon it without again looking up the track for an approaching engine. At the same time, the court said that it was not unmindful of the fact that the highest degree of care devolved upon the conductor when he approached the crossing, as upon his watchfulness depended the lives of a car full of passengers, and it intimated that, under the testimony, the jury would have been justified in finding him negligent, though it did not think the case was so clear that the doctrine of legal presumption be invoked to prevent his recovery.

An electric railway is to be built at an early date connecting Jonesboro and Johnson City, Tenn. The line will be eight miles in length and will be used for both passenger and freight traffic.

In order to do away with annoyances resulting from car lights going out at street crossings, the Aurora, Elgin & Chicago Railway Co. is installing overhead trolley wires for use in Wheaton.

SANTA CLAUS IN 1902.

The Wheeling Traction Co., of Wheeling, W. Va., presented each of its employes on New Year's with a \$5 gold piece. This included the trackmen and other employes as well as the motormen and conductors, so that about 400 men were recipients of the company's gifts.

The Pittsburg Railways Co., of Pittsburg, Pa., distributed nearly \$30,000 to 2,400 men on Christmas. This was the premium money promised six months ago by the company to motormen and conductors as rewards for care in avoiding accidents during the six months ending November 30th. About 80 per cent of the motormen and conductors employed by the company participated in the premium distribution. About 300 of the 2,400 men had small accident charges which aggregated less than the amount of their premiums and these men were presented with this difference. There has been a remarkable freedom from serious accidents on the company's line during this period, and the result is considered highly creditable both to the management and to the employes.

The St. Joseph Railway, Light, Heat & Power Co., of St. Joseph, Mo., gave a Christmas dinner to its employes and their families at the employes' club rooms at which 400 people were served. The dinner was served from 11 till 3 o'clock, and again from 5 to 8 o'clock, the time being arranged so that every one of the employes might be able to participate. Open house was kept at the employes' club rooms all through the day, and many friends of the company participated in the festivities.

The Connecticut Railway & Lighting Co., of Norwalk, Conn., had a unique Christmas celebration for its employes. A Christmas tree was fitted up at the company's barn in Meadow St., and a present appropriate for each one was hung upon the tree.

The conductors on the railways operating in Jersey City were generously remembered by the traveling public at Christmas time. A suggestion was made in one of the daily papers to remember the conductors and motormen on that day, and thousands of passengers paid double fares, while many persons who could afford to do so gave the conductors bills and took back no change. One of the conductors received as much as \$14 from passengers, while, so far as known, \$4 was the smallest amount received by any of the men.

The Chester Traction Co., of Chester, Pa., gave a turkey dinner to nearly 200 of its employes on Christmas. The dinner took place from 10 in the morning till 4 in the afternoon and was held in the large rooms over the company's office.

The employes of the Macon Railway & Light Co., of Macon, Ga., were presented, by order of the president of the company, with two days' extra wages as a Christmas gift. The gift was tendered to all of the company's employes, the average being about \$3 to each man.

The Dayton, Springfield & Urbana Electric Railway Co., and the Columbus, London & Springfield Electric Railway Co. remembered their employes at Christmas time in a substantial way. Married men each received a turkey and the single men \$1 each. The employes of both companies numbered about 225 men.

On the evening of January 6th the Lancaster County (Pa.) Railway & Light Co. gave its annual dinner to the employes of its various subsidiary companies. At 8:30 all traffic on the various lines of the company was suspended and all employes from President Given down were present at the dinner. After the serious work of the evening a number of speeches were made by officers of the company and invited guests. A report was made on the employes' relief association which now has a total membership of 190. President Given announced that the company would donate \$200 to the association and that he personally would pay the initiation fee of 100 members, if that number could be secured by the association.

INDIANAPOLIS & NORTHWESTERN.

The Indianapolis & Northwestern Traction Co. has incorporated with a capital stock of \$2,500,000. It was incorporated last February under the name of the Indianapolis, Lebanon & Frankfort Traction Co. with \$25,000 capital stock, but on December 17th the name was changed to the Indianapolis & Northwestern and the capital stock increased to \$2,500,000, with the privilege of increasing this to \$3,000,000 by additional common or preferred stock. It has issued

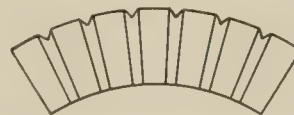
\$3,000,000 of bonds, which entire issue was taken by Tucker, Anthony & Co.

The road is now under construction between Indianapolis and Frankfort and is expected to be in operation to the latter place by July 1st. The Crawfordsville branch is to be put in operation by September 1st, and by the following month it is expected to be opened through from Indianapolis to La Fayette. Failure to establish service on the days named involves a heavy penalty.

This line was promoted by Townsend, Reed & Co., and is financed by Tucker, Anthony & Co., of Boston. The officers of the company are: President, George Townsend, Indianapolis; vice-president, Phillip L. Saltonstall, Boston; secretary, Winthrop Smith, Boston; treasurer, Chauncey Eldridge, Boston. Thomas Pettigrew, Boston, will be resident engineer of the system.

TO PREVENT FLAT COMMUTATORS.

The accompanying illustration shows the method of treating flat commutators which has been used by Mr. R. M. Howard, manager of the State Electric Co., of Clinton, Ia., which he states is particularly effective for armatures of more than one coil per slot in case of any trouble from flattening or blackening. These difficulties are rectified by taking a common three-cornered file and filing out the mica between the bars until the file touches on both bars. Mr. Howard states that he has treated over 200 commutators in this way in a number of different shops and localities and the result has been



METHOD OF TREATING FLAT COMMUTATORS.

extremely satisfactory in every instance. The mica should be filed out as far as a three-cornered file will reach until it touches the segments on each side.

The commutator treated in this way will wear true and bright and will give less trouble from short circuiting than one in which the mica is in the usual condition. The dust does not stay in the slot and as the surface of the mica will measure about twice as much as in the usual way the insulation is higher between bars. An explanation of this may be that many commutators are assembled with too hard a grade of mica and the copper will wear faster than the mica, making the surface uneven and causing flashing and bucking which will ultimately flat the commutator. This method of treating commutators is especially recommended in cases where motors or generators have more than one coil per slot in the armature.

STANDARD GAGE FOR NASHVILLE.

Mr. Percy Warner, president of the Nashville (Tenn.) Railway Co., has announced that the company has decided to change from the present gage of 4 ft. 11¾ in. to standard. This change will involve an expenditure of about \$50,000 more than was contemplated for the improvements intended, and is made with a view to permitting proposed interurban lines to enter the City of Nashville over the local company's tracks.

Ground was broken January 7th for the Tennessee Interurban Electric Railway Co., the occasion being celebrated in an appropriate manner.

FRANCHISES TO CORPORATIONS ONLY.

In the case of Goddard against the Chicago, Milwaukee & St. Paul Railroad the appellate court of Illinois has decided that city councils or boards of supervisors may grant street railway franchises to corporations only and not to individuals. This ruling, if affirmed by the supreme court, may invalidate many franchises.

The first car over the Wheeling & Elm Grove line was started over the road at noon December 31st.

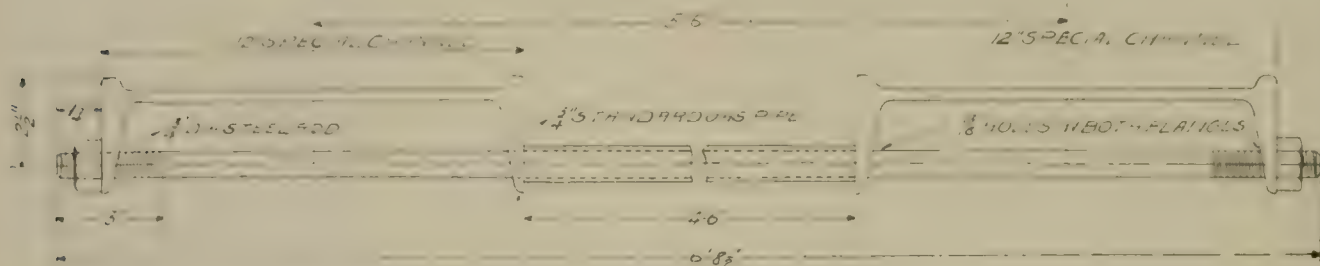
STEEL TRACKS FOR HIGHWAYS.

The idea of laying broad steel tracks on rails in public streets and highways for the use of all horse-drawn wagons and vehicles and automobiles has received a new impetus from experiments with steel roadways now being carried on in one of the busy down town streets of New York City. The subject is one of importance and quite as much so to the electric railway fraternity as to any other interests, inasmuch as the scheme is proposed as an effective means of drawing all heavy trucking from the car tracks and thus removing the principal obstacle to street car traffic.

The idea of laying steel trackways for expediting the movement

of rods placed 13 ft. 4 in. apart, and which extend from the outer flange of one channel to the outer flange of the other, the holding nuts being on the outside of the outer flanges. These rods keep the channels from spreading, and to keep them from narrowing from gage a piece of $\frac{3}{4}$ in. standard gas pipe is slipped over each rod so the ends of the pipe will bear against the inner flanges of both channels.

The paving is laid flush with the top of the channels. In future work it is the intention to roll the plates with certain depressions in the top face of the channels and also along the ridges to catch the toe-corks of horses and give them better footing. General Stone is authority for the statement that the steel trackway can be



SECTION OF STEEL HIGHWAY TRACK.

of general vehicular traffic in public streets is not altogether a new one, as experimental sections of track have been laid in various places in this country and abroad, notably at Valencia, Spain, in 1892; at Pittsburg in 1897, and at Joliet, Ill., in 1896.

The present experiment in New York probably has a better backing than any similar attempt to determine all the advantages and disadvantages of the scheme. Gen. Roy Stone, U. S. A., first became interested and brought the matter to the attention of the Automobile Club of America, an organization of prominent automobile owners. The Automobile Club at once voted an appropriation to further experimental work in this direction, and General Stone and Mr. Seligman, the New York banker, were designated a sub-committee to procure the steel for the trial road and also to interview the city authorities in reference to locations. The sub-committee found President Cantor of the Borough of Manhattan, and also City Engineer Olney favorably disposed toward the scheme, and it was arranged to lay three experimental sections of track: one section on Murray St. between Broadway and Church St., which is a heavy trucking thoroughfare; one section in the neighborhood of Central Park, where automobiles and light carriages would use it; and a third section on one of the earth roads farther uptown, the idea being to test the scheme under varying conditions of pavement and traffic.

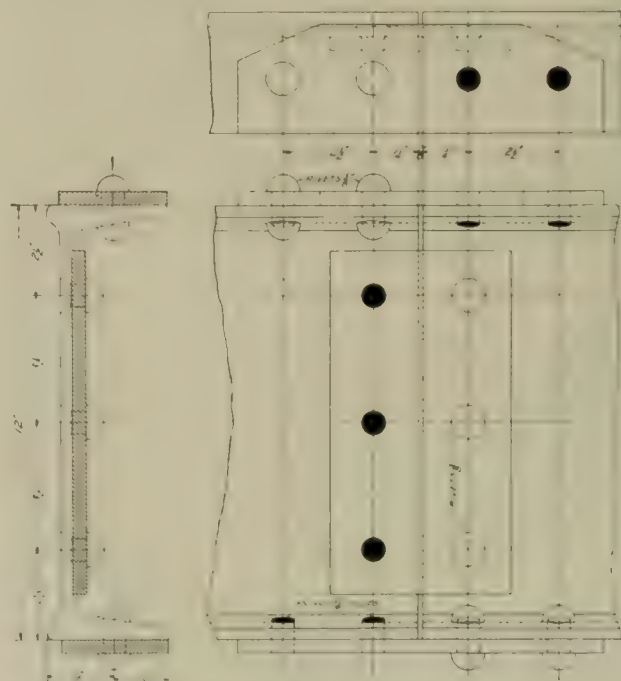
Messrs. Stone and Seligman also called upon Charles M. Schwab, president of the United States Steel Corporation, who entered heartily into the project and not only agreed to have special rolls prepared for making the tracks, but volunteered to furnish one mile of material free of cost.

After some delay a resolution was passed by the New York Board of Aldermen permitting the laying of the tracks in the Murray St. section. The work was commenced in last November and was finished the following month. As laid in Murray St., New York, the track comprises two special shaped steel channels laid 5 ft. 6 in. centers. Each channel is 12 in. across the top, $\frac{1}{4}$ in. in thickness, and has two flanges 3 in. deep. The channels are flat on top, except at either edge there is a ridge about $\frac{3}{8}$ in. high to act as a slight wheel guide. The channels are rolled in 40-ft. sections and the sections are joined by two $10\frac{1}{8} \times 3 \times \frac{3}{8}$ -in. fish plates at each joint. These plates fit on the outside of each flange and are riveted in place. At each joint there is a third plate, $9\frac{1}{2} \times 5 \times \frac{3}{8}$ -in., which fits against the under side of the broad face of the channels and is also riveted in place.

In laying the steel trackway it is usual to dig a trench 17 in. wide by 17 in. deep along the line of each rail. In the bottom of each trench is laid a layer of cobble stones. The trench is then partly filled with broken stone, screening $1\frac{1}{2}$ in., and the remainder is filled up to the top with gravel. The channels are laid in the gravel and by means of tamping blocks are driven down flush with the street level. The channels are held to gage by $\frac{3}{4}$ -in. steel tie

built for about \$4,000 per mile of single track. From recent tests it is evident that vehicles of all descriptions can be hauled over these trackways with from 40 to 60 per cent less pulling force than on regulation stone paving or ordinary dirt roads.

From consular reports it appears that the steel trackways at Valencia, Spain, have been a great success. The road between Valencia and Grao is 2 miles in length and the cost was as follows: Steel construction, \$6,890; transportation and laying steel



ARRANGEMENT OF JOINTS.

construction, \$507; binding stone construction between rails and lateral zones, \$2,109; total, \$9,506. The municipality of Valencia is of the opinion that the saving in cost of repairs for a road of this description, as compared with an ordinary flint stone road, pays for its construction in a short time, and other similar roadways are in contemplation.

Concerning the steel roadway at Joliet, Mr. Abel Bliss writes as follows: "The track was put down April 2, 1896, on a dirt road of typical Illinois soil, and consisted of steel rails, $\frac{1}{4}$ in. thick, 8 in. wide, with a flange 3 in. deep turned down on either side and

a 3/4 in. flange turned up on the outer edges to keep the wheels on the rails. These rails were let into the ground so the flat part rested on the earth and were fastened together at the ends by fish plates which are so constructed as to run the wheels on to the rails after passing a team. The earth between the rails was removed to a depth of 4 in. and the space filled with gravel for a tread for the horses. These roads have been tested with all kinds of loads, including traction engines, and have retained their position well. While the mud formerly made the road almost impassable during the winter a team could have trotted on this roadway any day with a 2-ton load. About 50 tons of steel per mile is required, having the rails 3/4 in. thick, which I think is ample."

The accompanying drawings showing details of the steel roadway as laid in Murray St., New York, were furnished us through the courtesy of Gen. Roy Stone, 860 Broadway, New York.

AMERICAN CAR CO., ST. LOUIS.

On Sept. 12, 1902, the plant of the American Car Co., at St. Louis, was sold by the trustees, the purchasers incorporating as the American Car & Truck Co. The old American Car Co. having been legally dissolved, its successor took the old name and is now operating the plant under the name of the American Car Co. The entire plant, assets and patterns are now owned by the new company, which has remodeled the plant with new machinery and greater facilities and a large stock of seasoned lumber. This company has made an arrangement with the J. G. Brill Co., of Philadelphia, for the use of its patents, drawings and patterns of all the different types of cars, both of the regular pattern and of the Brill patented convertible, semi-convertible and "Narragansett" types; also of the various Brill supplies, such as patented angle iron bumpers, patented "Dedenda" gongs, patented ratchet brake handles, conductor gongs, gates, Littell & Brill track scrapers, and others. The company has also acquired the Brownell car works at executor's sale, which puts it in possession of all the records, patterns and patents of the Brownell Car Co. The American Car Co. is now in a position to furnish cars of the Brill, Brownell or American Car Co.'s types and also all supplies pertaining to any of these companies, and to bid on specification work of any kind of cars for street and interurban railways.

The officers of the American Car Co. are: President, John A. Brill; vice-president, Samuel A. Curwen; treasurer, James Rawle.

NEW ELECTRIC TROLLEY SIGNAL.

We learn that a new corporation is about to be formed under the laws of Maine, to put on the market an automatic electric trolley signal. The officers and stockholders of this company are members of the firm of L. C. Chase & Co., of Boston, and of Sanford Mills, Sanford, Me., also several prominent railroad men, and some of the original promoters of the United States Electric Signal Co. The new signal is a single-wire system and is presented as cheaper to install than other systems now in use. The system involves the use of lights and semaphores working independently and thus doubling the security of the system. The company has taken out several broad patents covering the single-wire system, and has applied for numerous other patents covering details.

EASTERN CHRISTENSEN AGENCY.

Mr. N. A. Christensen, of Milwaukee, has arranged for opening a branch in Philadelphia to handle his eastern business in air compressors. This office will be in charge of Mr. H. A. Pike, who will have headquarters at No. 906 Real Estate Trust Bldg., Philadelphia. The increase in business which has made this arrangement necessary must be very gratifying to Mr. Christensen, and we congratulate him upon the expansion.

The Danville (Ill.) Street Railway and Light Co. will introduce express cars on its line at an early date. The company has secured a franchise for a loop in the city and has purchased a lot for the erection of an express depot.

LARGE CRANE FOR KANSAS CITY POWER HOUSE.

The Metropolitan Street Railway Co., Kansas City, Mo., lately placed an order with Pawling & Harnischfeger, Milwaukee, Wis., for an electric traveling crane which has quite a number of unusual features.

This machine will have a main hosting capacity of 60 tons, though to withstand a 75-ton test. In connection with the main trolley will be an auxiliary hoist of 10 tons' capacity, and the main trolley will have a lift of 58 ft. and the auxiliary hoist of 66 ft. The total span of bridge will be 70 ft. 5 in.

From this it will be seen that this crane is very large, indeed, for power-house purposes, yet in fact is strictly modern practice in giving due consideration to future contingencies. The bridge will be of riveted box section, with the cage attached to the left-hand side. The length of the runway will be 248 ft., and the weight of rails 100 lb. per yard.

The speeds per minute that will be supplied are as follows: Main hoist, full load, 10 ft.; light, 25 ft. Auxiliary hoist, full load, 20 ft.; light, 60 ft. Bridge travel, full load, 200 ft.; light, 250 ft. Trolley travel, full load, 100 ft.; light, 150 ft. The motors are: Main hoist, 60 h. p.; auxiliary hoist, 20 h. p.; bridge, 30 h. p.; trolley, 15 h. p. The voltage to be used is that of the standard railway practice, namely 500 volts. This crane is to be installed in the Missouri River power house of the Metropolitan Street Railway Co. and is to be used for the erection of machinery and repairs thereto. The approximate shipping weight of the crane complete in all respects will be 155,000 lb.

BRITISH WESTINGHOUSE COMPANY.

The Third Annual Reports of the British Westinghouse Electric & Manufacturing Co., Ltd., London, Eng., shows a material increase in the company's business. Hereafter orders received by this company will be executed at the Trafford Park plant, Manchester, Eng. A construction department has been organized to carry on building and general construction work. This will be under the management of Mr. James C. Stewart, of the firm of James C. Stewart & Co., whose record for quick and excellent work is well known. Among the important orders received by the British Westinghouse Co. during 1902 were those for the Metropolitan District Railway Co., the Metropolitan Railway Co., the Clyde Valley Electric Power Co., the London United Tramways Co., the Bath Tramways Co., the Exeter Corporation, the New Castle Corporation, and the Swansea Corporation.

The preferred capital stock of the company is to be increased by \$15,000,000, the bulk of the original capital having been absorbed in building and equipping the manufacturing works.

LARGE ORDERS FOR VAN DORN COUPLERS.

W. T. Van Dorn, of Chicago, reports that the coupler business was never before in better shape, and states that all of the largest elevated, underground and surface electric roads of the world have now adopted or are on the point of adopting the Van Dorn system of coupling as standard. This is certainly a recommendation that has seldom, if ever, been equaled in any line of manufacturing activity. The latest of the larger transportation companies to adopt the Van Dorn coupling is the Interborough Rapid Transit Co., which company will operate the Rapid Transit Subway road of New York City. The order given by this company is for 1,000 of the latest improved Van Dorn couplings.

Among other large orders received just at the close of 1902 or the beginning of 1903 are the following: An order for 260 draw-bars from the Brooklyn Rapid Transit Co., and 240 draw-bars from the John Stephenson Co., also for use in Brooklyn; an order for 492 additional equipments from the Manhattan Railway Co. of New York City; an order for 20 car equipments from the John Stephenson Co. for the Aurora, Elgin & Chicago Electric Ry. Mr. Van Dorn begins the New Year with orders on hand, or tenders for, something over 2,700 couplings for elevated roads alone in addition to the many orders from interurban and city electric railway systems.

DURABILITY IN CAR PAINTING.

While the beauty of perfect finish is one of the pleasing features of a newly painted street car and one which is likely to excite admiration, it should be borne in mind that under this extreme surfacing there lurks a danger, which is the absence of durability. Perfect finish cannot be accepted as an excuse for ignoring well-known rules in regard to the application of paint, or its action in conjunction with that to which it is joined. Nor should it act as a mantle to conceal from view the improper assembling of oils and spirits embraced in the paint. The uniting of successive coats of paint virtually into one body should be done with one paramount idea, namely, durability. In the matter of selecting the ingredients which constitute these coats it would certainly be folly to incorporate into any material used an element for the sole purpose of subsequently producing a hard, brittle surface which is positively necessary in cases where an absolutely level surface is demanded. This practice in no way warrants the cost of labor required to accomplish it, for owing to the comparatively brief life of the paint as a whole, resulting from this method of painting, the ultimate expense of repainting would be excessive. The waste of time and material in repeatedly applying coats of varnish and then laboriously rubbing it partly off with pumice in the attempt to imitate the finish of a private carriage is not compensated for by the appreciation of the public. Admitting, as experience has taught, that to obtain the best results when applying one coat of varnish over another it is essential that the gloss on the first coat should be removed, it does not follow that it is a wise policy to remove 50 per cent of the most valuable protective portion of the painting material on the car in order to procure a mirror-like surface. This is indeed a most unwise proceeding as the life of the varnish on the car when in service is thereby diminished in a corresponding degree.

It is not the purpose of this article to speak disparagingly of perfect finish, for painters who have been long associated with car work delight in its attractive appearance and it should be the aim to secure this quality, as far as is possible consistent with its ultimate durability. In securing a perfect finish it must not be expected that it can be produced jointly with elasticity which is the well-known requisite for great permanence. One of these qualities must be subordinated to the other as the case may be. The more brittle surface cannot be expected to compete with an elastic one in the matter of long life, nor can a tough rubber-like surface be leveled evenly, which perfect finish demands.

Wood is constituted so that the least change in atmospheric conditions causes it to shrink or expand and it must therefore be apparent that where the car is exposed to zero temperature for three or four hours and is suddenly run into the pit room with the thermometer recording 70 deg., where it will often remain a number of days before it is sent out, perhaps during a spell of stormy weather, the wood must, in the meantime, have contracted and expanded considerably under the influence of these different conditions.

And what about the paint during a disturbing period of this nature? It certainly cannot remain quiet during the time that its foundation, to which it is firmly fixed, is undergoing so many changes. If there has not been incorporated into the paint when prepared some vehicle which, when applied, would allow it to remain in an elastic state it cannot withstand the stretching to which it will be subjected under these circumstances. It has no alternative but to part in sections, thereby producing the small fissures which are the precursors of an early decay of the paint in general. This cracking of the surface marks the time when the value of the paint as a protection begins to decrease.

Much better results in painting might be gained if the study of the action of the surfaces to be treated were given more attention. Different coats of paint applied successively, form as they dry, strata which are closely united to each other, although not absolutely so. In view of this fact, for example, the result when a car is required to be quickly painted. Two coats of keg lead in oil are mixed with turpentine and applied. Over this, with the evident object of accelerating the work, two coats of Japan color are placed in quick succession. The whole is then finally finished with two coats of varnish, presumably finishing varnish. The dry priming which forms an elastic film on the wood readily responds to every motion of the latter, but the middle coats being of a brittle nature cannot

withstand the expansion they are bound to receive sooner or later and break apart, disclosing through a multitude of minute fissures the color of the priming below. In this case the varnish and priming will remain intact, and so would the color coat if in the beginning it had been mixed to produce a correspondingly elastic film. It would then have retained its original smooth appearance instead of being defaced by innumerable cracks the effect of which is to change its color in a marked degree due to the disclosure of the priming underneath.

These conditions, which are quite prevalent, result undoubtedly in most cases from failure to study thoroughly the theory of the subject and forcibly illustrate the danger of applying any painting material which, when subsequently changed into a solid will become a fixed film adhering to an elastic body. The result of such a combination must be apparent.

Practitioners of the old school of car painting who consumed a great amount of time in the completion of their work do not deserve perhaps all the praise with which they are accredited for producing durable results. They failed to observe the conditions just explained by applying three and sometimes four coats of hard drying varnish on panels for the specific purpose of developing an absolutely level surface. This is sufficient proof that they failed to grasp the possibilities in regard to extreme durability probably owing to the unlimited time which enabled them to make use of a maximum amount of oil in the preparation of their formulas. If they had used finishing varnish in connection with this work instead of extra time, and had been content with a reasonable amount of varnish on the work the possibilities of permanent results would have been as unlimited as the time they used so freely.

It is not the object of a modern street railway company to maintain at considerable expense a painting department for the exclusive purpose of embellishing its equipment to the highest degree. It is not the intent that all the energy of the painting department should be concentrated in the development of extreme display, but it is expected that the company should receive adequate returns for the money it invests by giving to all of its rolling stock all the protection that is possible under existing conditions.

Very quick drying paint and hard drying varnish should have no place in the painting department of a street railway repair shop which is supposed to work upon a paying basis. Consequently there will be no material on hand necessary for the successful operation of producing perfect finish. With the best of finishing varnish that money can buy, together with choice pigments and pure vehicles assembled and ground under the supervision of the head of the department in a judicious manner, it is safe to say that after a lapse of a dozen years or more the results would more than justify the original expense of application and the cars would present during this time a continuously neat and dignified appearance which would be commended by all who criticize from the standpoint of a reasonable basis.

No doubt the failure to produce better results in painting lies in the fact that cause and effect are seldom taken into consideration, and it is a deplorable truth that unscrupulous people are selling dishonest material under the name of pure paint. Still, we have not absolutely lost confidence in the paint producers to the extent that we believe this to be the rule. The ignorant use of the very best material to be had is often the cause of trouble subsequently appearing in some form which a practical analysis of the case would easily explain, and this sometimes leads to unjust condemnation of the materials used when in reality the fault is with the user. In seeking a remedy by using other material the painter will probably meet with still more discouraging results if he still persists in trusting to luck instead of probing for the cause. When the latter idea is more generally considered it will obviate in a marked degree the many mysterious conditions which frequently arise which are conveniently termed "deviltries" and work will proceed on more rational lines, so as to insure the greatest durability and least possible cost.

F. H.

December 13th a collision occurred between a passenger car and an inspector's car on the Lake Shore Electric Ry., about six miles east of Lorain, O. Both cars caught fire and were almost totally destroyed. The loss is reported to be about \$20,000. The motorman received cuts and burns which proved fatal. The wreck was caused by slippery rails.

NEW CARS FOR READING, PA.

Within the last few weeks the United Traction Co., of Reading, Pa., has put in service ten semi-convertible cars built by the J. G. Brill Co., of Philadelphia. The cars are the regular Brill patented semi-convertible type with roof window pockets. The general dimensions are: Length over end panels, 30 ft. 8 in.; length over ves-

ing the sides but 2 in. thick. The seats are brought close to the sides, leaving the aisle 24 in. wide. In summer, when all the windows are raised into the roof pockets, the car has a remarkably open appearance. This is easily imagined when it is known that the top of the window rail is but 2 ft. 3 $\frac{3}{8}$ in. from the floor, and the window openings are 28 $\frac{3}{4}$ x 40 in. The interior finish is natural cherry, with ceiling of decorated birch.

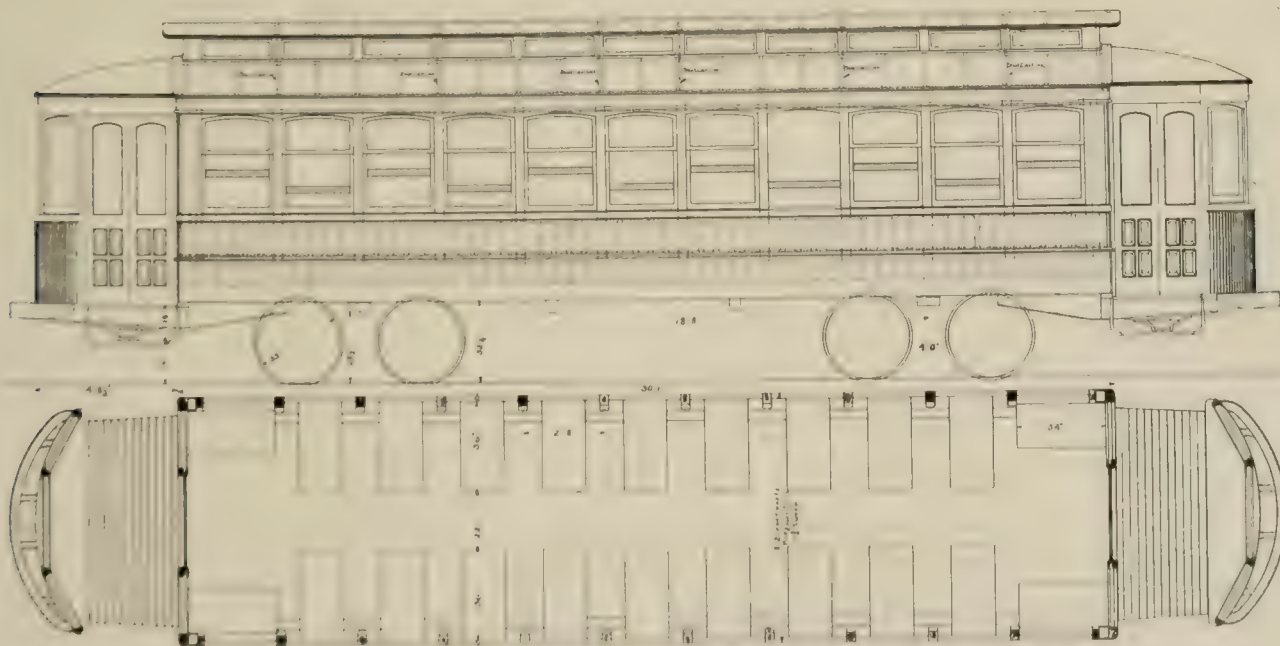


BRILL SEMI-CONVERTIBLE CAR FOR READING, PA.

tibules, 40 ft. 8 in.; width over sills, 8 ft. 2 $\frac{1}{2}$ in.; width over posts at belt, 8 ft. 6 in.

As these cars are for all-year use they are made stronger than ordinary, for instance, the side sills are of carefully selected yellow pine 4 x 7 $\frac{3}{4}$ in., with $\frac{3}{8}$ x 12 in. steel plates on the inner side. The corner posts are 3 $\frac{3}{4}$ x 5 $\frac{1}{2}$ in. and the side posts 3 $\frac{1}{4}$ in. The side posts are secured to the sill plate, thus the sill plate is made to do double duty, giving vertical stiffness as well as longitudinal. The steel carlines are nine in number, $\frac{5}{8}$ x 1 $\frac{1}{4}$ in., and are bolted to the top plate. The form of the side posts adds much to the firm sup-

The Brill No. 27-G trucks, on which the cars are mounted, carry the cars considerably lower than usual with trucks having 33-in. wheels, as will be seen by the height of the steps: from rail-head to step, 17 in.; step to platform, 14 in.; platform to car floor, 9 in. The vestibules are furnished with folding doors and Brill folding gates. The platforms are protected with Brill angle-iron bumpers, and the platform timbers are reinforced with angle-iron. Among the fittings of the cars are Brill "continuous-flow" sand boxes, "Dedenda" gongs, ratchet brake handles and radial draw bars. The cars weigh 27,200 lb. without the motors.



ELEVATION AND PLAN OF READING CAR.

port of the roof. At the post heads there is an inward sweep, to allow space for the roof pockets. The lining of the side roof follows the sweep of the post, giving a very graceful appearance and entirely concealing the fact that there is a deeper cross section than usual. The roof window pockets do not lessen the width of the monitor deck, the clear space being 4 ft. 7 in., full standard width.

The seating capacity of the car is 44. The seats are of spring case with reversible backs and are 37 in. long. As there are no wall window pockets, the side linings are set within the posts, mak-

WHEELING COMPANY PAYS DIVIDEND.

The Wheeling Traction Co., of Wheeling, W. Va., has just declared a one per cent dividend on its capital stock of \$2,000,000, which is the first dividend declared since the reorganization of the company. The improved physical condition of the company's lines, the rapidly increasing travel resulting from extensions, better accommodations and lower fare, it is expected, will place the stock permanently on a dividend-paying basis. There has recently been considerable activity in the stock on the local market.

PERSONAL.

MR. F. M. ZIMMERMAN on January 1st resigned as general manager of the Elgin, Aurora & Southern Traction Co.

MR. LYMAN WATERMAN has resigned as general manager of the Creston (Ia.) Electric Railway, Light, Heat & Power Co.

MR. A. C. FROST, vice-president of the Chicago & Milwaukee Electric Railroad Co., left Chicago January 15th for a three-months trip in Europe.

MR. J. H. LUTHEWILLER, superintendent of construction for Ford, Bacon & Davis, has been transferred from Kansas City to Nashville, Tenn.

MR. ELZER C. NOE, who has been connected with the General Electric Co. since its organization, was appointed to succeed Mr. Frank Hedley as general superintendent of the Lake Street Elevated



E. C. NOE.

and the Northwestern Elevated Railroads of Chicago, and assumed charge Jan. 11, 1903. Mr. Noe was born at Western Star, Summit County, O., in 1862. He commenced his business life with the Western Edison Light Co., of Chicago, in 1882, and was with this company and its successor, the United Edison Manufacturing Co., later reorganized as the Edison General Electric Co., for nine years, and with the Thomson-Houston Co. for one year prior to the consolidation of that company with the Edison General Electric Co. When the present General Electric Co. was formed Mr. Noe

was appointed engineer for the district controlled by the Chicago office. Mr. Noe has had a particularly wide experience which has made him thoroughly conversant with all branches of electrical work, and in his business career has made a wide circle of friends and acquaintances in Chicago.

J. H. GRONEMAN has been appointed general passenger and express agent of the Rockford & Interurban Railway Co. with headquarters at Rockford, Ill.

MR. CHAS. M. FLECK, of Franklin, Pa., has been appointed superintendent of transportation, electric maintenance and equipment of the Citizens Traction Co., Oil City, Pa.

MR. T. L. LYMAN, manager of the asbestos department of H. W. Johns-Manville Co., New York, sailed for Havana December 20th, where he remained several weeks for the benefit of his health.

MR. C. WUSTENFELD, of Elgin, Ill., has been appointed superintendent of the New Albany Street Ry and of the Southern Indiana Interurban Railway Co., operating between New Albany and Jeffersonville.

MR. E. P. THOMAS, who for 12 years served as secretary or treasurer of the Terre Haute Electric Co., left Terre Haute on January 1st for Dallas, Tex., where he will assist Mr. J. P. Clark in representing the Stone & Webster interests.

THE CRESTON (IA.) ELECTRIC RAILWAY, LIGHT, HEAT & POWER CO. on January 7th elected officers for 1903 as follows: President, E. G. Barker; vice-president, E. D. Arnold; secretary, W. J. Dobbs; treasurer, W. C. Elliott.

MR. JAMES H. BUDD was chosen president of the Stockton (Cal.) Electric Street Railway Co. at a stockholders' meeting held January 3d. The other officers elected were: Vice-President, H. E. Huntington; secretary, W. R. Clark, who will also act as manager.

MR. A. B. GILBERT has resigned as assistant business manager of the Engineering News Publishing Co. after a connection of 11 years with that company and will hereafter be business manager of the Good Roads Magazine, The Teller, Central Station Directory, Street Railway Directory and other publications of the E. L. Powers Co.

MR. R. N. BROWN, who was formerly connected with the Columbus, Buckeye Lake & Newark Electric Railway Co., has been

appointed to succeed Mr. H. E. Sawyer, as superintendent of the Dayton, Springfield & Urbana Electric Railway Co. Mr. Brown assumed his duties January 7th.

MR. JOHN W. GIVNEY has been appointed superintendent of the freight and express department of the United Traction Co., New Albany, N. Y., to succeed Mr. Charles W. Armatage, resigned. Mr. Givney has been in the employ of the company for 10 years and he has served as conductor, inspector and assistant chief engineer.

MR. WILLIAM W. BROWN, formerly master mechanic of the Twin City Railway Co., who designed the large cars used by this company, has resigned that position to accept a position with a large lumber concern in Los Angeles, Cal. Mr. Brown was employed for 10 years with the Twin City company, four years of which he was master mechanic.

MR. J. PEYTON CLARK, general manager of the Terre Haute (Ind.) Electric Co., has been appointed manager of the Metropolitan Street Railway Co., of Dallas, Tex. Both companies are controlled by Stone & Webster, of Boston. Mr. Clark is a Virginian by birth and has had 13 years' experience in street railway and electric lines in Kansas City, Tacoma, Seattle and Terre Haute.

MR. FREDERICK HALLER, who as assistant district attorney was identified with the prosecution of the street railway conspiracy case at Buffalo, of which an account was given in our last issue, has formed a partnership with Mr. John F. Patterson, and under the style of Haller & Patterson, for the practice of law. The offices of the firm are 705 Mutual Life Bldg., Buffalo.

MR. H. C. SCHWITZGEBEL, who for the last five years has been purchasing agent for the Metropolitan Street Railway Co., of Kansas City, resigned on January 15th to become treasurer of the Kansas City Trust Co., which is a new company controlled by Messrs. W. H. and C. F. Holmes. The duties of purchasing agent will be assumed by Mr. E. Kirkpatrick, treasurer of the company.

MR. W. S. DIMMOCK, general manager of the Tacoma Railway & Power Co., has been appointed to succeed Mr. G. W. Dickinson as general manager of the Seattle-Tacoma Interurban Railway Co. Since taking charge of the Tacoma lines Mr. Dimmock has been extremely successful in every way and is making a most enviable record, quite in keeping with his former work at Council Bluffs, Ia., and Richmond, Va.

MR. CHARLES H. BIGELOW has been promoted to the position of chief mechanical draughtsman of the department of motive power and machinery of the Boston Elevated Railway Co. Mr. Bigelow has been connected with the Boston system since 1891, commencing with the old West End Street Railway Co. as inspector of power stations and inspecting engineer. He was engaged on work at the old East Boston power station, which was the first power house to have direct connected units. He has had more or less to do with each of the four stations of the company built since that time and also with two other stations and several car houses. He is a graduate of the Massachusetts Institute of Technology, class of '92, and spent about 18 months with Stone & Webster installing electric plants.

MR. FRANK HEDLEY recently tendered his resignation as general superintendent of the Lake Street and Northwestern Elevated Railway companies, of Chicago, to become general superintendent of the Interborough Rapid Transit Co., of New York City. Mr. Hedley is a son of James Hedley, and is from an old English family that was one of the very first to be connected with steam railroad engineering. His grand-uncle was William Hedley, who designed and built the first locomotive engine ever constructed. A model of this engine was exhibited in Chicago at the World's Fair. Mr. Hedley studied the profession of mechanical engineering, but came to this country in 1882, when he engaged with the Erie Railroad, at its Jersey shops, as a machinist. He was next employed with the Manhattan Elevated Ry. as machinist engine inspector for the Third Ave. division and was later promoted to the position of assistant general foreman in the locomotive department. He remained with this company for over five years, after which he was appointed master mechanic for the Kings County Elevated Ry., in Brooklyn, N. Y., where he was located for three and a half years. He then took a position with the Lake Street Elevated, of Chicago, as superintendent of motive power and transportation in June, 1893. Here he had full charge of the construction of the cars and locomotives, and

of the operation of the road. In 1894 the construction of the Northwestern Elevated and the Union Loop was commenced, and during all the period of construction Mr. Hedley was on the consulting engineering staff. In November, 1897, he had charge of equipping and starting the trains around the Union Loop, and he also organized and started the Northwestern Elevated. Mr. Hedley has been awarded a number of United States patents; in 1897 he patented a railway track that is especially adapted for electrically operated railroads. This truck has been used exclusively on all the cars of the Northwestern Elevated, and has been adopted on all the new equipment of the Lake Street Elevated. He also patented a device for cleaning the third rail from snow and sleet, which is in use on the Lake Street and Northwestern roads also. In his new position as general superintendent of the Interborough Rapid Transit Co. Mr. Hedley will have full supervision of the operation of the system. During his connection with the elevated railways of Chicago Mr. Hedley has made many business and personal friends who will regret his departure.

MR. HOWARD F. GRANT, secretary to the vice-president of the Boston Elevated Railway Co., resigned his position on January 10th to become general manager of the Seattle Electric Co., of Seattle, Wash. His service with the Boston Elevated and its predecessor, the West End Street Railway Co., covers a period of 10 years, during which time his duties have been such as are usually assigned to an assistant general manager. The property which he is to manage at Seattle consists of upwards of a hundred miles of trolley and cable railway, an electric lighting and power plant and a coal mine. He goes to his new post of duty well grounded in the principles of operation, organization and discipline acquired in the service of the Boston company that has trained and developed so many successful railway operators. The Boston Elevated officials were very loth to part with him, as he is recognized as one of the most capable men connected with that company. Mr. Grant began railroading as a watchman at Portsmouth, N. H., for the Eastern R. R. His first promotion came in three years, when he was placed in charge of the company's kyanizing plant at that point. A year later he was appointed to a clerkship in the maintenance-of-way department, and a little later rose to the position of chief clerk of the department. When the Eastern and the Boston & Maine roads were consolidated he was made chief clerk of the department of engineering and maintenance of way of the combined system, in which capacity he served for 10 years, when he left the Boston & Maine to become secretary to the general manager of the West End Street Railway Co. It was not long before the clerical duties of secretary gave way to the executive function of an assistant, although there was no change in title, and he was given a large amount of administrative responsibility and was acting vice-president in the absence of that official. In the afternoon of the day upon which his resignation took effect (Jan. 10) he was ushered into the president's office, where he found some 40 officials of the company assembled to say farewell to him. The vice-president, with whom he has served for 10 years, acted as spokesman for the assembly and expressed the regret of the management and the members of the various departments that he was about to sever relations that had been so agreeable and satisfactory to those concerned in the welfare of the company. He dwelt particularly upon the loyalty and ability Mr. Grant had shown while serving as his head assistant in operating the system, and of the strong friendships that had been created. At the conclusion of his remarks he presented Mr. Grant with a letter signed by the president and about 50 other officers, congratulating him upon his well-merited success and expressing regret that he was about to leave them. A purse of gold was presented to him with the suggestion that it be used to supply in his new home some reminder of the friendship and good will that extended across the continent to him.

THE HAYCOX ELECTRIC CAR SIGNAL.

Our readers will be interested in learning that the Ohio Brass Co. has secured exclusive rights for the manufacture and sale of the Haycox electric car signal, invented by Mr. A. J. Haycox, superintendent of the Citizens' Electric Railway Light & Power Co., Mansfield, O., and which was illustrated in the "Review" for November, 1902, page 852. This device is for use in signaling interurban cars at night by those wishing to take passage.

ADVANCES IN WAGES.

The Cincinnati, Dayton & Toledo Traction Co., which has been paying its men from 16 to 18 cents an hour, has put into effect a new schedule as follows: New men will begin on the Hamilton & Lindenwald line at 16 cents an hour for the first year and receive an additional cent an hour for each of the two succeeding years, after which they will be transferred to the Cincinnati, Dayton & Toledo line at 19 cents an hour, with an additional cent an hour each year until a maximum of 23 cents is reached. Thus it requires seven years' service to begin to receive the maximum wages. The announcement was received with enthusiasm, as many of the men now in service received only 13½ cents an hour several years ago.

The Pennsylvania & Ohio Railway Co., Ashtabula, O., has raised the wages of its conductors and motormen from 15 to 17 cents an hour with the promise of another increase in the spring.

The Savannah (Ga.) Electric Co. increased the wages of its conductors and motormen one cent an hour January 1st.

The Lynchburg (Va.) Light & Traction Co. advanced the wages of all employes 5 per cent January 1st.

The Metropolitan Street Railway Co., of Kansas City, Mo., has increased the wages of its motormen one cent an hour, which places them on an equal footing with gripmen, who receive from 17 to 20 cents an hour according to length of service.

The Omaha & Council Bluffs Street Railway Co., which is a consolidation of all the street car lines in Council Bluffs, Omaha and South Omaha, has increased the wages of its motormen and conductors from a scale of 17, 18, 19 and 20 cents to one of 20, 21 and 22 cents an hour.

The arbitration board to which has been referred the question of wages for barns, shops and general employes of the Chicago Union Traction Co., reported on January 1st in favor of an increase of 10 per cent to date from Sept. 15, 1902.

The Northern Texas Traction Co., of Ft. Worth, Tex., has put in effect a new wage scale, the rate being 17 cents for the first year and an increase of one cent each year until the fourth year, when the amount is 20 cents.

The Lake Street Elevated Railroad Co., of Chicago, on January 1st increased the wages of motormen 10 per cent.

Wilmington & New Castle Electric Railway Co. on January 1st increased the wages of employes from 15 cents to 16 2-3 cents per hour.

The Wichita (Kan.) Railroad & Light Co. last year adopted the plan of paying employes a percentage of wages earned by them analogous to the dividends drawn by the stockholders. The second semi-annual payment was made Jan. 1, 1903, and was 5 per cent on the wages for the preceeding six months.

The Rockford & Interurban Railway Co., Rockford, Ill., put a new wage scale in effect January 1st which is as follows: For the first year, 14 cents per hour; second year, 15 cents per hour; third year, 16 cents per hour; fourth and fifth years, 17 cents; after the fifth year, 18 cents. On New Year's Day awards of \$25, \$20 and \$15 were made to conductors as prizes for good service, and awards of \$10 each were made to seven motormen who had had no accidents resulting in damage to property or injury to persons.

January 1st the Middletown (Conn.) Street Railway Co. increased the wages of trainmen who had been in the service for from three to five years one cent per hour; those who had served more than five years were given an increase of two cents per hour.

The Haverhill (Mass.) & Southern New Hampshire Street Railway Co. has increased the wages of the employes to 18 cents per hour for the first year, and 20 cents per hour thereafter.

CHANGE OF NAME.

The name of the Standard Traction Brake Co., of 26 Cortland St., New York City, has been changed to the Westinghouse Traction Brake Co. This company sells all power brakes for street railway service manufactured by the Westinghouse Air Brake Co., including straight or automatic air-operated brakes with axle-driven or motor-driven compressors, the storage system of air brakes, and the Westinghouse combined magnetic brake and electric car-heating apparatus.

FOSTER STEAM VALVES.

The Foster Engineering Co., of Newark, N. J., is one of the largest makers of steam engineering specialties in the East, and has a complete line of pressure regulators and valves, and various kindred devices essential to the safe and economical piping of steam, water, gas or air. The Foster valves are installed in many of the largest manufacturing plants as well as light, power and traction power houses of this country, the list of prominent users including the Carnegie works, the Krupp works in Germany, the Edison Electric Lighting Co., of New York City; the North Jersey Railway Co., the Cleveland Electric Railway Co., the Cleveland Electric Illuminating Co., Cleveland water works, the General Electric Co., Metropolitan Street Railway Co., New York; Cambria Steel Co., Pennsylvania Iron Works Co., the Colorado Fuel & Iron Co., Denver; the Atlanta water works. These valves are also used in a number of large steam plants on the Pacific Coast, and it is believed that 90 per cent of naval vessels built within the last five years are equipped

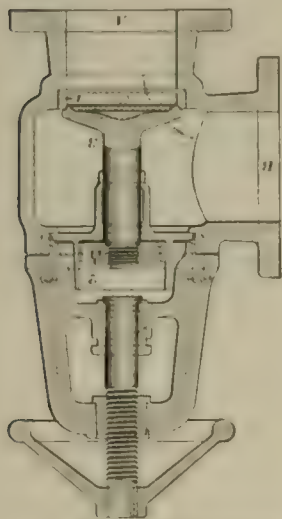


FIG. 1 FOSTER NON-RETURN STOP VALVE.

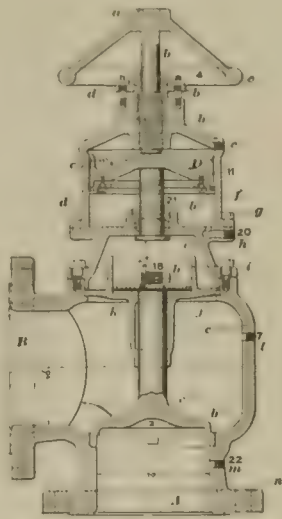


FIG. 2 FOSTER COMBINATION VALVE.

with the Foster goods. The demand for the company's specialties during 1902 taxed the capacity of the new plant, and it is probable that a further enlargement will be necessary this year.

Special attention is being directed at this time to the Foster non-return stop valve, and the Foster combination valve, which combines with the non-return feature certain automatic emergency and hand-stop functions. The Foster valves of these types are particularly designed for use in electric railway power stations. The non-return stop-valve is designed to absolutely prevent the flow of steam into the boiler from the header, as might occur when a boiler had been out of use temporarily and is cut into the line before the proper pressure had been reached.

Reference to Fig. 1 will make clear the method of operation. When the pressure in the boiler at A is equal to 1 lb. greater than the pressure at B, the valve opens and is held open by the flow of steam through it. If from any cause the pressure at A should fall below that of B, the valve will close.

The Foster combination valve shown in Fig. 2 combines with the non-return feature, the functions of an automatic emergency stop valve. It is designed to prevent pecuniary loss, or injury or death to power station attendants, through accidents caused by the rupture of a pipe or fitting, or other mishap which would make possible the escape of steam into the boiler room, inasmuch as it provides a means for shutting the main steam valve from several different points about the plant. This device includes a pilot valve which may be placed near the main valve or located at some distant or more accessible point. This pilot valve is connected by suitable small pipes to the boiler and to the chamber D of the large valve (Fig. 2), and there is also a pipe connection from the diaphragm chamber of the pilot valve to the outlet side of the main valve (as at 7, Fig. 2), or to some more distant point on the main pipe line. The

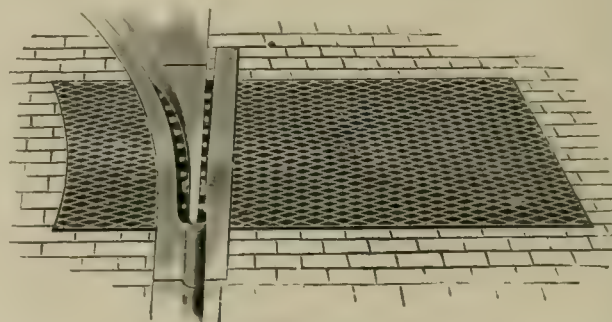
diaphragm of the pilot valve is normally held in place by a helical spring, which may be adjusted to resist any desired pressure, say 100 lb. Whenever from rupture or other cause the pressure in the main pipe line falls below 100 lb., the spring will operate the valve, allowing full pressure to flow from the boiler through the pilot valve into chamber D of the main valve against piston 11, which being of greater area than valve 2, instantly closes the latter against its seat and prevents the flow of steam in either direction. Stop valve 2 having been closed, automatically or manually, will remain closed until the pressure in chamber D is relieved. A number of small pipes with plug cocks or quick-opening valves placed at accessible points may be branched from the pipe leading to the diaphragm chamber of the pilot valve and led to distant points in the plant, thereby providing means whereby the main steam valve may be instantly closed in case of accident or emergency from any part of the station by the turning of a plug cock. As will be seen from Figs. 1 and 2, the Foster valves are provided with dash-pot to prevent chattering or hammering.

The Bureau of Steam Engineering at Washington, D. C., recognizing the value of a device of this character, recommended its use in the United States Navy. Many of the recent additions to the navy and all of the torpedo boats and destroyers (with possibly one exception) are equipped with the Foster combination valve. The New York Edison Co. is now installing sixteen 10-in. valves of this construction, in addition to a number of 8-in. valves installed in 1901 and 1902.

The Foster Engineering Co. claims that many recent disastrous boiler explosions as well as scalding of attendants resulting from the blowing out of main headers and defective fittings could have been prevented had this device been installed.

THE RAMION AUTOMATIC ELECTRIC SELF-CLEANING SWITCH.

The electric switch illustrated herewith is the invention of P. J. Ramion, Syracuse, N. Y., and was recently given a test on the track of the Syracuse Rapid Transit Railway Co. The switch and a signal may be operated by the motorman while the car is in motion, or from a tower as desired. It will be observed that the switch consists of rails suitably curved, between which the point operates, and which are joined by a series of ribs. Beneath the switch is a sewer designed to catch the dirt, snow, ice or water which might otherwise interfere with the movement of the point.



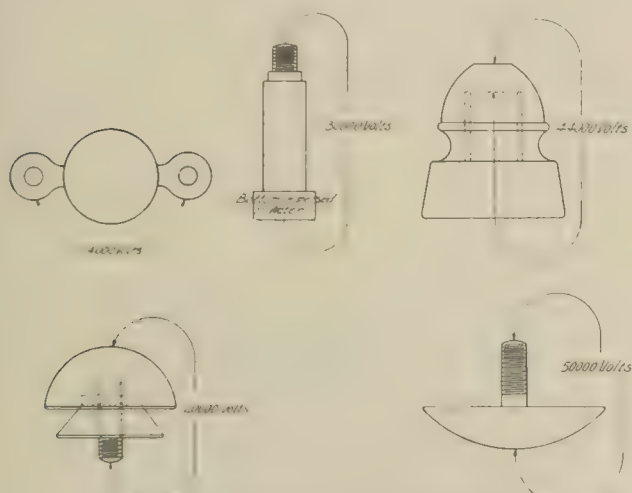
RAMION SELF-CLEANING SWITCH.

There is a small watertight compartment on the outside of the rail containing electric heaters for the purpose of melting snow or ice which, if allowed to accumulate, would interfere with the action of the switch. A signal system connected with the device is controlled by the switch point and is designed to inform the motorman of the position of the point before he reaches it, thus insuring safety. The principal features claimed by the inventor are: Economy of installation, independence of weather conditions, simplicity of construction and absolute certainty of the position of the switch point. A company has been organized to place the switch on the market.

December 20th there was a grade crossing accident in Weehawken, N. J., where three cars, breaking loose from a freight train, collided with a trolley car. Three passengers were fatally injured.

ELECTROSE INSULATION.

The increasing use of high potential currents in electric railway work has brought out a number of new forms of insulation to supply the demand for this class of work. One of the newer materials is known as "Electrose," and is made by the Electrose Manufacturing Co., 127 North 10th St., Brooklyn, N. Y. Electrose is a compound especially prepared to meet the requirements of electric railway light and power installations. It is a very hard, dense, tough and strong material of a uniform oak shade, and takes an ornamental polish and finish. The compound is easily molded into various forms in which it may be required, and requires no drilling or machine work for special shapes. The company is now prepared to furnish "Electrose" in all forms of overhead line fixtures, high potential insulators, sheets of various thicknesses and special forms and shapes. Its moisture and water proof qualities are claimed to be of the best, rendering it especially adaptable to all outside uses, especially where climate conditions are severe. Samples that have been under test by the resident engineer of the Niagara Falls Power



ELECTROSE INSULATORS.

Co. at Niagara Falls, N. Y., have shown remarkable insulating qualities, as set forth in the sketches reproduced herewith. These samples are regular stock, and the accuracy of the tests is vouched for by the engineering department of the Niagara Falls Power Co. In addition to the forms shown a sheet of "Electrose," 12 x 12 x 1 1/4 in. arced around at 80,000 volts and was not punctured. An 8-in. round column 1 1/2 in. in diameter arced around at 100,000 without puncture.

In addition to the tests made by the Niagara Falls Power Co., tests have been made by Prof. Samuel Sheldon, consulting electrical engineer, Polytechnic Institute, Brooklyn. In his report Professor Sheldon says: "On test on a 2-in. globe strain 'Electrose' insulator, the insulation cracked under tensile stress of 4,850 lb.; eye of bolt broke under tensile stress of 5,630 lb. On 2 1/2-in. globe strain insulator, eye broke out at 6,890 lb. The tensile strength was determined by pulling the samples apart by means of a standard Riehle 30,000-lb. testing machine. The insulation was not fractured in any case. On voltage tests, a 6-in. turn-buckle made of 'Electrose' insulation, arced between metals at 30,000 volts. A terminal strain insulator made of electrose insulation, with tensile stress limit of 8,240 lb., on voltage test arced between metals at 2,500 volts." Sample material of "Electrose" will be furnished on application.

At a meeting of the directors of the Lake Shore Electric Railway Co., of Cleveland, plans for the reorganization were arranged. A meeting of the stockholders has been called for February 12th to pass upon this.

December 29th the stockholders of the Indianapolis Street Railway Co. ratified the lease of the property of that company to the Indianapolis Traction & Terminal Co., the terms of which were given in the "Review" for December last.

CONSOLIDATION OF NEW YORK ROADS.

The Fonda, Johnstown & Gloversville Railroad Co., the Amsterdam Street Railroad Co. and the Cayadutta Electric Railroad Co. have been consolidated under the name of the Fonda, Johnstown & Gloversville Railroad Co. The capital is \$1,950,000, and the officers and directors are: J. L. Hees, of Fonda, president; Gustav Levor, of Gloversville, first vice-president; J. G. Ferris, of Johnstown, second vice-president; G. M. Place, of Gloversville, secretary and treasurer; S. H. Shotwell, Erastus Darling, Z. B. Whitney and A. J. Zimmer, of Gloversville; G. F. Moore, of Fonda; J. G. Younglove and James Stewart, of Johnstown; R. T. McKeever, of Houghton, Mich., and J. S. Friedman, of Albany; Chauncey M. Depew, of New York, and William Harris, of Northville.

NEW PLANT FOR THE ST. JOSEPH RAILWAY, LIGHT, HEAT & POWER CO.

Owing to the trouble which has been experienced this winter by the St. Joseph (Mo.) Railway, Light, Heat & Power Co. in procuring coal the company has decided hereafter to own its own coal cars and about \$25,000 will be expended in providing them. The plans of the company's new power house have been altered so that they now provide for the elevation of the tracks entering the house and leading to the boiler room, where a dumping platform will be located, from which the hopper cars are to be unloaded and the coal dropped into the fires directly in front of the boilers. The cars are to be of steel, 36 ft. long, 9 1/2 ft. wide and 4 ft. deep. They will have a capacity of 80,000 lb. each and will cost about \$1,000.

A NEW BUILDING MATERIAL.

The H. W. Johns-Manville Co. has just issued a booklet descriptive of a new preparation that is being put on the market to meet the needs of present-day architecture and building for non-inflammable material suitable for decorating the interior of buildings, serving as a substitute for wood in such work. This material is known as "Salamanderite," and is said to permit of all the decorative features which are possible with wood or tiling, and to be absolutely fire proof. It comprises fire and waterproof sheets or panels in various thicknesses from 1/8 in. to 1/2 in. finished on one side in fac simile wood as may be desired, and may be stamped in various forms, reproducing pictorial subjects or other designs. Moldings and trimmings of the same material are also furnished.

"CECO" MACHINERY IN CHICAGO.

The Christensen Engineering Co. has opened an office in the Merchants Loan & Trust Building, Chicago, for the sale of its "Ceco" electrical machinery. The manager of this office will be Mr. Chas. G. Burton who is well and favorably known in the electrical field through his previous connection for several years with the Central Electric Co., and later for three years with the Westinghouse Electric & Manufacturing Co. He left the latter company in the early part of 1902, to install a power and transmission system, resigning recently to accept his present position with the Christensen company.

PITTSBURG STREET RAILWAY SUPPLY HOUSE.

Gellatly & Co., with headquarters in the Times Bldg., Pittsburg, Pa., have for some time represented the Ohio Brass Co. in Pittsburg territory along with other manufacturers of electric railway and mining supplies. One of the agencies recently taken by this firm is that for the electrical department of the Christensen Engineering Co., of Milwaukee.

The South Side Rapid Transit Co., of Chicago, has announced the following schedule of wages effective January 1st: Conductor, 20 cents; guards, 18 cents; station agents and platform men, 16 cents per hour. This is an increase of from 5 to 10 per cent.

GOLD'S IMPROVED FOLDING GATE.

Edward F. Gold, of New York, has recently placed upon the market a combination of gate or door with locking device which is reported to have been most successful in operation, fully meeting the

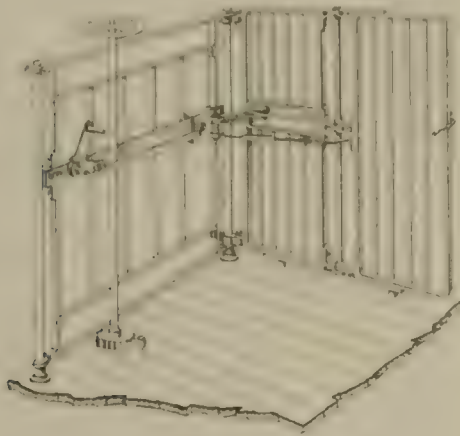


FIG. 1.

requirements of railway service. This type of gate is in use on the elevated roads in Brooklyn, where traffic is very heavy, and the advantage of the gates requiring a very small space for their opera-

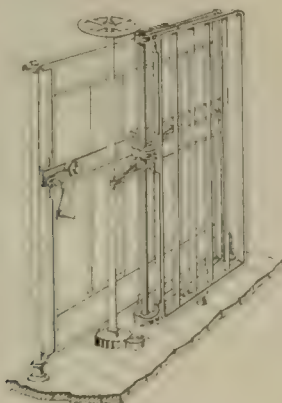


FIG. 2.

tion, is appreciated. Mr. Gold is the owner of the well-known Gold gate lock, extensively used on elevated, suburban and underground cars, where a solid gate has been adopted. The locking device on

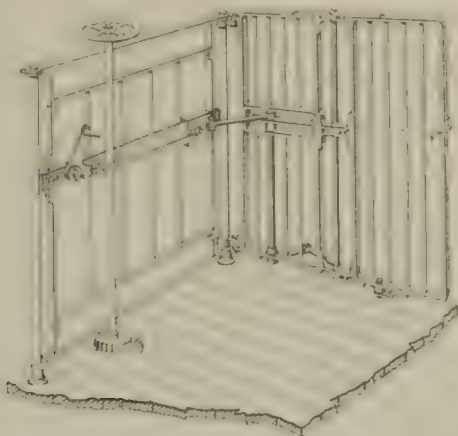


FIG. 3.

the improved gates, which are illustrated in the accompanying engravings, is the same as on the old types with the exception that the connecting rod between the slide and gate is made in several

forms for the purpose of operating folding gates, which obviously may be of different designs.

The double gate illustrated in Figs. 1 and 2 consists of two leaves hinged together, the primary leaf being hinged to a support on the car platform. The primary hinge is swung back by means of an arrangement of levers which is the same as has been for years applied to the solid type of gate. The secondary leaf in the design illustrated is operated by an additional link. Fig. 1 shows the gate open, and Fig. 2 the gate closed.

Other arrangements for manipulating the secondary leaf of the gate are lazy tongs placed either at the top or at the bottom.

Fig. 3 shows the arrangement of the lazy tongs at the bottom.

This new device is covered by very broad patents.

THE NOARK BRANCH BLOCK.

To meet the demand for inclosed-fuse branch blocks, the H. W. Johns-Manville Co., 100 William St., New York City, has introduced the "Noark" line, which presents features of merit appealing to constructing engineers and other users of such devices. The engraving herewith shows a 30-ampere 220-volt two-pole single branch block of this type, from which it will be seen that the makers have departed from the usual arrangement for branch block devices, in which the fuses for the branch circuits abut at right angles to the outside of the two or three parallel main wires. This construction requires a block of some size, owing to the fact that it is necessary to give space for the main wires and branch fuses separately. In the "Noark" branch blocks the object has been to economize space and



NOARK TWO-POLE SINGLE BRANCH BLOCK.

at the same time effect an arrangement of the wires and fuses which must be absolutely safe, both in the operation and manipulation of the device. To obtain this result, the branch fuses are so arranged that each of the terminals in which they are received and to which the branch wires are connected are separated from the adjoining terminals by heavy partition walls, high enough above the contacts to prevent anything being laid across from contact to contact and causing short circuiting. The main wires to which the branch block is connected, instead of passing across the block at the end of the branch fuses, are arranged to traverse it in suitable grooves placed in the porcelain block between the terminals of the branch fuses. In this way a great economy of space is effected, while at the same time the block can be easily and readily installed and the manipulation of the fuse devices for a removal or insertion is entirely safe.

Mr. C. J. Franklin, formerly of Brooklyn, N. Y., has been appointed superintendent of the Tacoma Railway & Power Co., Tacoma, Wash.

There was such a demand for funeral cars in St. Louis last month, owing to the cab drivers' strike, that the street car companies were unable to supply the requisite number of cars.

An effort is being made at St. Paul, Minn., to have an ordinance passed requiring the street car companies to establish an "owl-car" service by running at least one car an hour between midnight and 5 a. m. At present the last car leaves the center of the city at 1 a. m.

KANSAS CITY NOTES.

On the morning of December 22nd a car in the barns of the elevated road, Kansas City, Kan., was discovered to be on fire. Serious damage was prevented by the night foreman in charge who coupled onto the burning car with a motor car and removed it from the building.

On January 1st the gripmen and motormen of the Metropolitan Street Railway Co. were put on the same basis as regards wages, the rates for both classes now being 17, 18, 19 and 20 cents for the first, second, third and fifth years respectively.

Some time ago thermometers were placed in all Kansas City street cars. These have been removed, it being claimed that they by reason of the jarring of the cars, or some other cause, all registered from 10 to 20 degrees below the actual temperature.

On Christmas Day most of the conductors of the Kansas City lines were the recipients of from \$1 to \$2 from passengers who told them to "keep the change."

ELECTRO-MAGNETIC CONTROL FOR THE BROOKLYN ELEVATED.

The Brooklyn Elevated Railway Co. has recently ordered 210 Westinghouse multiple train control equipments which will be used to operate the electrically propelled trains on its lines. When the company, a few years ago, decided to discard steam locomotives and operate its trains electrically, an exhaustive test of the different methods of controlling electric trains was inaugurated. The company, therefore, had a number of trains equipped with the systems of the leading electrical manufacturers, and these trains were placed in regular operation on the road in its daily traffic. Careful records were kept of the number of miles run by each train, the number of accidents met with, cost and time required for repairs, the comparative convenience in operation and all other matters which might influence a decision between the different systems. These tests resulted in the placing of the present order and all steam locomotives now in use will be shortly replaced by the Westinghouse electro-magnetic system of train control. This system involves the use of compressed air for moving the controlling apparatus, electro-magnetic valves governing the admission of air to the controlling cylinders, and low voltage electric circuits running from car to car for controlling the action of the magnetic valves.

The special requirement for each motor car consists of two or four electric motors, a controller very similar to those used on ordinary street cars and one or two motormen's controlling switches from either of which all the car controllers on the train may be operated. One of the special features of this system is that the trolley circuit is isolated from the main power circuit and is therefore not affected by any momentary interruption of current due to ice or sleet on the third rail, or other causes.

The motor circuits on any car are automatically opened in case of excess current and they may all be simultaneously closed at the will of the motorman. All controllers are automatically turned off by the application of the automatic air brakes which greatly reduces the possibility of accidents. With this system the trains may be cut up into two or more smaller units, according to the fluctuations of the service.

The Brooklyn Elevated will equip all of its new cars with four motors each. The trains are made up of 5 or 6 cars, 2 or 3 of which are usually motor cars. When these trains reach the suburbs they are broken up into smaller units of one or two cars and the smaller trains branch off on different divisions. Any proportion of motor cars desired can be used in a train making it possible to obtain any desired amount of power for starting the trains quickly.

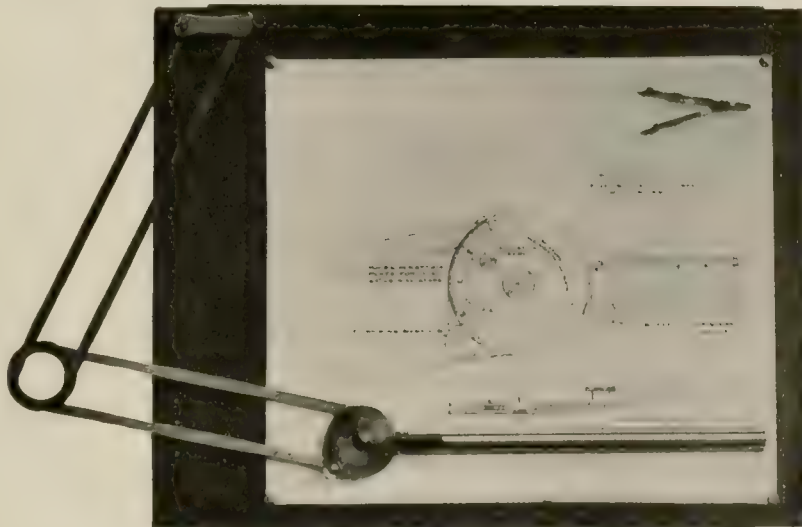
December 24th an express train on the line of the Union Traction Co. of Indiana collided with the president's private car, one of the motormen being fatally injured.

HUDSON RIVER TROLLEY TUNNEL.

The trolley tunnel which is being built by the New York & Jersey Railroad Co. under the Hudson River between Jersey City and New York City had reached its lowest point on January 1st. This is 102 ft. below the mean water level and only 12 ft. of mud separates the tunnel from the river bottom. Since the present company started operations, 240 ft. of the tunnel has been constructed. The company took up the work on the north tunnel only, and is building that one first and is working at present only from the Jersey side. Work on the second or south tunnel will be taken up after the completion of the present one. It is expected that the trolley cars will be crossing under the river between Jersey City and New York some time in 1904.

RAPID SKETCHING DEVICE.

The rapid sketching device illustrated herewith has been designed to obviate much of the annoyance and drudgery necessitated by the almost constant placing and replacing of the scale, T-square and triangles, in making sketches and small drawings. The device consists of a scale joined to a protractor which is anchored to the upper left-hand corner of the board by means of an arm made up of two pivoted parallelograms. The scale has a free motion of 90° between two stops, and it comes against either one or the other, depending upon whether a horizontal line or a vertical line is desired. These two stops are fastened to a protractor and may be turned to any angle with the horizontal or vertical, thus permitting



RAPID SKETCHING DEVICE.

the scale to come against a stop at the desired angle and also at right angles to it. The lower part of the protractor always lies in the same direction no matter where it is moved about the board, and hence when the protractor is once set at any desired angle the scale will give parallel lines anywhere on the drawing. This is accomplished by the two parallelograms which act similarly to a parallel ruler.

The protractor may be clamped at any angle by means of a thumb screw. A spring stop is provided for the 0, 30, 45, 60 and 90° angles, and is operated by merely raising it and allowing it to drop into the hole for the angle desired. A screw is provided for adjusting the right-angle stops. The general use of this device is exactly the same as one would use a scale without any attachment. Either a triangular or flat scale may be used. The scales chuck into place and may be turned so that any edge may be used. The triangular scale has the advantage of giving a larger variety of graduations on one piece, while the flat scale has the advantage of giving a better ruling edge.

It is claimed that there is a great saving in time by the use of the device, which is made by the Universal Drafting Machine Co., Blackstone Building, Cleveland, O.

LARGE ORDER FOR AIR BRAKES.

The Brooklyn Heights Railroad Co. has just closed a contract with the Christensen Engineering Co. for 200 Christensen No. 2 air compressors and other parts of air brake equipments for the elevated division of the company's road. The Brooklyn Heights company placed its first order for Christensen air brakes in the early part of 1898, when 12 equipments were ordered, the company at this time having been experimenting with various types of air brakes. At the time of giving this last order the Brooklyn Heights company had in service 130 Christensen equipments, the contract just awarded bringing the total up to 370. This order is particularly gratifying to the Christensen company, as it is considered substantial proof of the efficiency of its apparatus after actual service for nearly five years.

NEW CARS FOR GALVESTON.

The accompanying illustration shows one of the 20 closed cars which were recently built for the Galveston City Railway Co. by the St. Louis Car Co. The length of these cars over corner posts is 20 ft. 9 in., the length over all 30 ft. 6 in. and the width 7 ft. 10 in. The cars were built for city service exclusively and were provided



GALVESTON CAR. ST. LOUIS CAR CO.

with longitudinal rattan seats. The interiors are finished in cherry, and all the trimmings are nickel plate. The window sash are in two sections, the upper one being stationary, and the lower one drops in sockets. Pantasote curtains are used. The cars are vestibuled at both ends, the vestibule being provided with folding gates and they are mounted on St. Louis Car Co's. du Pont trucks, having a 7 ft. 6 in. wheel base.

HOPE WEBBING CO'S. ADDITION.

The Hope Webbing Co., of Providence, R. I., reports such an unprecedented era of activity that, in order to increase its facilities, it has had to erect a large addition to its mills at Woodlawn. The addition is of brick, mill construction, 223 x 84 ft., three stories and two basements. The basements can hardly be called such, however, as, viewed from the street at the rear, the addition is five stories high, owing to the grade of the land. The addition is connected with the two original mill buildings, each of which is 500 feet long, by arched passageways. By removing part of the apparatus into the addition room is made in the mills for 100 or more looms, bringing the total up to about 600. Two additional generators have been installed by the General Electric Co. and extra help is required in addition to the 650 hands previously employed. The Hope Webbing Co's. tapes and webbings have a world-wide renown. Just now the looms are turning out large quantities of electric tape, while the output of elastic webbings is a large factor, 48 looms being employed on this work alone.

The Danville (Ill.) Street Railway & Light Co. and the Danville Northern & Paxton Railroad Co. on the first of the year issued a 16-page pamphlet giving the routes and schedules of the railways and matter descriptive of the electric light and power and steam heating departments of the business.

DETROIT CAR BARNS BURNED.

December 30th the two-story car barn of the Detroit United Ry. on Jefferson Ave. was entirely destroyed by fire caused by an explosion of gasoline. The fire started in the paint shop on the second floor and spread rapidly. An alarm was at once sent in and several engines responded, but considerable delay was occasioned on account of the ice and snow. The fire spread with great rapidity and the building, together with about 24 open cars, was completely destroyed. There are three car barns located close together at this point and the firemen succeeded in confining the fire to the central barn in which it broke out. The loss is estimated at about \$60,000. During the fire traffic on the Jefferson Ave. line was completely at a standstill and it was several hours before the burned-down wires could be replaced and traffic resumed. Mr. Jere C. Hutchins, president, Mr. Brooks, general manager and Mr. Stanley, superintendent of the company were at the scene of the fire and succeeded in saving considerable of the rolling stock which was removed from the barn.

PROPOSED PENNSYLVANIA LEGISLATION.

The Pennsylvania legislature will be asked to amend the act giving elevated or underground railways the right of eminent domain and fixing the method of securing compensation for damages to property owners along their lines and put it on a more substantial legal footing. On account of the contemplated elevated railway in Pittsburgh the matter is considerably discussed in that city. The question at issue is whether any property owner whose property is not actually taken nor occupied can collect damages, no matter to what extent he is injured, inconvenienced or annoyed by the proximity of elevated lines. Lawyers fail to agree, some claiming the act is unconstitutional because compensation is not adequately secured to persons who may be damaged. The supreme court has decided cases against property owners where dangerous telegraph or telephone poles were planted on their sidewalks. A Philadelphian lost his case against the Pennsylvania Railroad Co., which company had practically barricaded his house to the third story in building the approach to the Broad St. station.

ORDER FOR PECKHAM TRUCKS.

The Peckham Manufacturing Co., of New York and Kingston, has received an order from the Brooklyn Rapid Transit Co. for 480 motor trucks of special M. C. B. construction. These will be used in elevated service in Brooklyn under cars fitted with the Westinghouse system of multiple unit control. The Peckham company on January 1st had orders in hand for 750 M. C. B. trucks in addition to its other work. The company reports an unusually large business in snow plows, having sold during the season 18 large Ruggles rotary plows.

FIRE HAZARD OF ELECTRICAL APPARATUS.

A fire occurred in the power house of the Helena Light & Traction Co., Helena, Montana, October 20th, which completely demolished the building and nearly all the machinery. The building contained an abandoned steam plant, power being purchased from the Missouri River Power Co., which transmits an 11,000-volt current over a double wire from Canyon Ferry, 18 miles distant. In the building were six 11,000-volt, 150-kw., oil insulated Westinghouse transformers, two of which were practically uninjured; the other four were upset by the burning away of the floor and poured out their oil. Two 100-h. p. induction motors were damaged only 50 per cent while six direct-current arc-light machines were totally destroyed. Three oil insulated Westinghouse potential regulators were practically uninjured while the switchboard was completely destroyed. The result of the fire demonstrates the practical immunity from injury by fire of oil-insulated transformers in cases.

STREET RAILWAY REVIEW

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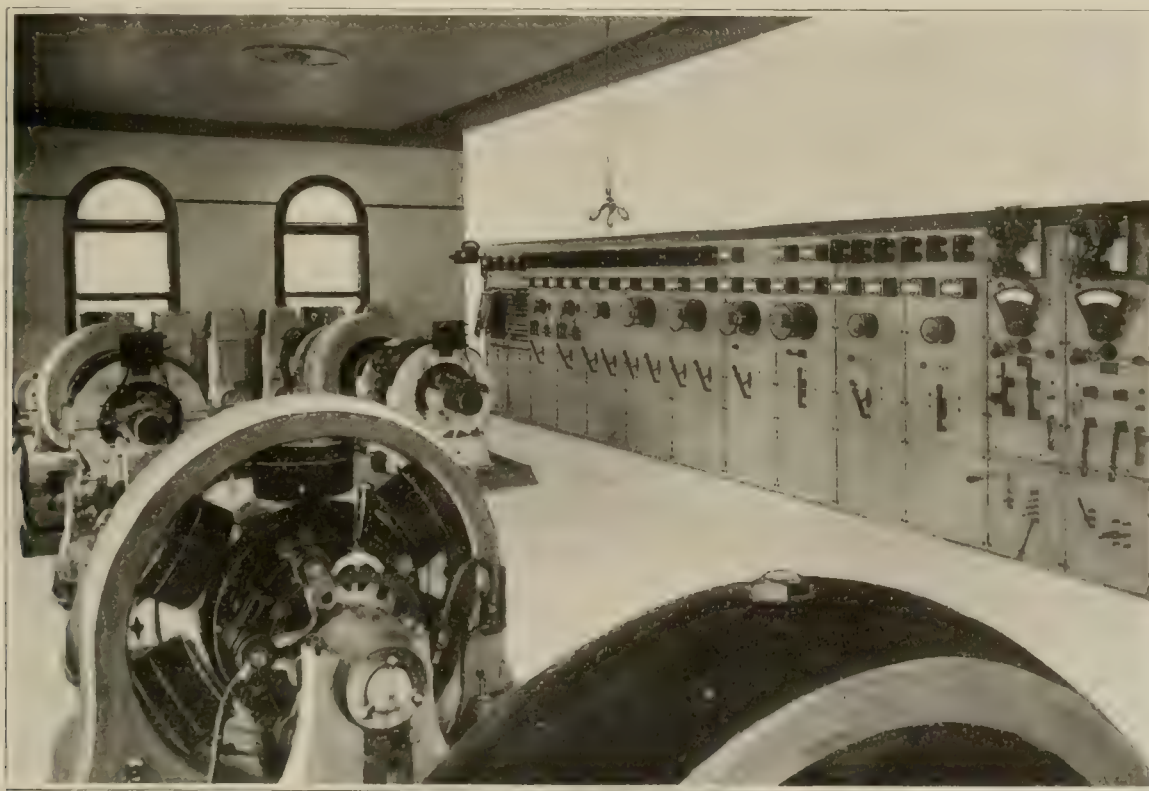
Columbia Electric Street Railway, Light & Power Co., of Columbia, S. C.

Roadbed and Overhead Construction—3,300-Volt Power Distribution—Sub-Station Equipment—Car Equipment—Car Barn—Parks—Operating Features—Personnel.

It has been said appropriately that within the past decade a new monarchy has sprung up within the confines of the little state of South Carolina, and of this monarchy Cotton is King; and it is in the bustling little city of Columbia that King Cotton holds his court. It is hard for the average northerner, and especially for a son of New England, to realize that this is anything more than fairy-land talk, told to children to lull them to sleep. If he gives the statement any credit at all, he dismisses the whole subject by concluding

it were, and King Cotton is supreme. At the present time, power for operating the electric railway system of the city and current for the lighting system as well as current for power motors, is taken from the power plant of the Olympia Cotton Mill and from the plant of the Columbia Water Power Co.

Geographically, Columbia stands approximately in the center of the state of South Carolina, whose boundary lines form an irregular triangle with one of the angles pointing directly south. Within the



INTERIOR OF SUBSTATION COLUMBIA ELECTRIC STREET RAILWAY, LIGHT & POWER CO.

that the state of South Carolina raises considerable cotton, and that Columbia is merely a prominent shipping port for the raw material on its way to the mills of New England to be made up into finished products. It will take an actual personal tour of inspection into this locality to convince the doubting one that in and about the city of Columbia, S. C., have been established within seven years a group of cotton mills and villages, exceeding in point of output, engineering design and economical operation any group of mills in New England, or in old England for that matter, and that included in this system of southern mills is the finest and largest cotton mills under one roof in all the world.

Though this is not an article on the cotton industry of the South, in order to know and understand the street railway situation in the city of Columbia, it must be borne in mind that Columbia lives by cotton; the commercial atmosphere is saturated with cotton and

city limits proper and including mill villages which have grown up contiguous to Columbia, but in all respects should be identified with the city itself, the population served by the electric railway system of Columbia will approximate close to 40,000. For instance, in the villages of the Olympia, Granby and Richland mills, all operated by one company, there are fully 10,000 inhabitants. And this little city has all come into being within the past seven years. The mill towns as well as the mill properties are owned by the W. B. Smith-Whaley syndicate, which also controls the Columbia Electric Street Railway, Light & Power Co. These mill towns are equal to anything of like nature to be found in the country, and in their way are models of philanthropic ideas. The cottages for employees are well built detached dwellings, each with its individual architectural design, and each town has its electric lighting system, complete sewerage, water works, fire department, school houses, churches

and hospitals, for all of which privileges the mill hands pay the modest stipend of \$1 per room per month rent, a six room house for instance renting for \$6 a month. There are no other taxes or assessments.

There are of course other activities and lines of industry in and about Columbia beside the manufacturing of cotton goods, and these are all on the increase. Incident to the prosperity of Columbia, and one potent cause of it, is the remarkable supply of water power available, and under the plans now being carried out, the utilization



SUBSTATION AND GENERAL OFFICES.

of available water heads will give the city abundance of electric power at rates sufficiently low to assure unprecedented growth and development.

The Columbia Electric Street Railway, Light & Power Co. was organized Jan. 6, 1892, by the consolidation of the Columbia Electric & Suburban Railway Co. and the Congaree Gas & Electric Co., under an act of the South Carolina Legislature approved Dec. 16, 1891. By the consolidation, the company obtained the very valuable franchises of the two companies mentioned. On Sept. 1, 1890, the

Waverly and on to Shandon. Both of these suburbs are rapidly growing, and the company now enjoys a good travel over all of these lines.

ROADBED AND OVERHEAD CONSTRUCTION.

The company owns 10½ miles of single track, 1¼ miles of double track and about ½ mile of turnouts, making a total of about 14 miles of single track, covering the entire city. All of the road has been completely rebuilt during the past three years, new material being used throughout with the exception of six miles of rail which was found to be in first class condition. The track is built of 48-lb. T-rail, with Weber rail joints and "Columbia" bonds. The ties used are heart pine, 7 x 9 in. x 7½ ft. The overhead construction is entirely new and has been built in the most thorough manner. The railway poles are octagon in section, 14 in. at the butt and 9 in. at the top, 30 ft. long, thoroughly creosoted at the base and painted above ground. The overhead work on single track is Ohio Brass bracket construction and on double track is span construction. In setting poles each pole was braced laterally by two 4 x 4-in. timbers, 2 ft. long, one placed on one side of the pole at the butt, and the other placed below the surface on the opposite side. All of the special work, consisting of curves, cross-overs, switches and turn-outs, is new and conveniently arranged. The roadbed, track and overhead lines are new and in excellent condition.

POWER.

The company controls by lease from the state of South Carolina for a period of 30 years from Dec. 6, 1892, 500 h. p. of water power on the banks of the Columbia Canal. This property is within the corporate limits of the city of Columbia, and within one mile of the business center of the city. This plant at present is not in use. It contains, however, granite foundations for the water wheels built in the most substantial manner.

In the spring of 1900 it was decided to rebuild entirely all of the street railway track and overhead lines, and also all of the lighting lines both arc and incandescent. It was further decided to accept a proposition made by the Olympia Cotton Mills for furnishing current. On account of this decision the water power plant on the Canal was not improved with the rest of the property, as it was



CAR BARN. COLUMBIA ELECTRIC STREET RAILWAY, LIGHT & POWER CO.

stock of the Columbia Electric Street Railway, Light & Power Co. was purchased by Mr. W. B. Smith-Whaley and his associates, and reorganized, acquiring the property and franchises of the Columbia & Eau Claire Electric Railway Co.

The railway now occupies all the principal streets of the city, and reaches every railroad depot, both freight and passenger. It extends two miles in a northerly direction to Hyatt park. The country along this line during the past two years has been rapidly built up, and the growth in this direction continues to such an extent that it is probable the line will have to be extended within the next year. In an easterly direction the railway runs through the suburb of

thought to be to the company's interest to accept the proposition of the Olympia Cotton Mills.

The power plant at the Olympia Mills consists of three McIntosh & Seymour engines, each of a normal rating of 1,600 h. p., capable of developing a maximum of 2,000 h. p. These engines are of the vertical cross compound condensing type with cylinders 20 x 48 in. in diameter and a stroke of 42 in. The cylinders are steam jacketed and a reheating receiver is placed between them. Each of these engines is direct connected to a General Electric alternating current generator rated at 1,300 kw., with 36 poles operated at 133 r. p. m., and delivering 40 cycle alternating current at 600 volts. The switch-

board for controlling the various separate circuits to the Columbia Electric Street Railway, Light & Power Co. and to the Granby, Richland and other mills, is 57 ft. 4 in. long, divided into 21 panels. Current for the Columbia company is first stepped up to 3,300 volts for transmission to the single sub-station two miles distant, in which station this current is transformed and converted for the various lighting, motor and electric railway circuits, all of which center on a single switch-board located in the main room of the sub-station. The transmission line from the Olympia mills to the sub-station is two miles long, and consists of six No. 2 wires, the line being equipped with all modern safety devices and accessories. The sub-station building, which also includes the general office of the company, is located at the corner of Washington and Assembly Sts., very near the center of the city of Columbia and incidentally very near the geographical center of the state of South Carolina. The building is two stories in height and is built of brick with terra cotta trimmings. The upper floor contains the general offices and sub-station apparatus; the lower floor the store rooms and testing rooms. The building is thoroughly fire-proofed with iron framing and floors of concrete with mosaic filling. All wires and connections to and from the switch-board are carried under the floor.

From the sub-station four distinct lines of current are sent out, all of these being conversions or transformations of the 3,300-volt, three-phase, 40-cycle alternating current which is delivered at the sub-station from the transmission line.

The four circuits are as follows:

For street railway purposes the current of reception is first stepped down by static transformers to 340 volts; thence the current passes through rotary converters which change the 340-volt, three-phase alternating, to 550-volt direct current for use in all street railway motors.

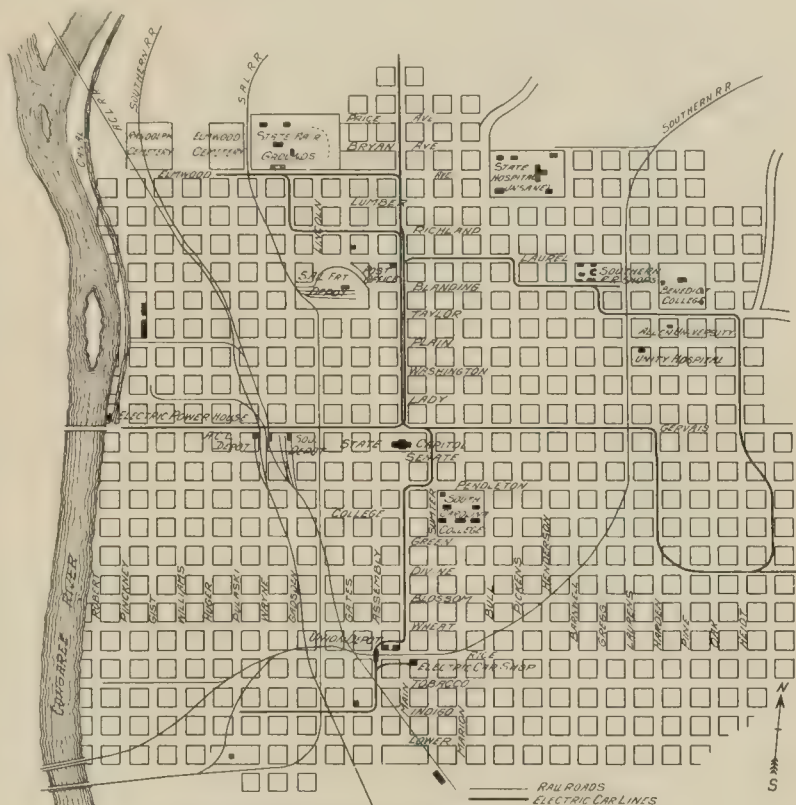
For incandescent, multiple arc lighting and motors up to 1 h. p. the current of reception is "split" into two single-phase currents of the same initial voltage, and carried direct to customers' premises and there transformed in static transformers. In sections where load is not scattered these transformers are interconnected on a secondary three-wire net work at 230-115 volts. In sparsely settled districts house to house transformers are used with 115-volt secondaries.

For the motor circuit for motors over 1 h. p. the current of reception is not changed but is run direct to customers' premises where are placed static transformers delta connected for 550-volt, three-phase secondary to the motor.

For series arc lighting the current of reception is used without transformation in synchronous motors direct connected to Brush multi-circuit arc machines located at the sub-station and giving 5-ampere, 10,000-volt direct current.

Six 75-kw. airblast transformers which receive the 3,300-volt alternating current at the primary terminals and deliver at the secondary terminals 340-volt alternating current.

For electric railway work there are two 200-kw. rotary converters which take the 340-volt alternating current from the transformers and deliver 550-volt direct or continuous current to the electric railway circuit.



MAP OF COLUMBIA, S. C., STREET RAILWAYS.

For the series arc lighting there are four motor-driven Brush generators with a capacity for each generator of about 118 series arc lamps. These machines are arranged in two sets, each being driven by a 200-h. p. three-phase synchronous motor using the 3,300-volt current. Each pair of machines is mounted with the driving motor between the two generators with flexible coupling, permitting either machine or both to be operated as desired. The machines are excited by two exciter sets, each comprising a 2½-kw. 125-volt generator, driven by a 7.5-h. p. 350-volt induction motor.

The lighting system extends to all parts of the city. The company has a five-year contract with the city of Columbia to furnish 200 arc lights; also contracts with the various railroads entering the city for about 30 series arc lights. These arc lamps are of the enclosed pattern. The incandescent lines cover both the city and the suburbs thoroughly, and contain 36.2 miles of single wire, Nos. 6 and 8. At present, the company has about 11,000 incandescent lights cut in for service. All of these lamps are on the meter system. The number of incandescent lamps is steadily increasing. Both the incandescent and arc lighting systems have been constructed with the utmost care and in the most thorough and approved manner.

The motor circuit, for driving small motors, consists of 6.7 miles of single wire, No. 8. This circuit is being used more and more in the various industries of the city for driving motors in establishments like printing plants, small manufacturing plants, planing mills, in groceries for running coffee mills, in meat markets for chopping meat, in drug stores, in confectionery stores for freezing ice cream, in jewelry stores for running small tools, etc. This business, which is one that affords a good profit, has been worked up by the management, and is now a considerable source of revenue to the company.

The switchboard comprises the following: Main output meter panel; two main street railway panels for current going to each



STANDARD DOUBLE TRUCK CAR.

With the exception of the railway apparatus, which is standard design, the sub-station equipment was developed by Mr. W. B. Smith Whaley, president of the company, assisted by Mr. E. F. Lilly, electrician, and the engineers of the General Electric Co., and the installation was made up especially for this company by the General Electric Co.

The sub-station apparatus for supplying the various circuits comprises the following:

converter, two double truck railway regulator panels, four feeder panels, one panel for incandescent lighting circuit, one panel for



STANDARD CLOSED CAR

motor circuit, and four panels for arc lighting circuit, or two for each set.

CAR EQUIPMENT.

The car equipment of the company consists of four double truck 15-bench open cars built by the Laconia Car Co., mounted on La-

Peckham trucks, with two G. E. 1,000 motors to each car. The company has three construction or working cars, and one platform car around which a railing is built, and which is used for trolley parties. All cars are equipped with Christensen air brakes; Syracuse headlights; Wood folding gates; Wilson trolley catchers, and Ridlon fenders. The equipment, machines and material used on the entire system have been standardized and are of the best quality obtainable.

CAR BARN.

The car barn is situated at the corner of Main and Rice Sts., Columbia. It is a two-story brick building of mill construction, and has a storage capacity of about 45 cars. The lower story contains storage tracks, store room, carpenter and paint shops. The upper floor is used entirely for the storage of cars. The barn is of the most improved construction and is very complete in all of its equipments.

PARKS.

Hyatt Park, owned by the company, is located about two miles from the city limits. It contains about 15 acres of land upon which have been built an auditorium and theater, and also a rustic or open-air theater. The grounds of the park have all been carefully laid out with terraces and flower beds. It is attractively lighted with electric lights. During the summer months vaudeville entertainments are carried on at the park, and during the last two summers the park has been a very popular resort.

The park contains one of the finest collections of animals to be found in the South, many rare specimens having been secured through the efforts of Mr. Clark and other officers of the company.



VIEWS IN HYATT PARK, COLUMBIA, S. C.

conia trucks and fitted with G. E. 1,000 motors; 12 single truck 10-bench open cars built by the Laconia Car Co., mounted on Peckham trucks, with two G. E. 1,000 motors to each car; ten 30-ft. single truck closed cars built by the Laconia Car Co. and mounted on

A charge of 5 cents is made to all visitors who enter the special enclosure devoted to the menagerie. A portion of the park is given over to the horticultural gardens, and the company employs an expert gardener to take care of this feature of the park. Many rare

and beautiful plants are to be found here, the display of roses being exceptionally fine and including over 160 distinct varieties of the rose family.

Another unique feature of Hyatt Park is the elevated tank for supplying water to all parts of the grounds. This tank is a necessity, and ordinarily would be apt to mar the beauty of the place. But instead of permitting this elevated tank to become an eyesore, the management has changed it into one of the most attractive features of the place by arranging around the sides of the tank and the tower which supports it about 1,500 incandescent bulbs of various colors and tints, and when these are all lighted at night, they make a display at once unique and striking. The reflection from the tower can be seen from a long distance, and thus serves as something in the nature of an advertisement for the park. This arrangement is also useful as well as ornamental, inasmuch as the lights at this elevation flood the whole park with a soft illumination which adds to the charm of the place.

The tank is supplied with water from a nearby spring by means of a small pump operated by a direct current motor, taking current from the trolley circuit. In addition to the water taken from the tank for drinking, washing and irrigation purposes, a pipe is led from the tank and feeds a small fountain located near the entrance of the park, thus gaining another attraction that is especially appreciated by the children.

The company also owns one acre at Shandon, on which is built a dancing pavilion. During the summer months this is also a popular place in the evenings.

OPERATING FEATURES.

In the running of cars there is one fundamental rule on which special emphasis is laid and to which the attention of every employe on the system is continually directed, that rule being that the prescribed schedules must be adhered to, and it is the pride of the management that the citizens of the city are practically always safe in regulating their watches by the passing of cars, and if a car is scheduled to be at a certain corner at a certain moment, the chances are all in favor of that car being at the designated point at the time specified. Care is used in arranging the schedules, so that nothing unreasonable is asked of the men, but if a car fails to keep up to its schedule to the very minute, a satisfactory reason must be given for the delay. All motormen and conductors are required to carry reliable watches which must be inspected and regulated by a designated local watchmaker every month. To this end the company has made arrangements with the watchmaker for supplying the men with good watches at a reasonable price, and also for inspecting and regulating the timepieces.

For announcing the schedules to the public, a large display board is mounted at the central depot somewhat similar to the board described in the "Review" for last month, page 10. The board has in the center a large clock which is regulated by the Western Union Telegraph Co. Around the edges of the board are advertising spaces which are sold to the local merchants.

The conductors and motormen work 10 hours a day, their work being arranged so that the day's work is performed within 12 consecutive hours. The schedules are shifted each day, so that one set of men have the early runs one day and the late runs the following day, and vice versa. It is worthy of mention that the men are not paid on the hour basis but strictly on the car mileage basis, and in connection with this it should be stated that all the accounts of the company are kept on a car mileage basis throughout, so that it is possible to keep very close comparative records of passengers carried, car receipts, cost of operation, cost of management, cost of repairs, cost of fuel, etc., as every separate item, including as just mentioned cost of labor, is reduced to a per car mile basis.

The company's instruction book was compiled by Mr. Clark, general manager, and contains a number of features that are entirely original. The book is intended not only as a book of rules and regulations, the idea being to make it a book of instructions as well. After every subject in which the conductors and motormen are interested, are given first the rules and regulations which the employes are required to observe, and then follows a set of special instructions which explain the subject fully and give the reason for the preceding rules. This principle of instructing or educating the employes has been found very satisfactory and is worthy of emulation.

A few extracts from the book are here given as being especially good, and illustrating the way in which care is taken not only to

tell the employes what to do and what not to do, but also telling them the reason for the rule.

Rule 15. Ordinarily in stopping the car, always release the brake somewhat, just before the car comes to a dead stop. Do not let the brake fly, or kick the brake-dog off, for if you do the armature will take up the lost motion in the gears, and when starting again it will be with a jerk. This is unpleasant to passengers and hard on both motors and gears.

Rule 22. If car won't start on dry or dirty rail, put controller arm on first or second notch and rock the car. If this fails to accomplish the purpose, have conductor take a piece of wire or switch stick and rub one end of it against the rear tread of the wheel, while the other end is pressed against the rail. In case an insulated wire is used, break contact at the wheel first, keeping the other end against the track, else a shock will be received.

Rule 25. In case current is shut off at station for any reason while car is running, bring controller to "off" position immediately. Then turn on light current and wait until lamps light up; when they have reached their usual brilliancy, but not before, start the car. The reason for this precaution is that, should you turn the controller far enough to start the car before the full current was on, there would be a little or no counter-electromotive force generated to keep back the rush of current when it did come, and your armature might be injured either by heat or by the sudden jerk that would result. In starting after interruption of current, all with even numbers start immediately; others must wait for a minute or two.

Rule 36. The proper handling of a car on a curve is perhaps the most difficult task that the new motorman has to learn. A good rule is the following: In approaching a curve, cut off your controller and bring the car down to a slow speed before entering, and have your brake in hand, but free, unless it be down grade. This will let the car run into the curve easily and without shock. As soon as you feel that the car is fairly on the curve, apply sufficient current to carry the car around the curve at about the same rate of speed, cutting it off again just before leaving the curve. This will allow the car to swing out with the least possible shock. Always bear in mind that anything that causes the car to jerk is wrong.

PERSONNEL.

The officers and operating staff of the Columbia Electric Street Railway, Light & Power Co. are as follows: President, W. B. Smith-Whaley; vice-president, W. A. Clark; treasurer and general manager, E. B. Clark; secretary, W. H. Lyles; superintendent of transportation, A. Wallace; electrician, E. F. Lilly; master mechanic, C. D. Boling.

Both Mr. Smith-Whaley and Mr. W. A. Clark are South Carolina men. Mr. Smith-Whaley is a Charlestonian, and Mr. Clark was born on James Island, near Charleston, where his family for generations were engaged in growing the famous Sea Island cotton. Mr. Smith-Whaley early in life went to Columbia with the firm belief that that city had a great future as a center of cotton manufacturing. He formed a partnership with Mr. Gasden E. Shand under the firm name of W. B. Smith-Whaley & Co., and at once opened offices as designing cotton mill engineers. Mr. Smith-Whaley soon took up a broader field of activity and in 1894-5 succeeded in organizing the Richland Mills Co. This mill was followed by the Granby Mills and numerous others, the largest of which is the Olympia Cotton Mills, said to be the largest establishment for the manufacture of finished cotton products in the United States.

Mr. E. B. Clark is also a commanding figure in the group of men whose energy and keen business foresight has resulted in the remarkable development of the territory in and about the city of Columbia. He is interested in several important financial and commercial interests, and the development of the various activities of the Columbia Electric Street Railway, Light & Power Co. has been very largely due to his energetic and efficient management.



E. B. CLARK.



SECTION OF TYPICAL RIGHT OF WAY MAP.

THE RIGHT OF WAY MAP.

BY JOHN B. WARREN, C. E.

In view of the renewed activity in the railroad world, especially in the projection and construction of new lines, a few words in regard to the scope and character of the right of way map will be of interest.

Every engineer has his own ideas as to the proper construction and form of the map, but in the main these are matters of detail only. The map is the record of months of hard and painstaking labor on the part of every one connected with the construction engineer's office, from the chief to the chainmen. Weeks and sometimes months are spent before the map is actually begun in its final shape, but it is first outlined, perhaps, in some real estate office.

When a few men sit down with a map and say "We will build a road from A to B," the foundation is laid for a map that may be years in the making. It is an interesting thing to watch the growth of a railroad, from its conception, as illustrated, to its completion and operation. The process is the same in all cases. Beginning with a small map and a pencil line connecting a few towns, it grows by degrees from a small and easily lost or mislaid piece of paper, hardly worth the trouble of looking after, to a voluminous record that represents thousands of dollars and many a weary day's work and the needing of expensive cases and index systems for its preservation.

The map starts with a pencil line drawn on, we will say, a pocket map, through a few towns that are without railroad facilities, or are considered large enough to support another road, then a larger map is obtained, and possibly a trip taken over the proposed route, and the route is moved slightly, as other vantage points are discovered. Then comes the investigation of terminal and other facilities, and maps on a larger scale are called for, and possibly county records and maps are consulted. Finally a route is decided upon and the first party is put in the field and a preliminary line is run and platted. Now something tangible can be seen, or in other words, "something is doing," but our map even now shows only a line across sections and townships. More discussion in the office and examination of the accompanying profile. "We must hit that hill, so as to get material to fill that low place." "We must clear that piece of property, as it costs too much." More line running and platting of notes, and more discussion. Finally the preliminaries are all disposed of and the location decided upon, and the locating parties put in the field. Now the work on the right of way map begins in earnest, and soon the skeleton furnished by the first line, roughly drawn on the pocket map, is being filled in and the map begins to take form.

The chief engineer follows the work of the locating parties and studies the ground carefully. The builders of the road have determined roughly the width of right of way necessary. The chief engineer must keep to this as closely as may be, and he studies the problems of cuts and fills, not only as concerning construction, but with due regard to operation. Grade and curve limits must be respected and deep cuts taken out wide to minimize the effects of snow. All these help to determine the width of right of way needed.

As fast as the information is recorded the right of way is laid on the map and the right of way man is put to work. His is no easy task, and he earns his money. With the patience of Job he labors with an old farmer of the old school, who can see nothing but the ruin of his farm and the destruction of his stock by the road. He is "agin" all corporations that apparently give him no adequate return. He sees some favorite animal ruthlessly slaughtered, or, in imagination is kept awake by the rumble and roar of the trains, and cannot see why, for the life of him, the road had to choose that particular route and seems to consider it a piece of spite work on the part of the originators of the project.

The work of the right of way men causes some changes on the map. John Smith leases a strip across the corner of his farm, and is cut off from an acre or two. Question, is it cheaper to buy the corner or furnish friend Smith with a crossing? The land is not cheaper, perhaps, but the crossing may prove costly to the operation of the road, so the triangle is purchased, and the fact noted

on the map. In another place a heavy bank must be built and there is no available hill to furnish the material. It is then necessary to buy a slice of Jones' farm and set it up on edge. All this goes on the map, which is beginning to grow and demand attention, but as yet it is still in its infancy and must undergo many changes before it shows what has been accomplished.

Finally all the right of way is secured, and the map, as it now stands, might be considered finished. It shows, however, but a part of the information that should be recorded. It now has but the width of right of way shown in addition to the location. The names of the owners of the land appear on it, and the intersection with property and section lines are noted.

So far we have shown simply the real estate acquired, together with the various corporation lines. From the map as it now stands, a smaller map may be constructed for record at the county seat, giving only such information as may be necessary to enable a surveyor to accurately locate the line on the ground. More than this is unnecessary, and is a useless expenditure of money, as the cost of recording depends upon the time spent transferring the map to the recorder's plat book.

During construction, the right of way map may be used to show progress of track laying as the profile shows the progress of the earthwork.

Beginning at points convenient to railroads already in operation, and from which the work may be pushed advantageously, yards are established for receiving and storing material. These are shown, together with the sidings and connections with other railroads and as track work is done it may be noted from day to day, or at other stated times, as may be decided upon, and the progress of the work may thus be seen at a glance.

As usually laid out a railroad is divided into sections of approximately a mile in length, and from six to ten miles are assigned to a resident engineer. For convenience, the map may be made in sections corresponding to such residencies. In this shape the map is easier to handle and time is saved when a certain section is consulted.

For office use in general, it is most convenient to have a copy of the map in short sections, from two to three feet in length, and bound at one end. The map then lies flat and any particular section may be turned to easily. This is easily done when the map is blue printed and will be found preferable to the long roll, especially when deskroom is limited.

The utility of the right of way map to the engineer is generally understood; it is the property of the engineering department and the preservation of the original falls upon that department also. Copies of it, either tracings or blue prints are used in other departments, and information useful to them may with propriety be recorded on the original. In connection with the right of way, as noted above, the names of the different owners, together with the length and width of right of way, and acreage should be noted on the respective properties and also the dimensions and acreage of land acquired outside of the right of way. Also, the location of farm crossings, cattle passes, culverts, bridges, etc., should be noted, and information in regard to waterways that may not be clearly shown on the profile might also be put on the map.

All departments have occasion to consult the map at various times. Next to the engineering department comes what may be termed the real estate or land department. The map is in constant use by the various employes of this department, and a little of the draftsman's time spent on the map while the notes are "warm" will save hours and perhaps days in this department. Even in a comparatively small system, where there are no outlying lands to market, information that is of no apparent value to the engineers save as statistics will save many a weary hour of research. Especially is this true when it becomes necessary to make returns to the assessors of the various counties. The law requires not only a list of the various parcels of land held by the company or its trustees, but also a detailed list of the tracks and sidings, station buildings, platforms, yard, shops, etc., and information of this character may be shown on the map, making it available at a glance. These lists have to be turned in at a specified time, and the lists can be checked and changes noted in a comparatively short time, when the data are presented to the eye graphically.

Another item that may appear on the map is the location of the road in the various school districts, and the length and width or widths of the right of way, length of double and single track, sidings, etc.; all that is essentially railroad property, and used for strictly railroad purposes, should be noted.

For example, referring to the map shown, we will consider that portion lying between the two highways as entirely within one school district. For the convenience of those checking the school tax-lists we would make the following note:

School District No. 10.

| | | |
|------------------------|-------------------------|------------|
| Right of way | | |
| across parts of secs. | | |
| 1 S. and 9. 1wp. 38 N. | 5103' x 100 | 11.02 acs. |
| R 9 E 3d P. M | | |
| Yards | | 2.12 acs. |
| | | 14.04 acs. |
| | Title in A. B. C. R. R. | |
| Double track | 5,000 ft. | |
| Side track | 2,350 " | |
| Yard tracks | 1,500 " | |

Were there any parcels of land owned by the company, but not used for railroad purposes, we would note them under the above as follows:

| | |
|-------|--------------------|
| Lands | |
| 1 | 4.32 acs. |
| 1 | 1.07 acs. |
| | 5.39 acs. |
| | Title in B. Blank, |
| | Trustee. |

This gives at a glance, in addition to the information shown on the specimen, data that would require considerable time for one not familiar with scales and note books, to secure.

Now, for all practical purposes, our map is complete. The next thing in order is to preserve it in such form that we may readily find the portion we wish to consult. We will all admit that drawings filed flat, are much handier to use, and require less space than those in rolls. In the case of right of way maps, however, this is impracticable. I have suggested making right of way maps in sections for convenience in handling. This is also an advantage when it comes to filing them, as each section can be indexed separately and its number used as a guide to all drawings of structures or track details within its limits. I will not attempt to give a complete system of indexing for I have not worked one out to my satisfaction. I believe that something of the kind will be worked out finally, that will give satisfaction. The card index, in one of its various forms, is without doubt the most satisfactory and elastic that has been devised. As for filing the maps themselves, I am in favor of using cardboard tubes and a system of pigeon holes with the number of the drawing and its title, condensed, on the cover. This protects the drawings and at the same time makes it easy to find, as it is not necessary to handle a number of drawings to find the one wanted. Time in the modern office is money, and the simplest method, easy of access and of comprehension, is always the best.

EXTENSION OF FUNERAL CAR SERVICE AT DETROIT.

For several years the Detroit United Ry. has been giving a funeral car service to cemeteries located on its city and suburban lines. Inasmuch as the car assigned to this service was a short, single truck car, some difficulty was experienced in operating it over the suburban and interurban tracks, and as the number of calls for the car to go out to the suburban cemeteries has constantly increased, the company recently built a new double truck car intended exclusively for funeral purposes and suitable for city, suburban or interurban service. The car went into service Nov. 12, 1902, and Mr. John H. Fry, assistant general passenger agent for the Detroit companies, writes us that it is in use on an average of four days a week. Frequently applications for the use of the car are received from two different parties for the same day.

The funeral car is 50 ft. in length over all. The interior is divided into two parts, the forward compartment being for the reception of the casket; the rear compartment is for the accommodation of the funeral party.

The forward or casket compartment has a door on each side which drops down from the outside of the car to receive the casket which is put in sidewise, there being small steel rollers sunk in the floor to facilitate the movement. The other portion of the car is fitted up with cross seats and center aisle. This arrangement is

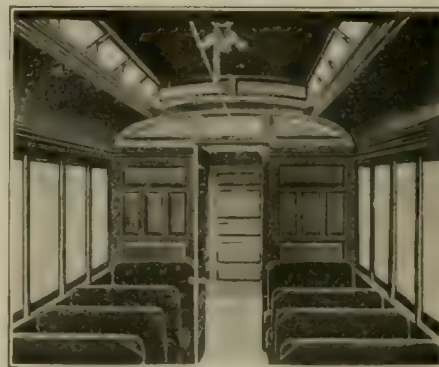


EXTERIOR VIEW OF FUNERAL CAR AT DETROIT, SHOWING OPENING FOR RECEIVING CASKET.

somewhat similar to the funeral car used at Baltimore and described in the "Review" for Dec. 15, 1900, page 703.

The seats are upholstered in green plush and will accommodate comfortably 34 persons. The interior is finished in cherry. The ceiling and panels are pale green with gold borders and stenciling and the windows are plate glass. There are three clusters of incandescent lamps in the ceiling. Push buttons are provided at each seat and at all other parts of the car where necessary. The exterior is painted a deep black, ornamented with gold stripes. The car is equipped with four 50-h. p. steel motors.

The rate charged for the funeral car for round trip service to cemeteries reached by the city lines is \$15. For round trip service



INTERIOR OF CAR, SHOWING SEATING COMPARTMENT IN FOREGROUND AND CASKET ROOM IN BACKGROUND.

to cemeteries in the immediate suburbs of Detroit, the charge is \$20. For round trips to points on the interurban lines the charge varies from \$25 to \$60, according to distance.

When the car was placed in service the company issued a circular giving a full description of it, and quoting the rates for city and interurban service. This circular was sent to all undertakers in the city and also to towns located on the interurban lines. The system meets with the hearty approbation of the undertakers and is popular with the public. The car was designed and built under the supervision of Mr. Thomas Farmer, master mechanic.

Americans have secured a franchise which calls for the construction of 275 miles of electric road connecting Lille with Roubaix and Tourcoing, in the French coal region. The estimated cost of construction is \$7,000,000. The power plant will be built in the vicinity of the coal mines. John Hayes Hammond and Henry A. Buttent, of San Francisco, are prominently interested.

SELECTING CAR BODY COLORS.

It is gratifying to note the disappearance of vivid, gaudy colors which have been identified with street cars for so many years. This indicates the prevailing, sensible preference for quiet and effective colors and is in notable contrast to the vulgar gaudiness and display which are distasteful to the educated mind. It also shows that the subject of body colors has been recognized as worthy of consideration, a fact that has doubtless largely contributed to the present improvements which have been inaugurated in many places. The relief afforded by this change is very welcome, and it is safe to prophesy that the prevailing colors of car bodies in the future will never again present the vivid spectacle that would cause them to be mistaken for circus wagons.

It is astonishing to what extent a grotesque style of painting will unwittingly increase in popularity as degenerate ideas are allowed to gradually supplement those of good taste. Memory recalls the days when it was the height of the painter's ambition to produce the most startling effects on car bodies that could be designed. At that time cars were gilded and then plaided with transparent green and carmine; some were colored with fugitive lakes and cadmium, while others were lavishly decorated with designs including colors so numerous that it was difficult for one to determine the one intended for the body color. Considering the excessive cost of the methods employed to produce these effects when compared with the present manner of painting it is exceedingly strange that they remained in vogue as long as they did. In selecting color for car bodies fancy should be subordinate to reason. A preference for any particular color should not be shown until three important points have been considered upon which satisfactory results depend, namely, permanency, harmony of color and shape, and taste regarding hue. It is generally understood that color coats in car painting are not intended for protection, the prime object in selecting a pigment for this purpose being to secure one which will retain a maximum color fixedness, and in this connection it is well to remember that the relation existing between pigment and color is pertinently stated in the simile, "Pigment is the body, color is the soul." If the pigment is incapable of withstanding the attacks of the elements early dissolution must be expected. The pigment in this case remains, but the fugitive color departs. To avoid the possibility of painting a number of cars with pigment of this nature it is wise to use only those pigments which are known to be lasting and to accept none without being personally assured of the honesty of the goods.

This may seem a lack of confidence, to regard all strange paint with suspicion, but it is justifiable considering the opportunities offered the unscrupulous makers to incorporate into paint spurious material which will reduce the color life of the pigment in proportion to the quantity of the adulterant used. For example, barytes can be compounded with chemically pure pigments in equal parts without making any perceptible change in the color, and in view of the fact that it would require the use of laboratory apparatus to determine the purity of the pigment it is manifestly proper that a painter, in order to protect himself, should be somewhat conservative in his ideas when selecting color material for car work.

The average life of color on street cars when properly prepared, applied and protected should be 10 or 12 years. This, however, only applies to a limited number of colors whose permanency has been tested and proved in actual service to be reasonably durable, while those whose extreme durability may be depended upon when subjected to extreme exposure are still limited to a very few, among which is one that may be mentioned which stands pre-eminent in its class. I allude to medium chrome green. From this pigment, or rather compound of pigments, may be produced hundreds of different shades of green which are more or less permanent in proportion as the admixture of color recedes from the color which is generally accepted as the standard. This offers an assortment from which may be selected many desirable body paints which will give perfect satisfaction as to the permanency of color. The Pullman car color is another desirable color which might be included in the extremely permanent list and out of which may be produced, by the addition of green and golden ochre, many rich and soft shades that will still retain the lasting quality. The other colors that deserve notice are golden ochre, if a light color is desired, ultra-marine blue, and russet red. These pigments will produce many hundreds of

different shades of attractive body paints if judiciously assembled and properly mixed, and under normal conditions will successfully resist the moisture of the elements for a long period.

The rapidity with which the hue will depart from all lakes, vermillion, carmine or bright yellow pigments when exposed to the sun's rays should cause them to be avoided as far as possible for all car work. No practical and experienced painter would consider these for body coats unless forced to do so by the orders of his superiors.

One very important point in the coloring of car bodies is the harmonizing of color and shape. The consideration of this question is apparently often omitted, the mistake proceeding generally rather from inadvertence than ignorance. The consideration of this subject, however, opens a broad field for improvement along these lines which would be productive of much improvement in the appearance of the promiscuous variety of models and types of cars that are generally included in the inventory of a modern street railway. A straight side, 50-ft. vestibule car painted in bright green would, in all probability, be an object of much criticism. Compare this with one of the same type painted a quiet olive green, or Pullman car color and note the great improvement which the latter presents. On the other hand, if a 20-ft. open face car with convex and concave lower panels be painted Pullman color, it certainly would mark the absence of the fine appreciation of the harmony of color with the figure it was supposed to embellish.

As there is no fixed law that can be applied to determine what color is required for a specific shape, it remains for the painter to judiciously use the knowledge of this matter which he has derived from experience.

To some fortunate people the gift of instantly comprehending this matter of harmony seems to be instinctive; this shows in their clever arrangement of color without apparent deliberation. To others who are less favored the necessity of thorough study of color and form harmony is apparent.

Certain unwritten laws of propriety and taste which regulate the appropriate use of color are without doubt recognized more fully by people of education and refinement than by those who have not had the chances of developing these qualities. The inherent inclination of man in the savage state to be unduly attracted by exceedingly bright and vivid coloring is known, and these mysterious tastes can be traced across the void which divides the higher from the lower animals, exerting some mysterious influence over the latter. Deer, for instance, have been known to lose their lives in order to gain a nearer view of the hunter's red blanket used for a decoy, while other cases can be cited where animals have been unnaturally excited at the appearance of unusually bright colors. Beginning at the lowest point of intelligence in the human family, there exists an uncontrollable eagerness for vivid colors which greatly diminishes with advancing stages of civilization until it largely disappears when civilization reaches its highest development. This fact should be accepted as an indication at least that there is a natural law in regard to the proper use of color, and reason prompts that its precepts should be regarded.

This natural law can nowhere be better fulfilled than in its application to the subject in hand. Nowhere is there more need of its subtle or forceful influence than in the arrangement of colors on the most conspicuous objects in our city streets. The indication that these principles are being followed marks the intelligence of the designer, while the failure to meet the precepts of this law produces an object of deservedly adverse criticism. F. H.

It is reported from Springfield, Mass., that scarcity of coal has compelled the curtailment of street car service. Similar reports come from Ashtabula, O., and Altoona, Pa.

The Auburn (N. Y.) City Railway Co. notified all its conductors and motormen to report to the company's office at 12 o'clock, on the night of January 19th. They were met there by Pres. C. D. Beebe, who invited them across the way to a banquet, which had been prepared. After the banquet Mr. Beebe announced that the company had decided to give the men an increase in pay, ranging from 10 to 20 per cent. The increase is to date from January 1st. The men extended a vote of thanks to President Beebe and the other officers of the company.

THE AMERICAN RAILWAY MECHANICAL AND ELECTRICAL ASSOCIATION.

The street and interurban railway interests of the country are to be heartily congratulated upon the work accomplished at the meeting held in Cleveland, February 16th, which resulted in the organization of the American Railway Mechanical and Electrical Association. This association to a large extent owes its being to the energy of Mr. Thomas Farmer, of the Detroit United Ry., who took the preliminary steps to effect such an organization at the A. S. R. A. convention in Detroit last October, and the new association has fittingly honored Mr. Farmer in making him the first president.

The dispatch with which the association effected its permanent organization, formulated constitution and by-laws and elected officers, augurs well for its success, and the wide extent of territory represented by the master mechanics, chief engineers and electrical engineers who answered the call for the organization meeting gives assurance that the need for such association is recognized in all parts of the country. It is certain to receive the hearty support of the street railway companies and of the parent association—the A. S. R. A., for the new association will develop a special field of its own just as the Accountants' Association has done, and permit discussion of engineering subjects to be transferred from the floor of the more general association to a forum where all instead of only a few are deeply interested in the subjects to be considered.

Questions of standardization, interchange of cars between steam and electric railroads, and between city and interurban electric lines, and similar matters peculiarly within the knowledge of the mechanical and electrical engineering departments, which were suggested by various speakers at the meeting, need only be mentioned to render evident the field that is open for such an association.

The meeting was called to order at the Hotel Hollenden, Cleveland, February 16th, at 10 a. m., Mr. Farmer being chosen chairman of the meeting and Mr. Mower, secretary.

The companies represented at the organization meeting were:

Detroit United Ry., by Thomas Farmer, superintendent of motive power, and S. W. Mower.

Boston Elevated Ry., by C. F. Baker, superintendent of motive power and machinery.

Rochester (N. Y.) Railway Co., by Alfred Green, master mechanic, and R. E. Danforth, superintendent.

Cleveland Electric Ry., by D. F. Carver, chief engineer.

Northern Ohio Traction & Light Co., Akron, O., by W. Roberts, master mechanic.

Grand Rapids (Mich.) Railway Co., by W. W. Annable, master mechanic.

United Railways & Electric Co., Baltimore, Md., by H. H. Adams, superintendent of shops.

Toledo Railway & Light Co., by C. A. Brown, master mechanic.

Milwaukee Electric Railway & Light Co., by E. W. Olds, superintendent of rolling stock.

International Railway Co., Buffalo, N. Y., by J. Millar, superintendent of rolling stock.

St. Louis Transit Co., by W. O. Mundy, master mechanic.

Scranton (Pa.) Railway Co., by T. J. Mullen, master mechanic.

Lake Shore Electric Railway Co., Toledo, by F. Heckler, master mechanic.

Messrs. Adams, Carver, Green and Olds, with the chair as chairman, were constituted a committee to draft a constitution and by-laws for the association, and the meeting then adjourned.

The afternoon session was called to order at 2:30 p. m. and the committee on constitution and by-laws made its report, submitting a draft which was thoroughly discussed by the meeting.

The constitution and by-laws as finally adopted are as follows:

CONSTITUTION

I. NAME

The name of this association shall be "The American Railway Mechanical and Electrical Association" and its office shall be at the place where the Secretary resides.

II. OBJECT.

The object of this Association will be the acquisition of experimental, statistical, scientific and practical knowledge relating to the construction, equipment and operation of street and interurban railways.

III. MEMBERS.

1. The active Members of this Association shall consist of American railway companies or lessees or individual owners of railways, and each member shall be entitled to one vote by delegates presenting proper credentials.

2. The head of any department or electrical department of a railway company may be elected an Associate Member of this society and will be entitled to all privileges except that of voting. Other employees and clericals are Associate Members, may become eligible to junior membership upon the recommendation of at least one official of the company in which they are employed and one Associate Member, and shall be entitled to all privileges except that of voting.

3. Technical personnel shall be eligible to honorary membership upon recommendation of the Executive Committee.

IV. AMENDMENT

This constitution may be amended by two-thirds vote of the members present at a regular meeting after thirty days' notice thereof has been given to each member in writing by the Secretary.

BY LAWS

1. APPLICATIONS

Every applicant for membership shall signify the same in writing to the Secretary, enclosing the requisite fee, and shall sign the Constitution and By-Laws.

2. OFFICERS AND EXECUTIVE COMMITTEE

The officers shall consist of a President, three Vice-Presidents, a Secretary and Treasurer, and four others, who shall constitute the Executive Committee. The Executive Committee shall have the entire charge and management of the affairs of the Association. The officers and Executive Committee shall be elected by ballot at each regular meeting of the Association, and shall hold office until their successors shall be elected. The duties of Secretary and Treasurer shall be performed by the same person.

3. DUTIES OF OFFICERS

The officers of the Association shall assume their duties immediately after the close of the meeting at which they are elected. They shall hold meetings at the call of the President or, in his absence, at the call of the Vice-Presidents, in their order, and make arrangements for carrying out the objects of the Association.

4. PRESIDENT

The President, if present, or in his absence one of the Vice-Presidents, in their order, if present, shall preside at all meetings of the Association and of the Executive Committee.

5. TREASURER

The duties of the Treasurer shall be to receive and safely keep all moneys of the Association; keep correct account of the same, and pay all bills approved by the President; and he shall make an annual report to be submitted to the Association. He shall give a bond to the President in such sum and with such sureties as shall be approved by the Executive Committee.

6. SECRETARY

The duties of the Secretary shall be to take minutes of all proceedings of the Association and of the Executive Committee and enter them in proper books for the purpose. He shall conduct the correspondence of the Association, read minutes and notices of all meetings, and also papers and communications, if the authors wish it, and perform whatever duties may be required in the Constitution and By-Laws appertaining to his department. He shall be paid a salary to be fixed by the Executive Committee.

7. MEETINGS

The regular meetings of this Association shall convene at the same place as the American Street Railway Association, and one day in advance of the meeting of that Association. Notice of every meeting shall be given by the Secretary in a circular addressed to each member at least thirty days before the time of meeting. Ten members shall constitute a quorum of any meeting.

8. ORDER OF BUSINESS

At the regular meeting of the Association the order of business shall be:

1. The reading of the minutes of the last meeting.
2. The address of the President.
3. The report of the Executive Committee on the management of the Association during the previous year.
4. The report of the Treasurer.
5. Report of special committees.
6. The election of officers.
7. The reading and discussion of papers of which notice has been given to the Secretary at least thirty days prior to the meeting.
8. General business.

9. ORDER OF BUSINESS SPECIAL

At other general meetings of the Association the order of business shall be the same, except as to the third, fourth and sixth clauses.

10. NOTICES

The Secretary shall send notices to all members of the Association at least sixty days before each meeting, mentioning the papers to be read and any special business to be brought before the meeting.

11. EXECUTIVE COMMITTEE

The Executive Committee shall meet one day in advance of each annual meeting of the Association, and on other occasions when the President shall deem it necessary upon such reasonable notice specifying the business to be attended to, as the committee shall by vote determine. A vote of the Executive Committee may be taken by mail when deemed advisable.

12. VOTING.

All votes except as herein otherwise provided shall be by the up-lifted hand unless a ballot is called for, and in case of a tie a presiding officer may vote.

13. READING OF PAPERS

All papers read at the meetings of the Association must relate to matters connected with the objects of the Association and must have the approval of the Executive Committee before being read. Persons to whom subjects are assigned must signify in writing their intention to prepare the paper and forward it to the Secretary at least sixty days previous to the date of the meeting so that advance copies of the paper may be printed and forwarded to the members.

14. PAPERS, DRAWINGS AND MODELS.

All papers, drawings and models submitted to the meeting of the Association shall remain the property of the Association at the option of the Executive Committee.

15. FEES

Active members shall pay annual dues of \$20.00, payable in advance. The Executive Committee shall have no power to expend for any purpose whatever, an amount exceeding that received as hereinbefore provided for. It shall be the duty of the members to pay such returns to the Secretary as shall be required by the Executive Committee.

Associate Members will pay annual dues of \$5.00.

Junior Members will pay annual dues of \$3.00.

16. ARREARS

No member whose annual dues shall be in arrears shall be entitled to vote.

17. WITHDRAWAL

Any member may retire from membership by giving written notice to that effect to the Secretary, and the payment of all annual dues, but shall remain a member and liable to the payment of annual dues until such payments are made except as hereinafter provided.

18. EXPULSION.

A member may be expelled from the Association by ballot of two-thirds of the members voting at any regular meeting of the Association upon the written recommendation of the Executive Committee.

19. RULES OF ORDER.

All rules not provided for in these By-Laws shall be those found in Roberts' Rules of Order.

20. AMENDMENT.

Notice of all propositions for adding to or altering any of these By-Laws shall be given to the members of the Association at least thirty days before the meeting at which they are to be acted upon.

21. COPY OF CONSTITUTION AND BY-LAWS.

Each member of the Association shall be furnished by the Secretary with a copy of the Constitution and By-Laws of the Association and also a list of the members.

The association then proceeded to the election of officers, who were chosen as follows:

President, Thomas Farmer, superintendent of motive power, Detroit United Ry., Detroit, Mich.

First Vice-President, E. W. Olds, superintendent rolling stock, Milwaukee Electric Ry. & Light Co., Milwaukee, Wis.

Second Vice-President, Alfred Green, master mechanic, Rochester & Sodus Bay Railway Co., Rochester, N. Y.

Third Vice-President, C. F. Baker, superintendent motive power and machinery, Boston Elevated Railway Co., Boston, Mass.

Secretary and Treasurer, Walter Mower, Detroit United Ry., Detroit, Mich.

Executive Committee: The officers and—

W. O. Mundy, master mechanic, St. Louis Transit Co., St. Louis, Mo.

T. J. Mullen, master mechanic, Scranton Railway Co., Scranton, Pa.

H. H. Adams, master mechanic, United Railways & Electric Co., Baltimore, Md.

D. F. Carver, chief electrician, Cleveland Electric Railway Co., Cleveland, O.

The secretary then read applications for membership from the following companies which were not represented at the meeting:

Worcester Consolidated Street Railway Co., Worcester, Mass.

Chicago City Railway Co.

Santa Barbara (Cal.) Consolidated Street Railway Co.

Mobile (Ala.) Light & Railway Co.

After receiving applications for associate membership from the delegates of companies represented, the association adjourned to meet at the time of the next A. S. R. A. convention as specified in the by-laws.

At a meeting of the executive committee immediately following the "Street Railway Review," the Street Railway Journal, and the Western Electrician were chosen honorary members of the American Railway Mechanical and Electrical Association.

Extremely pleasant and heartily appreciated features of the meeting were the entertainments extended to the association by the suppliers. Lunch was served at the Century Club at 1:30 p. m., plates being laid for 32. At this the following gentlemen were hosts: H. N. Ransom, Christensen Engineering Co., Cleveland; W. R. Kerschner, Columbia Machine Works, Brooklyn; W. D. Ray, Westinghouse Traction Brake Co., Detroit; J. E. Eldred, Jr., Christensen Engineering Co.; M. S. F. Yates, New Haven Car Register Co.; C. J. Smith, Chicago Pneumatic Tool Co.; George S. Hastings, Cleveland; F. E. Green, Westinghouse Traction Brake Co.; D. B. Dean, J. G. Brill Co.; F. A. Elmquist, Sherwin-Williams Co.; E. F. Wickwire, Sterling-Meaker Co., New York; F. C. Randall, Christensen Engineering Co., New York; C. N. Leet, Christensen Engineering Co.; H. E. Ackerly, American Car Seat Co.; J. W. Paterson, American Car & Ship Hardware Manufacturing Co., New Castle, Pa.; C. P. Tolman.

In the evening the suppliers were hosts at a theater party.

The Cleveland Electric Railway Co. placed a special car at the disposal of delegates who wished to "see Cleveland," a courtesy that was much appreciated.

ROCHESTER RAILWAY REUNION.

The 15th annual reunion of the officers and clerks of the Rochester Railway Co. was held Jan. 30, 1903. The occasion was in honor of the completion of Mr. T. J. Nicholl's seventh year as vice-president and general manager of the company, and a similar affair has been arranged each year by the employees. A unique feature of the occasion was the printing of the programme and menu in the form

of an official coupon passbook and which was designed by Miss L. M. Taft, chairman of the entertainment committee. The programme included an address of welcome by Mr. T. J. Nicholl and musical selections, both vocal and instrumental, after which a dinner was served, followed by appropriate toasts.

THE ELECTRICAL EQUIPMENT OF THE NEW YORK CENTRAL.

The New York Central & Hudson River Railroad Co. officially announces the electrical conversion of its lines in New York City and vicinity to electricity and the company has established an electrical commission which will be in charge of the electrical work to be undertaken. This commission consists of W. J. Wilgus, fifth vice-president of the company; Bion J. Arnold, Chicago, electrical engineer; Frank J. Sprague, New York, electrical engineer; George Gibbs, New York, electrical engineer, and A. M. Waitt, superintendent of motive power of the company. The force of electrical and mechanical engineers for carrying on the work will be in charge of Mr. Edward B. Cotte. The company's plans provide for the electrical operation of trains from the Grand Central Station, 35 miles out on the Hudson division to Croton Landing, and 20 miles out on the Harlem Division to North White Plains. On the Harlem division the electrical system will be installed from 155th St. to Yonkers. These improvements are to be undertaken largely on the advice of Mr. B. J. Arnold, whose report on the feasibility of operating trains from the Grand Central Station to Mott Haven Junction was read last summer before the American Institute of Electrical Engineers, and published in the "Review" for July 20th, 1902. It is estimated that over \$20,000,000 will be expended on the new work, and an agreement between the city and the company has been made conditioned upon the railroad company procuring and aiding the city to procure necessary legislation to permit a change of motive power from steam to electricity in the Park Ave. tunnel. It also contains the provision that in case of emergency, or break-downs through trains only may be operated by steam and the emergency in each case to be determined by the Mayor of the city of New York. In case of break-downs steam may be used for three days, after which the railroad company must pay the city \$500 a day penalty, unless a certificate is obtained from the Mayor that the further use of steam is justified. The power house cannot be situated on Manhattan Island farther than two blocks from the water front except by the consent of the Board of Estimate.

INTERURBAN LINES AND FARM VALUES.

FROM THE ROCKFORD, ILL., GAZETTE.

I have been asked many times "how I liked the electric cars running along the side of my farm," and did I consider them a benefit or a damage. I wish to say that no man who owns a farm and lives on it can realize the great advantage it is to have an interurban electric road running along his farm every hour. It is without a doubt the greatest benefit he has ever known and practically places the farmer right in town. So well satisfied was I when the matter was first talked of regarding the Rockford, Beloit & Janesville interurban road, that when I was approached for the right of way along my farm, which would take a strip of land off the farm 33 ft. wide the length of the farm, that I said at once they could have the land for nothing and I would then be well paid. Yet I never realized till the road was built and cars running what a benefit it would be to me as a farmer. With my telephone and morning delivery of mail I am better situated than if I lived in town, having about all the benefits of the city and none of its disadvantages. If one wishes to attend a lecture in Rockford or Beloit, or go to the opera house or to church, he is but 20 to 30 minutes from the city. If one has sickness, a telephone message to Rockford brings a physician on the next car. Or a need from the shop, or store and a telephone message and the next car brings you what you order. Yes, sir, the electric road is with us a necessity, and a check for \$2,000 would be no temptation to have it taken away. To my farms it is worth \$20 per acre benefit, and one farm on this line has sold for \$20 per acre more than the man asked for it before the road was built. This is my opinion of the interurban railway.

Roscoe, Ill.

A. J. Lovejoy.

INTERURBAN RAILWAY & TERMINAL STATION AT CINCINNATI.

One of the greatest advantages of the electric railway in competing with the steam railroads for passenger traffic lies in the ability of the electric railway to use for its passenger terminals the street railway tracks of the various cities and towns which it connects. Those interested in interurban electric railway properties have always fully appreciated the advantage, or even the necessity, of having working agreements with the urban companies, and in most instances there has been little difficulty in making amicable arrangements for the joint use of tracks in the terminal city.

With the extension of interurban electric systems the need for terminal buildings has become greater, especially so since the interurban lines have very generally undertaken to handle light freight and express matter. Such a business demands freight houses and transfer stations, and in a number of cities recognized as electric interurban railway centers special terminals, usually in the way of union stations for the use of all interurban lines entering the city, have been built or planned. We have in mind, Detroit, Toledo, and Cleveland as being among the first to arrange for such terminals.

In the "Review" for January announcement was made concerning the plans of the Indianapolis Traction & Terminal Co. for a union electric railway station, and in this article is described the terminal and freight handling system for the interurban electric railways entering Cincinnati. This building is the idea of Mr. G. R. Scrugham, who is president and general manager of the Interurban Railway & Terminal Co., of Cincinnati, which comprises the Cincinnati & Eastern Electric Ry., the Suburban Traction Co., the Rapid Railway Co., and the Interurban Terminal Co.

Of the three railway properties consolidated to form the Interurban Railway & Terminal Co., the Cincinnati & Eastern connected Cincinnati and New Richmond, O., 22 miles southeast; the Suburban Traction connected with Bethel and Batavia, 28 miles northeast, and the Rapid Railway with Lebanon, 32 miles north. The total length of track outside of Cincinnati is 82 miles, 14 miles being double track.

The three railways which the interests of the Interurban Railway & Terminal Co. are constructing (outside of the city and villages) for the most part own their rights of way, which consist of turnpike and toll-roads, that have been purchased. In such cases a wagon road is left parallel with the tracks. The remaining portion of the right of way was purchased or condemned through town lots, farms, etc.

The Cincinnati & Eastern division operates southeast from Cincinnati, through the new Water Works grounds (on which the city of Cincinnati is expending about nine million dollars), through the town of California, to Coney Island, the largest pleasure resort in the west; thence through a number of villages, to New Richmond.

The Rapid Railway division operates north from Cincinnati, through a continuous line of suburban villages, a large majority of the population of which are commuters, who have had to depend upon the steam railroad operated in this territory.

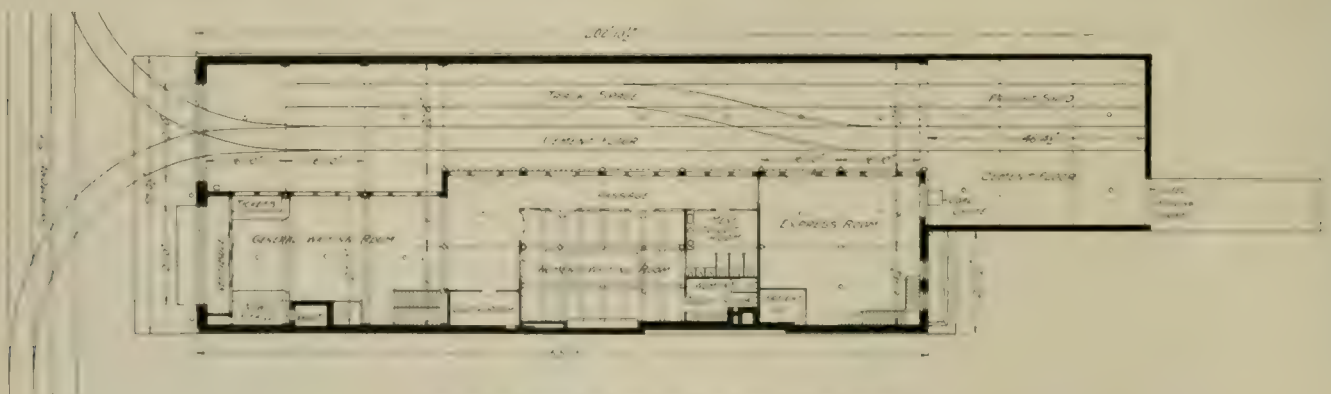
Experience has been that an electric railway operating in such



INTERURBAN TERMINAL STATION, CINCINNATI.

territory as this will not only carry the existing traffic, but will also largely develop and increase the traffic between suburban towns and the city, and between the towns themselves.

The street railway tracks of the Cincinnati Traction Co. have a



PLAN OF FIRST FLOOR OF TERMINAL STATION.

This road follows very closely the line of the Ohio River, making a very popular and picturesque pleasure ride.

The Suburban Traction division operates northeast of Cincinnati, and serves a district largely cultivated as market gardens, the produce of which has heretofore been hauled to the city by wagons, as there are no convenient railway facilities.

gauge of 5 ft. 2½ in., and the interurban roads mentioned, as well as the Mill Creek Valley Street Ry., which operates northwest to Hamilton, a distance of 18 miles, are constructed with the same gauge. Other roads will use the same terminal later. The basis for payment for the use of the terminal station will be according to the number of cars operated and the amount of freight handled.

The terminal station, which was opened for use the second week in February, but will not be entirely completed before April next, is without doubt the most elaborate structure of this kind yet erected exclusively for electric railways.

The station is situated on Sycamore St. between Fourth and Fifth, being within one block of Government Square, which is practically the center of Cincinnati. The depot is a six-story building, 60 ft. front x 160 ft. deep, with a freight shed in the rear 60 x 60 ft., extending to an alley. The first floor is for the cars, passenger waiting room, freight receiving room, etc. A single track will enter the building, but inside there will be a storage track connected by a cross-over for the handling of freight.

Reference to the plans herewith will make plain the arrangement. The general waiting room on the ground floor is 30 x 60 ft.; in the rear is a ladies' waiting room, 24 x 40 ft. These waiting rooms are finished with tiled floors, marble wainscoting and all modern conveniences. The upper floors are all arranged similarly to the second floor and are intended to accommodate special offices of the railways using the station. Partitions can be changed, however, to suit the convenience of different companies. These offices are served by a passenger elevator at the front of the building and a large freight elevator in the rear.

The building is a brick and steel structure, with Bedford stone front above the first floor, and a granite front on the ground floor,

MASSACHUSETTS NOTES.

There are all sorts of bills before the present legislature in regard to the operations of street railways, so many in fact and all coming in at one time, that it is impossible to enumerate them all. At the present time the one that seems the most likely to receive favorable consideration is one to give the necessary authority to the railroad commissioners to regulate the speed of trolley cars. This has back of it the endorsement of the governor and the commissioners themselves, and back of all this, the accident to the presidential party in Pittsfield last fall.

The law of last year by which the railroad commissioners have to approve all grants of local boards is attacked by a petition and bill to have this law repealed. There has been no hearing as yet on this matter and it is impossible to state how much force there is back of it. Its success is doubtful, however, for the present tendency of Massachusetts legislation is towards centralization of matter in the hands of state authorities.

There are one or two cases where companies are seeking to get from the legislature grants in the way of location, etc., that the railroad commissioners have refused them. Some of the suburban towns in the metropolitan section have majority votes in favor of keeping their roads for their own pleasure driving rather than giving them to public use for trolley cars.



PLAN OF UPPER FLOORS, INTERURBAN TERMINAL STATION, CINCINNATI.

and is to be equipped with an independent steam heating, electric light and elevator plant.

This building was designed by Mr. Scrugham. The architects were Warner & Adkins. The general contractors were L. P. Hazen & Co., of Cincinnati, and the sub-contractors as follows: Steam heating plant, John H. McGowan Co., Cincinnati; elevators, Werner Elevator Co., Cincinnati; engines, Buckeye Engine Co., Salem, O.; electric plant, Westinghouse Co., steel work, L. Schreiber Sons Co.; plumbing, Wm. Hillenbrand & Co.

It is the intention of the Railway & Terminal Co. to establish stations in many of the towns, with a man in charge to act as agent who will operate wagons to distribute and collect goods. The system of transporting these goods on the cars will be very similar to that now in use by express companies, way bills being used, and a regular tariff being established.

To facilitate small shipments, the company will sell books of tickets to paste on the packages for pre payment. Small platforms are being built along the land side of the tracks in front of the farm houses, so that packages, crates of vegetables, milk cans, etc., can be handled directly from each farm. For collecting and distributing freight to and from the terminal station in Cincinnati the company will operate a number of express wagons.

It is proposed to operate regular passenger cars on a schedule varying from 15 minutes to one hour, through combination cars which will handle light freight every hour, and large double truck baggage cars to be run at night for the handling of heavy freight and large shipments to be distributed from the depots in the towns through which the road operates.

The Fitchburg & Leominster Street Railway Co., of Fitchburg, Mass., is seeking permission to carry freight on its lines.

There are one or two companies seeking charters with more privileges than the commissioners can give under the general law. These are lines in the hill towns of the western part of the state and "down on Cape Cod." In these cases the claim is that the territory is so sparsely settled that a road cannot live unless it can sell electricity for light and power, make physical connections with the railroads at each end of the line and handle freight up and down, do an express business, etc. The street railway committee has already given a hearing on one petition of this kind, and heard many earnest pleas from leading men of the hill towns communities to "give them something in the way of connection with the outside world and not make them travel 12 or 14 miles in a stage coach the way their grandfathers did."

In fact the committee has taken a 30 mile drive through a number of these communities, has given a hearing in a central borough and has come back with a pretty clear conviction that something ought to be done to help those people who are so earnestly trying to help themselves.

Another important matter is a petition from one of the important railroad lines of the state that it be allowed to buy stock in street railway companies. This is supposed to mean a consolidation.

Rob.

The Manhattan Railway Co., of New York, has paid the city \$2,146,500 in final settlement of claims for taxes amounting to \$3,000,000, thus ending a litigation which began in 1894.

The Winnebago Traction Co. of Oshkosh, Wis., has experienced considerable difficulty in keeping its interurban lines open, on account of drifting snow. Storm fence may be erected at the worst points next winter.



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We cordially invite correspondence on all subjects of interest to those engaged in any branch of street railway work, and will gratefully appreciate any marked copies of papers or news items our street railway friends may send us, pertaining either to companies or officers.

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NARROW GAGE LINES.

There seems to be disposition in some quarters to lament the fact that in developing interurban railways in this country the so-called light railway has received scant attention. The term light railway must be understood as meaning narrow gage, since our engineers have had too much experience with rails of small section and the other features going to make up light construction, to seriously advocate a return to a practice which saves on the original cost but loses in maintenance and operation.

We believe it would be a great mistake to introduce the narrow-gage in electric railway work except in district where the existing street railways laid to gages narrower than standard as is the case on the Pacific Coast and in some cities in Texas. Even in such cases varying from the standard practice appears of doubtful wisdom, for it is impossible to predict either the time or direction of future developments which may render the interchange of cars with standard gage roads necessary or desirable. Some two years ago, in commenting on the existing variety in street railway gages, the opinion was expressed that sooner or later the companies must face the question of changing to standard gage. While Columbus, Cincinnati and Pittsburg are probably the cities where the greatest inconvenience because of non-standard gages has been felt, the Nashville (Tenn.) Railway Co. is the first to decide upon changing the old gage to standard, a work that will be undertaken this year.

JIM CROW LAWS.

Notwithstanding the practical difficulties that have been met in attempting to enforce so-called Jim Crow laws in the states where they have been adopted, and the fact that in every instance the requirements for the segregation of white and colored passengers in street cars have resulted in greater inconvenience to the race it was attempted to favor than to the one discriminated against, the state of Tennessee has passed a law requiring the separation of the two races in the street cars operated in counties having more than 150,000 inhabitants at the last federal census. This was aimed at Memphis, which is the only city affected by the act. The impossibility of so placing partitions in cars that the two classes of passengers shall at all times be suitably accommodated is apparent to any street railway man and it is needless to say that the passage of the Tennessee law was strenuously opposed by the company concerned.

PENSIONS FOR EMPLOYEES.

In commenting, in the "Review" for December, upon some recent expressions by street railway managers on the subject of discipline, we called attention to the growing favor with which the idea of pensions for superannuated employes is regarded. We believe that up to the present year but two street railway companies in this country had definitely adopted the policy of providing pensions for their employes, these being the United Traction & Electric Co., of Providence, R. I., now succeeded by the Rhode Island Co., which put its pension order in effect in November, 1901, and the Metropolitan Street Railway Co., of New York, which inaugurated a similar plan in March, 1902. The Boston Elevated Railway Co. is the third company to find itself in a position to institute old age pensions, an order to that effect having been published in January last. The Boston Elevated plan is to contribute to the support of superannuated "blue-uniformed" employes who have been continuously employed by the company for 25 years and who have reached the age of 60 years, to the extent of not more than \$25 per month; this differs from the scheme adopted by the two other companies mentioned, both of which fixed the pension at a percentage of the average wages received for the ten years next preceding retirement, the rate varying with the term of service.

In the order issued by the Boston Elevated company, which is published in full on another page, another departure is made in that "extra" men are guaranteed a minimum wage for each day during which they have reported and are on hand awaiting work, regardless of whether work falls to them. The principle here involved is one which we know has engaged the attention of a number of managers who have carefully studied discipline, and commended itself as being equitable and effective in removing a frequent cause of friction between the men and the management. There may well be a difference of opinion as to whether a man

should receive compensation while learning his work, but when he has become competent to take a run, and has entered the service, the uncertainty incident to being on the "extra list" is generally a hardship. When transposition to the bottom of the extra list is a recognized penalty for infraction of rules the case is of course different, but the present tendency is towards the substitution of demerit marks on a record of conduct in lieu of suspension, and where such systems have been adopted a position on the extra list without guarantee of a minimum wage places on the employe a burden for which he is not responsible, and as a rule is not in a position to bear.

STEAM TURBINES.

On another page we give the plans and a general description of the new steam turbine power plant which is being installed by the Massachusetts Electric Companies. The first station to be installed will contain three 1,000-h. p. turbines, although the three other stations to be built later by this company will contain three 3,000-h. p. turbines. The station containing the smaller units is being installed first so that the company will have an opportunity of experimenting and deciding upon the minor engineering details of this type of station before going ahead with the installation of the 3,000 h. p. units.

While the steam turbine is the oldest type of steam engine known, its commercial development so far as large units are concerned, has taken place only during the last few years, and in America this type of engine is practically new; for while turbines have been installed in a few power plants largely as a matter of experiment, the station under consideration is the first one using steam turbines exclusively. As has been previously pointed out in the "Review" the introduction of steam turbines to drive alternating current machinery will have a tendency to cause the design of the latter to revert in some particulars to types manufactured during the earlier period of electrical manufacturing. The high speed of the turbine seems particularly adapted for direct connected units as it will materially reduce the weight and dimensions of these machines, which of late years have been vastly increased to meet the conditions imposed by the general use of low speed engines of the corliss type. One difficulty in the introduction of turbines has probably been due to the rapid increase in the prevalent sizes of generators, which in point of capacity have kept ahead of the turbines.

The various types of steam turbines on the market are designed upon one of two general principles. One of these types, of which the DeLaval turbine is an embodiment, is known as the impulse type, and the other, represented by the Parsons turbine, is the multiple-expansion or parallel-flow type. The Rateau and Curtis turbines are both of the first type above mentioned. While at the present time there is a great paucity of data in regard to the economy of operation of steam turbines the few tests which have been published give promise of excellent results in this direction, and if the high efficiency claimed for the smaller units of this type of machine can be attained in the size common in the modern central station, turbines will undoubtedly become a standard feature of future generating plants.

STEAM AND TROLLEY COMPETITION.

It is pretty generally recognized that the development of electric interurban lines has resulted in the diminution of the local passenger traffic on the steam railroads with which the former are in competition, this being due largely to the more frequent trips and more convenient terminals of the "electrics." Some interesting figures as to the extent of this loss of local passenger traffic by steam roads to electric interurban lines have been published recently. On the Lake Shore & Michigan Southern, the number of passengers carried between Cleveland and Painesville, O., and intermediate points, fell from an average of 16,600 per month in 1895 to an average of 2,400 per month in 1902. Between Cleveland and Oberlin, O., and intermediate points, from an average of 16,900 per month in 1895 to an average of 7,650 per month in 1902.

The steam railroads have regarded the loss of the traffic thus taken from them with equanimity since it was a traffic that did not pay them, but it is doubtful whether the additional long haul passenger traffic due to the stimulating effect on the public of trolley facilities has been heretofore properly appreciated. So far as passenger traffic is concerned the two classes of roads are not at all

antagonistic, except as the promoters of electric railway enterprise have had to meet the opposition of steam roads that preferred to control the paralleling trolley lines if any were to be built. Where electric railways have undertaken to handle express and freight as well as passengers there has been a more direct conflict of interest and by refusing to grant through rates express companies and railroads have in some instances succeeded in preventing substantial expansion in trolley freight traffic. The logical counter move is for the electric roads to establish a wagon collection and delivery service where such is necessary to meet similar facilities afforded by express companies, and the establishment of union stations or clearing houses for freight as for example has just been done by the Interurban Railway & Terminal Co., of Cincinnati. As electric interurban lines grow in number and length the competition for freight is certain to become stronger, and it is equally certain that the steam railroads will not regard the invasion with indifference.

CHICAGO FRANCHISE SITUATION.

After a series of public conferences, beginning February 4th, between the Chicago Council committee on local transportation and representatives of the street railway companies, formal statements were on February 11th submitted as a basis for future negotiations. These statements were as follows:

POSITION OF THE COMMITTEE.—It is the sense of the committee that the grant be for a period of twenty years; that the city shall have the right to take over the properties after ten years, making allowance for the then values of the unexpired part of the grants as well as for the then value of the tangible properties. The committee will consider at this time the value of all unexpired franchises, including the value of the unexpired portion of the ninety-nine year act (if any) in connection with the question of compensation. In line with the foregoing, the city council will proceed with its endeavors to secure enabling legislation permitting municipal ownership.

POSITION OF THE COMPANIES.—The city to grant the right to operate the street railways for a period of twenty years, and at the expiration of this period the city to have the option to take them over upon paying the then value of the tangible or physical properties for street railway purposes and existing rights (if any) in the streets and alleys of the city under laws and ordinances now in force; this without prejudice to the city's privilege of maintaining that no such rights exist. The value of the properties and rights (if any) are to be determined by appraisalment. In manner specifically provided for in the ordinance. If the city does not exercise its option to take over the properties and rights at the expiration of twenty years it shall have the right to do so at any time thereafter and in the meantime the property shall be operated upon the same terms as during the twenty years.

While there had been tentative agreements relative to a number of provisions that should be included in a proposed ordinance, nothing definite had been reached even on these points, and no agreement can be expected till the more important considerations as to the term of the grant, the present value of the companies' rights under the 99-year act, and the ownership of any subway that may be built, shall be determined. The "town meeting" method of discussion has not resulted in marked progress, and it is believed that to have the attorneys for the committee draft an ordinance, which will then be discussed, will greatly facilitate the negotiations by eliminating academic questions.

COMING STREET RAILWAY LEGISLATION.

This year the legislatures of a majority of the states hold their biennial sessions and it is safe to predict that there will be many new laws relative to street and electric railways placed on the statute books. An important question which is of especial interest to the promoters of interurban lines is under consideration in several states. This relates to the condemnation of rights of way, and it is extremely gratifying that the tendency of public sentiment is towards liberal provisions for roads of this character. It is beginning to be recognized that to permit individual property owners too much latitude in saying on which side of the road shall be located railways which are built in the public highways is a positive injury to the public as well as to the company. When the conditions are such as to make a railway in any community desirable, there is nothing to be gained and much to be lost, by permitting the prejudice of a few individuals to stand in the way of good engineering on the part of the railway. There are some states in which under present laws the owners of abutting property may dictate whether a railway shall be built on one side or the other, or in the middle of the highway, and in consequence we find electric lines weaving back and forth over the road, needlessly multiplying grade crossings and increasing the danger to the public using the highway.

INTERURBAN ELECTRIC RAILROADS AND THEIR RELATION TO STEAM RAILROADS.

So recent are the later developments in electric transportation facilities that the public has hardly yet realized the fact that the electric railroad is not still the light trolley line, with its stubby cars, following the outline of the landscape with bumpy motion and reaching at uncertain time an uncertain destination. In certain portions of the country, where a condensed population and heavy traffic have demanded better things, may be seen examples of the new type of modern electric interurban transportation, which has adopted the most effective methods of steam railroad service in addition to the peculiar advantages of the smokeless, noiseless and more easily controlled electric power.

These electric lines, moreover, whether of the later or earlier type, have undoubtedly educated the public to travel. With lower fares and more frequent service and the ability to stop at a customer's door, they are distinctly the "people's railroad," and have been so adopted. They have thus performed an important part in bringing about the prosperity which is observed on all sides. In accomplishing this it is not too much to say, although not generally admitted, that they have been of material benefit to the steam lines. It is true that with lower cost of working, and lower fares, they have taken from the steam railroads most of their suburban traffic, resulting in the withdrawal, in many cases, of suburban service by the steam lines. This, however, has not proved an unmixed evil. The usual suburban service by steam trains is ill-adapted nowadays to public convenience and with its frequent stops, wear and tear of equipment and damage claims, is not missed in the final sum of net revenues of the steam lines and its loss or curtailment, carrying with it the long list of commuters' woes, is not unfrequently a source of relief to the railroad manager.

On the other hand, the suburban and interurban roads have undoubtedly stimulated travel—they have not only created for themselves by reason of their frequent service, lower fares and more popular accommodations, a traffic not previously developed by steam service, but have in addition, originated for the steam roads important traffic on which they receive their long haul without the necessity of providing special accommodations, thereby creating the apparent paradox of a demonstrable amount of business lost, with an equally certain, if less demonstrable, amount of revenue gained. In view of this, some systems have already acquired auxiliary lines which they are developing in their own interest; others are seriously considering the substitution of electricity as the motive power for suburban and branch roads in order to realize the increment of profit arising from the new methods of transportation, while they are relying upon the increased activity among business interests, especially among the suburban and rural population, brought about by electric traction, to add materially to the volume of their traffic.

It is yet too soon to expect a complete understanding on the part of all railroad officers of the true relations of electric and steam transportation, and a similar lack of comprehension undoubtedly exists among the operators of electric lines. Time and the logic of events must be relied upon to work out this problem, as has been the case with others which have preceded it.

In the meantime, the managements of the best types of electric roads have before them the work of so affiliating themselves with the steam lines as well as the public, as to produce the largest amount of lasting good to all concerned, a result which in the opinion of the writer, is the only permanent good to the electric roads and can only be secured by co-operative and friendly interchange of both traffic and ideas.—B. F. Wyly, Jr., Traffic Manager, Lackawanna & Wyoming Valley Railway Co., in the Railroad Gazette.

CHICAGO TO BUFFALO.

At the annual meeting of the Western Railway Co., it developed that plans are under consideration for a Buffalo-Chicago electric line. To make a through line from Toledo to Chicago, there would be included the Toledo & Western, now operating between Toledo and Pioneer; the Garrett & Northern, projected between Pioneer and Goshen, and the Chicago & Indiana projected between Goshen and Chicago.

NASHVILLE, TENN.

There is great activity in the interurban railway field in the vicinity of Nashville, Tenn., and there are four companies proposing to build lines in the near future. These are:

The Tennessee Interurban Electric Ry., which is a consolidation of the Nashville & Gallatin Electric Railway Co. and the Nashville & Columbia Railway Co., and proposes to build from Gallatin south to Nashville, and thence through Franklin, Columbia and smaller towns to Mt. Pleasant, Tenn. It is expected to use Nashville Railway company's tracks in that city and the interurban line to be built comprises 28 miles north of Nashville, and 63 miles south of that city. The ground was broken a few weeks ago for the first construction work. The officers are: President, Frank Hassell, of Pittsburg; vice-president and treasurer, C. W. Ruth, Pittsburg; secretary, Frank T. Bond, Nashville; general manager, J. H. Connor, Nashville.

The Nashville & Clarksville Ry. in which Mr. T. N. Watson, of Clarksville, is principally interested, proposes to build an electric line between the towns mentioned in the title and passing through Rudolphtown, Pleasant View, Sycamore Mills and Crocker Springs. A right of way has been secured from the Davidson County Court for the turnpikes in that county.

The Nashville & Lewisburg Electric Ry., in which Messrs. Edgar Jones and E. R. Richardson, of Nashville, are interested, proposes to build a 55-mile line through Nolensville, Wrenco, Triune, Kirkland, Eagleville, Chapel Hill, Farmington and other smaller towns and villages that are at present without transportation facilities other than are given by the stage coach. The present route lies about midway between the lines of the Nashville, Chattanooga & St. Louis and the Louisville & Nashville Railroad. It is expected that the work of construction will commence in the early spring.

The McMinnville, Woodbury & Nashville Electric Ry. has completed a survey through the counties of Warren, Canon and Rutherford and is now at work in Davidson County. C. M. Henley, and others, of Columbus, O., have presented applications for a franchise in Davidson County. It is the intention of the company to arrange for an interchange of freight and passengers with the Nashville Railway Co. and not seek separate entrances to the city. The Nashville representative of the company is Mr. J. M. Grant.

TO JAMES M. JOHNSON.

We are publishing the following pathetic appeal at the request of Mr. Peter Valier, superintendent of La Crosse City Railway Co., of La Crosse, Wis., and beg that anyone having knowledge of the present location of Mr. Johnson, who was formerly employed by the La Crosse railway, will bring this letter to his attention and also communicate with Mr. Valier:

"Dearest Papa:—O write to my mamma for she is dying day by day. Nothing can rouse her but hearing from you. She cries for you night and day; she don't sleep or eat any more to do any good. O papa, don't let our mamma die. You don't know how well she loves you; she don't care what you have done—she forgives you everything and never will reproach you again for anything you have done. She says that she can't live without you. Nobody will ever love you as our mamma does. You can have all your money, but love mamma a little. O papa, don't rob us of our mamma; let us come and live with you and we will be three of the best little girls a papa ever had. Save our mamma and make us all happy. Why didn't you come home Christmas. We had such a sad Christmas this year; we didn't have a Christmas tree or anything and mamma cried all day. Now, papa, your three little girls are going to pray to God every night that He may cause you to read this and write to mamma

"From your own little girl.

Hazel Johnson."

Mr. George B. Harrison, cashier of the Glasgow Savings Bank, Glasgow, Mo., advises us that the proposed Missouri Central Electric Railroad has not yet been organized and that no persons are authorized to make any contracts on behalf of the company. A survey has been completed and a charter for the company will be secured as soon as the necessary stock has been subscribed.

Steam Turbines of the Massachusetts Electric Companies.

Announcement is made that the street railway systems controlled by the Massachusetts Electric Companies, approximating 900 miles of electric railway track covering a strip of territory comprising the extreme eastern portion of Massachusetts for a distance of about 50 miles from the Atlantic coast and extending north from the city of Boston to and into the state of New Hampshire and south from the city of Boston to and into the state of Rhode Island, have entered into contracts with the General Electric Co. for 33,000 h. p. of steam turbines, direct connected to electric generators. Through the courtesy of the officials of the Massachusetts Electric Companies we are permitted to publish plans and descriptions of the Newport station which will be the first plant to receive the turbine equipment.

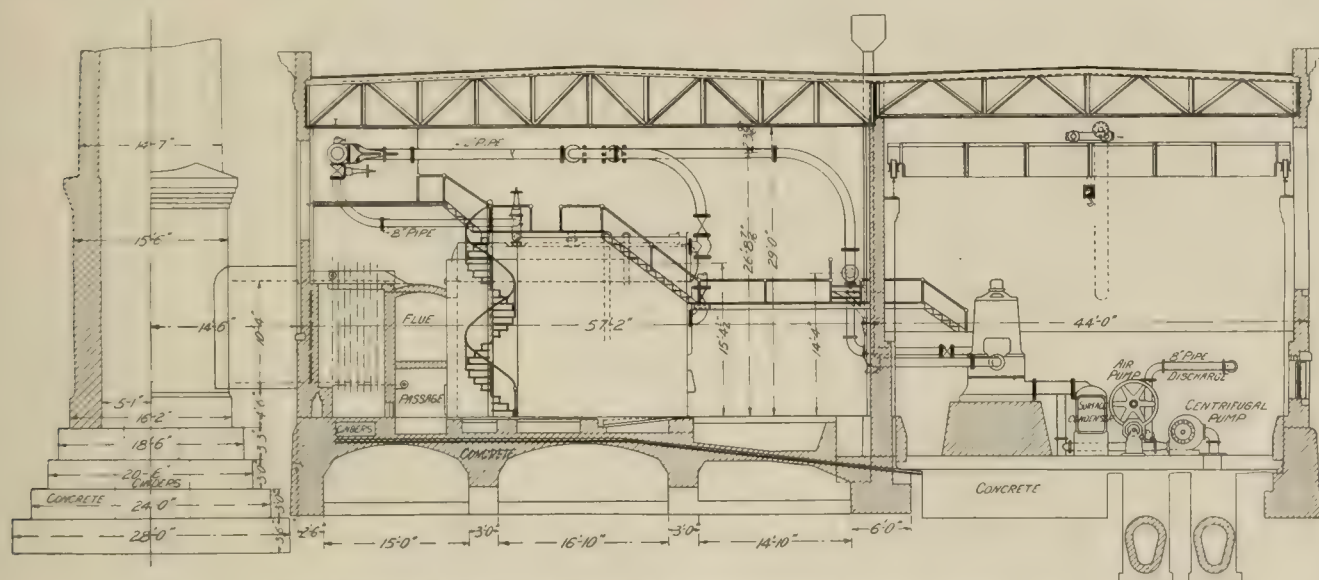
At this writing, the situation as regards turbines is defined by Mr. C. F. Bancroft, chief engineer of the Massachusetts Electric Companies, as follows: The companies have contracted for ten 3,000-h. p. and three 1,000-h. p. steam turbines. The ten 3,000-h. p. turbines will be installed in three stations superseding 13 of the engine-driven stations now operated by the companies. At present the lines south of Boston, comprising about 380 miles of track and designated as

25 cycles, and will pass at that voltage to the three-phase transmission line. Sub-stations will be established at or near the sites of the present engine-driven power houses, where current will be stepped down to 360 volts, and converted to 600 volts direct current for the railway circuits. The sub-station apparatus will be of standard design with the exception that in place of three separate transformers, single three-phase transformers are to be used. There will be three rotary converter units in each sub-station, varying in size from 200 kw. to 750 kw., depending on the work to be performed.

The makers have not yet made public the details of the turbine design, but each turbine will be 12 ft. in diameter at the base, 19 ft. in height and weigh approximately 190,000 lb. All apparatus is guaranteed to stand a momentary overload of 100 per cent, and 50 per cent overload for two hours.

Newport Station.

The small combined electric lighting and railway station at Newport, R. I., is to be used to some extent as an experimental station for the purpose of determining the best design for many of the



CROSS-SECTION OF NEWPORT STATION, MASSACHUSETTS ELECTRIC COMPANIES.

the Old Colony Division, are operated from 11 separate stations, distributed irregularly over the territory served. Nine of these will be displaced by two steam turbine central stations, one aggregating 9,000 h. p. located at Fall River, and one of 12,000 h. p. capacity at Quincy Point. The lines north of Boston, known as the Boston & Northern Division, comprise about 455 miles of electric railway track and are now operated from 10 separate power stations. Five of these power houses will be displaced by one steam turbine station, aggregating 9,000 h. p., located at Danvers, Mass. The three 1,000-h. p. steam turbines mentioned are intended for a small combined lighting and electric railway power house at Newport, R. I., which is also under the control of the Massachusetts Electric Companies.

For the most part the power houses put out of service by the new arrangement contain engine-driven direct-current generating apparatus of accepted makes and design for ordinary electric railway work. Some of the apparatus is somewhat antiquated and part is comparatively new.

The design for each of the three new steam turbine central stations includes, as stated, turbine units of 3,000 h. p. each. The turbines are of the Curtis vertical type and run at the exceedingly low speed of 750 r. p. m., taking steam at 175 lb. pressure at the turbine nozzle. In each unit the generator is mounted directly on the upper end of the turbine shaft without gears or reducing mechanism. The generators specified are rated at 2,000 kw. and are very similar in form and design to the water-turbine driven generators built by the General Electric Co.

Alternating current will be generated at 13,000 volts, three-phase,

minor details connected with the plant, and the experience gained here will be brought to bear in the work of designing the larger stations.

The old power house at this place contained a somewhat varied assortment of small belted Edison and Thompson-Houston units for supplying power to the Newport & Fall River Street Ry., and current for arc and incandescent lighting in Newport and vicinity.

This entire plant and its boiler, engine and generating equipment will be superseded by the new station which is built closely adjoining the site of the old house. The plans provide for four 1,000 h. p. steam turbine units, of which three are now in course of installation. The arrangement of boilers, headers, turbines, condensers, and other apparatus for the new house is well set forth in the drawings accompanying this article. The boiler room is to be fitted with equipment for supplying superheated steam on the Schmidt system, and the action of the steam turbines can therefore be watched and the results noted when using either superheated or saturated steam.

The new building itself is a two-story brick structure about 101 ft. square, divided by a single brick wall partition into a boiler room which is 57 ft. 2 in. wide, and a turbine room, about 44 ft. wide, both of these rooms extending the full length of the structure.

The boiler equipment comprises four 350 h. p. Aultman & Taylor water-tube boilers, arranged in two batteries of two each. Provision has been made for an additional battery if it is ever required. The boilers are equipped with Green fuel economizers.

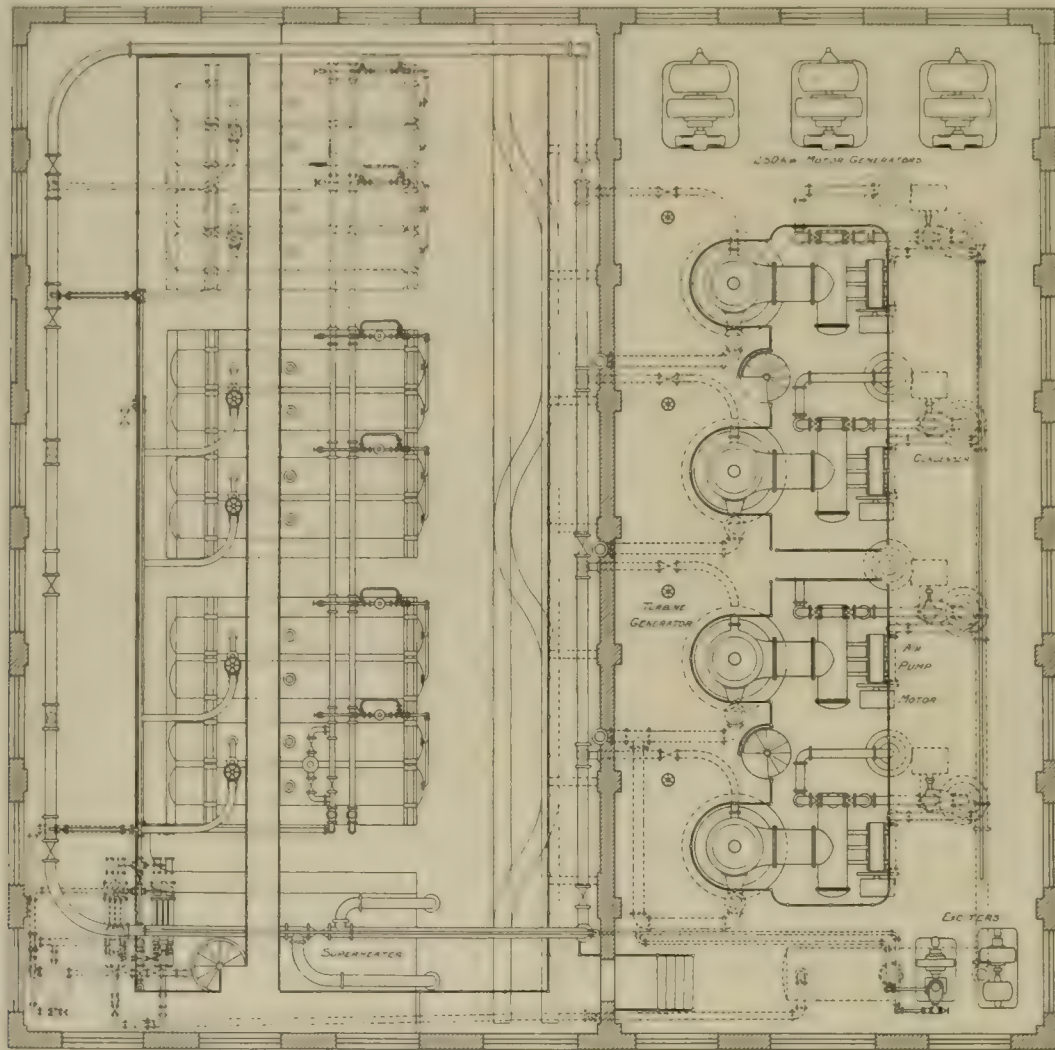
The separately fired superheater stands at one end of the line at boiler and the arrangement of steam headers permit steam to be

taken either through the superheater or from the boiler to the engine direct. Steam rises from the boiler through 8-in. headers and passes to a 12-in. header line carried near the end wall at the rear of the boilers. These headers lead in one direction to the superheater and in the other to a second 12-in. header line carried along the front of the boiler room near the partition wall. By the adjustment of valves, therefore, steam is taken either one way through the superheater, or the other way in saturated form. From the second header mentioned the 8-in. turbine connections drop, then turn and pass through the partition wall direct to the turbines.

The arrangement of feeder and condenser pump and connections, economizer connections and by-passes, auxiliary header, etc., is well conceived to give the fullest measure of economy and flexibility in the running of the plant, and follows standard approved engineering

unit is 7 ft. 8 in. in diameter at the base, and 12 ft. 6 $\frac{1}{4}$ in. from the bottom of the bed plate to the top of the governor cap on top of the generator. The remarkable saving in floor space and in height over either a vertical or horizontal steam engine of the same horse power capacity is at once evident. Each turbine unit rests upon a brick foundation which is 9 ft. at the top, 11 ft. at the bottom and 5 $\frac{1}{2}$ ft. high, the brick foundation resting in turn on an 18-in. bed of concrete. In this particular station, the basement floor line is below tide level, and it was therefore necessary to build a waterproof wall around the engine room. This wall consists of a concrete retaining wall about 6 ft. thick at the base with a waterproof lining of tar paper.

Steam enters the turbines near the top and leaves at the bottom. Each turbine is provided with a 12-in. free exhaust pipe, but under



PLAN OF NEWPORT STATION, LOCATING BOILERS AND GENERATING UNITS.

practice of the day. The details can be traced from the drawings. Feed water may be taken either from a hot well or from the city water main, or both. All piping is covered with the H. W. Johns magnesia steam pipe covering. All valves are Chapman make. The feed water heaters are of the Wainwright type.

The coal and ash handling track, serving the line of boilers with all cars and apparatus, were furnished by the C. W. Hunt Co. The boiler room pumps are of the Smith-Vaile type and condensers are the Wheeler make.

The engine room contains three turbine generator units with room for a fourth unit. As stated, the turbines are 1,000-h. p. units and are of the vertical type. The generator in each case is mounted on top of the turbine and is direct connected to the turbine shaft. The generators are 500-kw. three-phase, 2,500-volt General Electric machines, and run at the turbine speed, 1,800 r. p. m. Each turbine

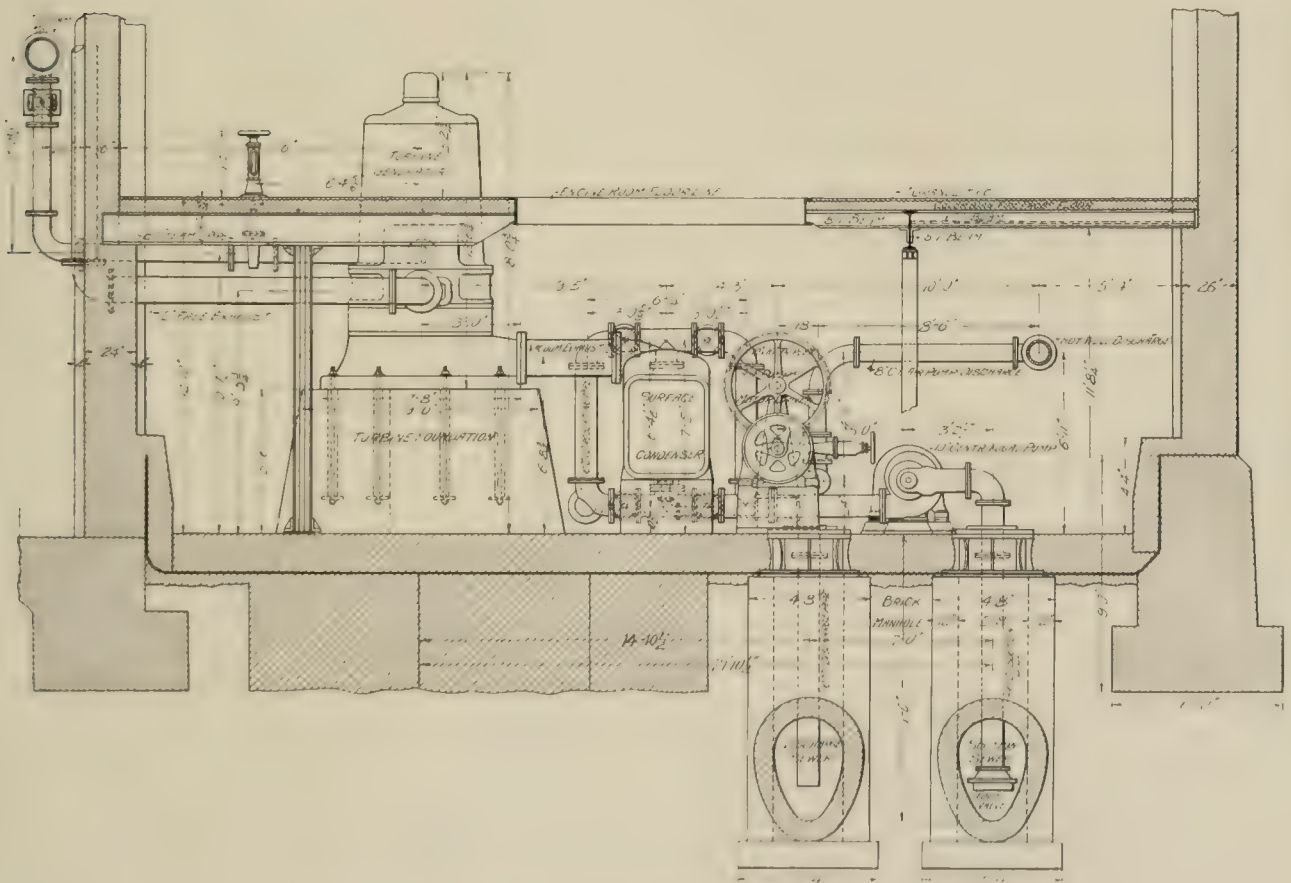
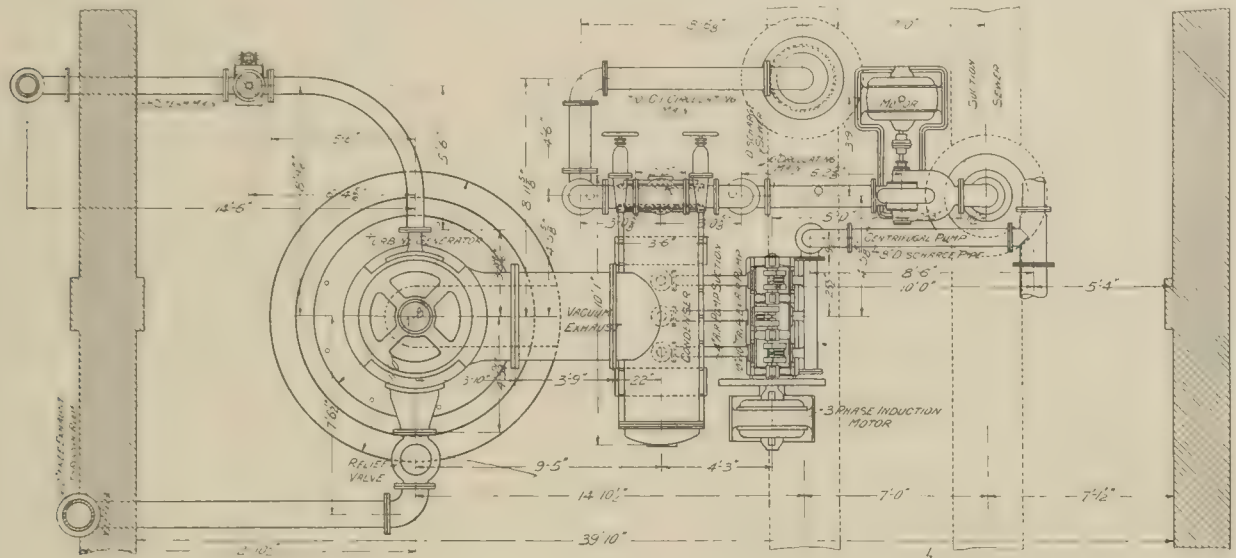
under ordinary conditions the steam after passing through the turbine enters immediately a surface condenser, which in this case is of the Wheeler "Admiralty" type. Salt water for these condensers is taken from the river through a brick sewer which leads from the river to a point beneath the engine room floor. Water is lifted from this sewer by a motor-driven centrifugal pump, the 10-in. suction intake pipe of course going near to the bottom of the sewer in order to establish a perfect syphon. The condensers are so arranged as to permit condensing water to be run either way through the condenser so that they can be freed from any seaweed that may be drawn up through the sewer. After passing through the condenser, the water is returned to a second sewer similar in all respects to the first. The hot water from the condenser is passed to a hot water tank located in one corner of the engine room by means of a 10 x 10 in. Edwards triplex motor-driven air pump. The details of this

arrangement and the relation between the several pieces of apparatus are clearly indicated on one of the accompanying drawings.

The arrangement of intake and discharge sewers is somewhat unique. Each sewer is oval in shape with brick walls 9 in. thick. The river end of the intake sewer is protected by a screen composed of $\frac{3}{4}$ -in. iron rods, going down to about 7 ft. below mean low tide.

from the condenser being drawn into the intake sewer. The discharge sewer empties into an open crib which insures protection from ice and other obstructions.

The engine room floor line is 12 ft. 10 in. above the basement floor line so that no part of the generating unit except the generator itself appears above the true floor line of the engine room. There is no



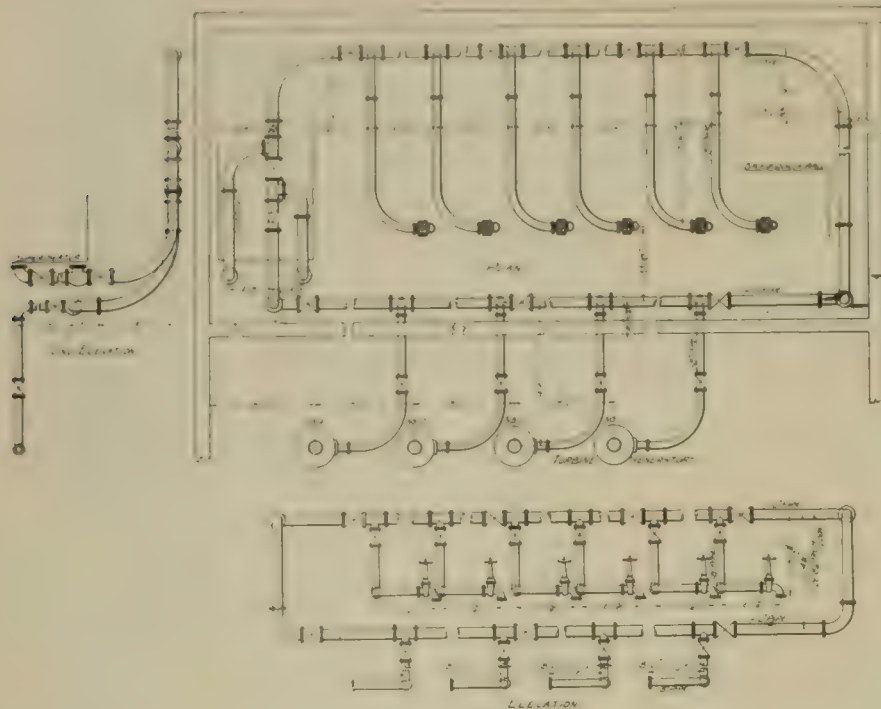
PLAN AND ELEVATION OF TURBO-GENERATOR UNIT AND ACCESSORIES.

There are two sluice gates, either one of which can be closed in order to clean the screens. Each of the sluice gates is a copper screen of about $\frac{1}{2}$ in. mesh. The river end of the discharge sewer is located some distance away from the intake sewer on the opposite side of a long stone wharf, so there is no danger of the hot water

woodwork whatever in the construction of the building, the engine room flooring being supported on 8 in. I beams with "Columbian" fireproof flooring, covered with 1 in. of granolithic material.

For supplying current for electric railway purposes there are three 250 kw. motor generators which take current from the turbine gen-

exciter at 2,500-volt alternating current and deliver 600-volt direct current to the electric railway trolleys. For lighting purposes the initial current will be sent out at 2,500 volts alternating and will then be transformed and sent to customers at 125 volts alternating current in the usual way. For exciting the turbine generator there are two exciter sets, one of which is motor driven and one engine driven, either one of which may be used for exciting four units.



ARRANGEMENT OF STEAM PIPING.

The motor-driven exciter unit comprises a 35 kw. 60-cycle 2,200-volt, induction motor, driving a 30-kw. 125-volt generator. The engine-driven exciter set comprises a marine type engine, driving a 30-kw. 125-volt General Electric generator.

The plant is equipped with a 20-ton traveling crane and has a brick chimney 175 ft. high with an 8-ft. straight flue. For the convenience of employes there is a toilet and wash room with shower bath, lavatory, etc.

EQUIPMENT OF RAILWAYS WITH CONVERTER SUB-STATIONS.

BY ALTON D. ADAMS.

Copyright, 1903, by Alton D. Adams.

Alternating current may be generated on one of four plans for a railway that extends beyond the limits of economical distribution with direct current from a single power station. On one plan generators yielding direct current may be entirely discarded and alternators employed for the entire output, as was done in the 40,000-kw. station of the Manhattan Elevated railway. An obvious advantage of this plan is the fact that all generators may be operated in multiple and that each generator may supply energy to any part of the railway line. On the other hand this uniform equipment of alternators carries with it a large investment in transformers and rotary converters. Thus the distribution system of the Manhattan Elevated includes 78 transformers with a total capacity of 42,900 kw., and 26 rotary converters with a combined capacity of 39,000 kw. In other words, the alternating generators with their sub-station equipments represent three times the capacity of direct current generators necessary to deliver energy at an equal rate. The showing as to capacity of generating and sub-station equipments just stated is by no means peculiar to the Manhattan system. Lines of the New Hampshire Traction system have extremes 75 miles apart and are operated by

a main station of 2,000 kw. capacity. This system has nine sub-stations containing 45 transformers with a combined capacity of 5,010 kw., and 15 rotary converters with a combined capacity of 4,350 kw. The total capacity of equipment at the main and sub-stations of this system is thus 11,360 kw., or 5.5 times the capacity of the main generators. It is the intention to add a 2,000-kw. generator to this equipment, but if this is required to feed present sub-stations the total capacity of 13,360 kw. will still be 3.34 times that of the main generators.

Where the generating station is a long distance from any part of the electric railway line, the saving in the cost of conductors effected by a high voltage of transmission may well warrant the exclusive use of alternating generators and a large investment in transformers and rotary converters. In the more common case the generating station can be located close to some portion of the railway and often near a point midway of its length, and then the exclusive use of alternating generators is of questionable expediency unless the road is very long.

One solution of the problem where the generating station is near the railway line lies in the use of both direct current generators and alternators, the former to supply that part of the railway nearer to the main station, and the latter that part which is more distant. This plan was followed in the generating station of the Brockton & Plymouth railway which contains an alternator of 300 kw. and direct current generators of 500 kw. capacity. In length this railway is 22 miles, with the generating station close to the tracks and three miles from one end of the line. A single sub-station is located on the railway line and 11.83 miles from the generating plant. This

sub-station has a capacity of 400 kw. in transformers and 400 kw. in rotary converters, so that the sub-station equipment has a capacity only as great as that of the main generators. A disadvantage incident to the plan of equipment just considered is the fact that the direct current generators cannot under ordinary conditions supply the more distant parts of the road, while the alternators cannot supply that portion nearer the main station. In a particular case, however, this disadvantage may be a very small one.

Another plan for the equipment of a railway a part of which is quite distant from the generating plant includes the use of double current machines for a part or all of the generator capacity. If a part of the generators are of the double current type, delivering direct current at about 600 volts for that portion of the railway near the main station, a saving is made as to transformers and rotary converters in sub-stations, but these transformers are simply transferred to the main station if the double current generators are to work at any time on the more distant parts of the railway. If, however, the alternators and double current generators correspond in voltage phase and frequency, then the double current generators when used to supply distant parts of the line may operate through transformers used at other times to step up the voltage of the simple alternators. In the same way, if the entire equipment of generators is of the double current type, the transformer equipment at the main station need correspond in capacity to only that part of the generators which will be required to supply distant portions of the railway at any one time. The new power station of the Detroit, Ypsilanti, Ann Arbor & Jackson Railway, which supplies 100 miles of line, contains simple alternators of 1,250 kw. combined capacity, and double current generators with a total capacity of 750 kw. All of these generators operate at an alternating voltage of 390 three-phase, and the transmission line is supplied by a bank of transformers rated at 1,200 kw., which raise the pressure from 390 to 21,000 volts. Either the simple alternators or the double current machines may thus supply the transmission line and sub-stations through these transformers. Ordinarily the simple alternators work through the

transformers, and the double current machines operate that portion of the railway nearest the power station. The sub-stations of this system contain 6 transformers rated at 1,200 kw., and 4 rotary converters rated at 1,000 kw., so that the sub-station capacity in both transformers and rotaries is 1.1 times that of the main generators. If the step-up transformers have their capacity added to that of the sub-station equipment the total is 3,400 kw., or 1.7 times that of the generators. It is to be observed that the 1,250 kw. of simple alternator capacity in this case cannot be applied to the operation of that portion of the railway nearer the power plant, as might be done if the simple alternators were changed into double current machines by the addition of commutators.

In the power station of the Worcester & Southbridge railway both generators are of the double current type and have a combined capacity of 800 kw. at the three-phase pressure of about 355 or 550 volts on the commutators. Six transformers of 450 kw. capacity step up the generator voltage to 11,000 for transmission to the sub-stations which contain transformers of 450 kw. and rotary converters of 400 kw. total capacity. The total capacity of transformers and converters at the main and sub-stations is thus 2,300 kw., or 2.87 times the generator capacity. This railway is about 20 miles long with its generating station near the center and a sub-station near each end, so that a greater portion of the line can be operated with direct current from the main station than could be so operated on the Brockton & Plymouth railway. Nevertheless the latter system shows a lower ratio of transformer and converter capacity to that of generators. The Detroit, Ypsilanti, Ann Arbor & Jackson road is so long that its ratio of combined transformer and rotary capacity to that of generators must be large if only a single power station is operated.

Still another type of equipment for long railways includes generators all of the direct current type, plus rotary converters and transformers at both the main and the sub-stations. Such equipment has been used in some cases to extend previously existing railway systems, but involves a large relative capacity in transformers and rotary converters. Take for example the Oley Valley railway, for which two rotaries of 800 kw. combined capacity are operated in the power station at Reading to supply 18¾ miles of line running to Philadelphia. These rotaries take direct current at 550 volts from the main generators and change it to three-phase alternating for three transformers of 840 kw. total capacity where the voltage is raised to 16,000. Current at this voltage goes to two sub-stations which contain transformers of 600 kw., and rotaries of 600 kw. capacity, so that the entire rotary and transformer capacity for this line amounts to 2,840 kw. Taking the capacity of direct current generators required to operate the system at 800 kw., it appears that the transformers and converters employed represent 3.55 times this capacity. The use of an 800-kw. high voltage alternator in this case would have displaced 800 kw. in direct current generators, 800 kw. in converters and 840 kw. in transformers.

When direct current generators are abandoned for alternators the general practice is to pass at once to a line of voltage of 11,000 to 13,000, because alternators are now regularly built for these pressures. If the voltage of alternators equals that required for the transmission line the expense of step-up transformers is avoided, and this is an advantage if the first cost and subsequent maintenance charges of the high voltage alternator are not greater than the like cost and charges for a low voltage alternator and its step-up transformers. The tendency is to hold to a voltage of about 13,000 even on very long lines of railway, because this voltage represents the highest pressure for which alternators are regularly built, so that a higher line voltage would be apt to imply step-up transformers. This tendency may be noted on the New Hampshire Traction system, where one end of the railway is 50 miles from the power station and the transmission voltage is 13,200; also on the Albany & Hudson line where one end of the tracks is 27 miles from the generating plant and the voltage of transmission is 12,000. In both the cases just named the line voltage is developed in the generator armature coils. There is a tendency to push the voltage of alternators to still higher figures, one instance being seen in the Washington, Baltimore & Annapolis Electric Railway now under construction where the generators will develop a voltage of 15,000 in their armature coils.

In the relatively small number of cases where transformers are employed to give a voltage above that of standard generators, for transmission along railway lines, some rather high figures have been selected. Thus the transmission on the Detroit, Ypsilanti, Ann Arbor & Jackson Railway is carried out at 21,000 volts, on the Aurora, Elgin & Chicago Railway at 26,000 volts, and on a line under construction in Indiana the voltage of transmission along the railway is said to be 32,000.

As a voltage of 50,000 is regularly employed on the power transmission lines between Canon Ferry and Butte, Montana, and a voltage of 40,000 has been in use several years on other transmissions. It seems that the present voltages of railway lines may be materially increased where the length of the road makes it desirable. The necessity for using step-up transformers for a part of the output is perhaps the greatest objection to the exclusive employment of double current generators for a long railway. Where the greater part of the generating equipment consists of simple alternators without commutators, as on the Detroit-Jackson road, there seems to be a disadvantage in holding the voltage of the alternators down to that of the double current machines. Thus in the system just named the 1,200 kw. of transformers at the main station might have been avoided if the 1,250 kw. of alternators had been given a voltage of 13,000. On the other hand it may be said that the voltage of 21,000 actually employed made a saving in line conductors over their cost at 13,000 volts, and that it is an advantage to be able to work the 750 kw. of double current generators on distant parts of the railway.

With very slight exceptions three-phase rather than two-phase transmission and equipment has been adopted on electric railways. One instance of the use of two-phase generators for railway purposes is that of the Youngstown & Sharon system where their capacity is 2,000 kw., but these generators also furnish current for lighting. A frequency of 25 cycles per second is much the most common in railway generators, but there are some variations on each side of this figure. Probably the lowest frequency applied in railway work is that of 16.2-3 cycles per second, which is to be used in the operation of the Washington and Baltimore line, where the current will be single phase. On the Detroit & Port Huron road the frequency is 28, and on the Detroit & Jackson 29 cycles per second. Where the same power plant operates an electric lighting as well as a railway system there is some inducement to adopt a frequency much higher than 25 cycles. Thirty cycles per second give fair results as to the absence of flicker in incandescent lamps, but for satisfactory arc lighting between 40 and 50 cycles are necessary. Generators in the main stations of the Albany & Hudson, and also the Youngstown & Sharon railways work at 60 cycles, but so high a figure increases the numbers of poles, armature slots and commutator segments in rotary converters to an undesirable extent. If as much as 60 cycles is desired on lighting circuits, it seems better to operate motor-generators with 25 cycle current from the main generators, and let these motor generators carry the lighting load. This is the practice at the generating station of the New Hampshire Traction system. If there is a large load of incandescent lamps as well as a railway to be operated it is a good plan to use main generators of 30 cycles per second and then it is only necessary to have motor generators for the arc lighting.

Where step-up transformers at the main station are employed to raise the generator voltage, the number of these transformers is often only three and seldom more than six. In illustration of this difference in practice it may be noted that in the main station of the Houghton County railway the 600 kw. capacity of step-up transformers is divided into six units, while three transformers furnish the 1,200 kw. capacity in the generating plant of the Detroit & Jackson road.

In view of present methods of transformer construction it may be doubted whether any greater reliability of two sets of transformers makes up for the lower cost and higher efficiency of a single set, where moderate sizes are under consideration. Transformers in sub-stations are limited in capacity to a certain extent by the sizes of rotary converters which they serve. Three transformers must usually be connected in a bank and the general practice is to provide a separate bank of transformers for each rotary converter. With this practice the size of converters must be comparatively large if the capacity of individual transformers is to be other than small.

It is usually thought desirable to have at least two rotary converters at each sub-station, but if the capacity of individual machines is to be kept up to a high point this number can seldom be exceeded. It is seldom desirable to install converters of less than 250 kw. each, even if only one is placed in each sub-station. On the New Hampshire Traction system there are nine sub-stations including one in a box car, and the number of rotary converters is 15, three sub-stations having one each and the remaining six sub-stations two rotaries each. The smallest of these converters has a capacity of 250 kw. The total number of transformers in the nine sub-stations is 45, three being connected to each rotary, and the transformers range from 100 to 120 kw. each in capacity. Sub-stations on the Manhattan Elevated number eight and contain 26 converters of 1,500 kw. each, or 39,000 kw. so that the average capacity is nearly 5,000 kw. per sub-station, which is much greater than that on any other system. Three transformers of 500 kw. each are connected to each of these rotaries.

It is not desirable to operate transformers at overloads to any great extent, and for this reason it is a common practice to give a bank of transformers a greater capacity than the rotary to which they are connected. Thus at the sub-stations of the Worcester & Southbridge railway the total converter capacity is 800 kw. and the

LOUISVILLE RAILWAY RELIEF ASSOCIATION.

The annual report of the Louisville Railway Relief Association shows the association to be in a prosperous condition and to have accomplished much good during the year.

The report of the financial secretary shows that, during the year the receipts from all sources amounted to \$4,902.22. The amount paid in dues was \$2,839. The Association received a handsome Christmas donation of \$2,000 from the Louisville Railway Co. through the president, Mr. T. J. Minary. Prof. B. B. Huntton, of the Kentucky Institute for the Blind, sent a check for \$10 in appreciation of the kindness shown by the men on the Market-street line to the children of the school. Interest, etc., of \$53.22 made the total receipts \$4,902.22. The disbursements were \$2,930.93. One hundred and twenty-three members drew sick benefits amounting to \$1,807.40; death benefits paid were \$750. The general expenses for the year were \$373.53. The cash on hand Jan. 1, 1903, amounted to \$4,395.04.

The association adopted a resolution thanking Mr. Minary and the directors of the company for the donation of \$2,000 and for the many other indications of good will shown the employees during the year.

| ELECTRIC RAILWAYS | | | | | | | | | | | | | | | |
|------------------------------|----------------------------------|-------------------------|--|---|----------------------|--------------------------------|----------------------|-----------------------------|---------------------------------|----------------------------------|-----------------------------------|------------------------------------|------------------------------|-------------------------------|---|
| | Number of alternating generators | Kw. of each alternator. | Number of direct or double-current generators. | Kw. of each direct or double-current generator. | Volts of alternator. | Cycles per sec. of alternator. | Phase of alternator. | Volts of transmission line. | Number of step-up transformers. | Kw. of each step-up transformer. | Number of step-down transformers. | Kw. of each step-down transformer. | Number of rotary converters. | Kw. of each rotary converter. | Ratio of kw. of all transformers and converters to kw. of all generators. |
| Manhattan Elevated..... | 8 | 5,000 | | | 11,000 | 25 | 3 | 11,000 | | | 78 | 550 | 26 | 1500 | 2.47 |
| New Hampshire Traction | 2 | 1,000 | | | 13,200 | 25 | 3 | 13,200 | | | 6 12 127 | 100 120 110 | 3 12 11 | 250 300 | 4.68 |
| Aurora, Elgin & Chicago..... | 3 | 1,500 | | | 2,300 | | 3 | 26,000 | 36 | | | | | | |
| Albany & Hudson..... | 2 | 750 | 2 | 200 | 12,000 | 60 | 3 | 12,000 | | | | | | | |
| Detroit & Jackson..... | 5 | 250 | 3 | 250 | 300 | 29 | 3 | 21,000 | 3 | 400 | 6 | 200 | 4 | 250 | 1.70 |
| Berkshire..... | 2 | 750 | | | 13,300 | 25 | 3 | 13,300 | | | 18 | 100 | 4 | 300 | 2.26 |
| Boston & Worcester..... | 1 1 | 1,000 500 | | | 13,200 | 25 | 3 | 13,200 | | | | | | | |
| Brockton & Plymouth | 1 | 300 | 1 | 200 | 380 | 25 | 3 | 13,000 | 6 | 90 | 6 | 90 | 1 1 | 250 200 | 2.16 |
| Worcester & Southbridge..... | | | 2 | 400 | 355 | 25 | 3 | 11,000 | 3 | 200 | 12 | 75 | 2 | 300 | 2.87 |
| Oley Valley..... | | | | 800 | | | 3 | 16,000 | 3 | 280 | 6 | 100 | 2 12 | 400 300 | 3.55 |
| Detroit & Port Huron..... | 3 | 500 | | | 390 | 28 | 3 | 16,000 | 6 | | | | | | |
| Washington & Baltimore | 3 | 1,500 | | | 15,000 | 16 | single | 15,000 | | | 18 | 250 | | | |

total transformer capacity 900 kw. Again, on the Detroit & Jackson road the sub-stations contain transformers of 1200 kw. and converters of 1000 kw. capacity.

In a sub-station on the new Manchester & Concord railway an arrangement of transformers and rotaries has been made which seems to offer some advantages as to the first cost of transformers and their ability to give good results under overload. At this sub-station there are two rotaries each rated at 300 kw. Under the ordinary practice these rotaries would require six transformers of, say, 120 kw. each. Only three transformers have been installed at this sub-station, however, and each transformer is rated at 200 kw., or 600 kw. for the group. On each transformer the secondary winding is in two electrically separate parts. One part of the secondary winding on each of the three transformers is connected with like parts on the other two transformers, and the group of windings thus formed is connected to one of the rotary converters. Another like group of secondary windings is connected to the other converter. The first cost of these three transformers of 600 kw. was no doubt less than of six transformers of say $120 \times 6 = 720$ kw. would have been, and when only one rotary is working there is a large reserve of transformer capacity behind it.

Considering all the factors that effect the capacity of transformer and converter equipments on electric railways, it seems that this capacity may be made the lowest by using alternators of the line voltage, direct current generators for those parts of a railway close to the power station, and transformers with double secondary windings at sub-stations.

The Norfolk Railway & Light Co., of Norfolk, Va., has opened its extension in Montalant for traffic. The cars run from Montalant to the stockyards.

ATTEMPT TO DEFRAUD THE METROPOLITAN.

Luke D. Stapleton, attorney for the Metropolitan Street Railway Co., of New York, recently revealed what is believed to be a plot to exact from the railway company \$50,000 on a fraudulent claim brought by Wm. Kelley against the railway company.

The plaintiff was injured in a railroad freight yard some fifteen years ago. As a result he became afflicted with double vision, hysterical tremors, and paralysis. His lower limbs are crippled. Since that time he has been used as a clinic exhibit by physicians throughout the city.

On Apr. 8, 1901, Kelley was knocked down by one of the Metropolitan company's cars. He was taken to a hospital but was discharged the same day; later he sued the company. In the trial several physicians testified as to Kelley's condition previous to his alleged injury, and a policeman testified that he had been offered \$25 to give evidence favorable to the plaintiff. At this point the plaintiff's attorney withdrew from the case and the trial was continued.

It is announced that the Manhattan Railway Co., of New York, is to install escalators, or moving stairways, at its 33rd St. and 42d St. stations; for both the uptown and downtown platforms.

The interurban line between Seattle and Tacoma recently sustained considerable damage from high water, several large washouts occurring. Temporary repairs were soon made so that partial service is being maintained until such time as permanent repairs are completed.

Street Railway Park Development.—III.

Park Advertising Acoustics of Park Buildings—Aquatic Attractions for Parks—What a Street Railway Park Should Be—Descriptions of Street Railway Parks—Opinions from Park Managers.

PARK ADVERTISING.

BY C. W. WADDELL

Judicious advertising pays.

Usually a good business proposition is a good advertising proposition. If we have an article or commodity which we desire to sell, others must know it before we can sell it. If our commodity is meritorious and is capable of supplying the want or of performing the service for which it was intended, others may buy it if we can convey the facts concerning it in such a manner as to inspire confidence in our statements.

If we were obligated to use our lips in publishing information, our business would, from necessity, be quite small. To extend our business, we would, therefore, seek some better medium for the transmission of our statements or desires. If for this purpose we should use a newspaper, print hand-bills, or placard the fences, we would call it advertising.

An advertisement is a common carrier of business ideas. In transporting these ideas to the public it performs a function that is of primary importance to the commercial world. A majority of business men admit the value of advertising, and in some way advertise, but few of them advertise judiciously. To many it means a lavish outlay of money without much thought as to the manner of spending it.

The limitations of this article will not permit of a comprehensive discussion of the principles of advertising, in general, or of their application to parks in particular, but we shall endeavor to frame an outline of our views which we trust may be of some assistance to owners and managers of "Traction Parks." If our views cannot be accepted, we hope they may be useful in stimulating a more careful consideration of the subject we have in hand.

It is essential that we should determine, as nearly as possible, the amount of money we intend to spend for advertising before the park season opens. In estimating this expenditure we should not overlook our mathematical limitations. The capacity of the car lines and the number of seats at the park will always limit our patronage. We cannot expect to entertain more persons than our maximum capacity will admit, and should not make an expense not justified by our possible maximum revenue. Inside these fixed boundaries, our policies should be as liberal as prudent economy will permit.

However good our attractions may be, we will have to rely upon our advertising to bring out the people. Good attractions justify good advertising, and both are necessary to the production of good business. We think that a false idea of economy in expenditures often prevents the successful operation of a park enterprise. Economy is the wise expenditure of money. In the opinion of many, blind retrenchment is economy. This kind may reduce the expense account, but if steadily pursued, is sure to result in a large reduction of income. There can be no exact rule for determining the precise sum that should be spent for park advertising, but we think we have suggested a basis on which good judgment may found an opinion.

The patronage of parks and summer resorts is from the masses, and embraces persons in every condition of life. It includes the banker, the merchant, the professional man, the artisan, the laborer, and their wives, sisters, mothers and children. We must reach all of them when we advertise.

If we were selling grain, live stock, agricultural implements, or steam engines, we should address a limited number of patrons and should select the medium best suited to convey advertising matter to each class. In advertising articles of large value, such as pianos or street cars, we might employ a medium that would reach a small number of persons, on the ground that one sale would justify a large expense in procuring it. In our park business it is quite different, we are selling entertainment to everybody at a small price, and each dollar expended is going to a many customers.

It is obvious that our conditions require the employment of a

medium that will reach every man, woman and child. The daily newspapers, street car banners and bill boards furnish the best opportunity for widespread advertising, and we think they are the best for our use.

The newspapers not only reach the masses, but do it daily, thus affording the opportunity to keep live matter before the public all the time. This is the most expensive kind of advertising, but it is the best if properly handled. The methods of many of our large daily papers, are often times new and startling to the uninitiated. Even the old advertiser is sometimes a little shocked. They charge a larger rate per agate line for amusement advertisements than for any other class. This charge is made on the theory that they will publish an indefinite amount of press comment or criticism. These so-called criticisms are really half-breed advertisements made to resemble news. They are usually written by an employe of the advertiser, and may be trimmed down, or cut out, according to the managing editor's views or policy. If the editor thinks that your company is not spending or does not intend to spend enough money for display space, or that you are otherwise delinquent in your duty, he mildly reminds you of your delinquency by an abridgment of your press notices. If he thinks you need shaking up, he may publish a real criticism not intended to benefit your business. You may be entitled to your opinion in this instance, but it is not always wise to express them. This conduct on the part of a newspaper may seem high-handed, arbitrary, and unjust, as it sometimes is, but it is often occasioned by the attitude of the advertiser. Many managers think that they have an arduous task in handling the papers, and that to procure good notices they must continually strive, beg and fight for special favors. If they adopt the doctrine that press notices are like kisses and go only by favor, they need not be surprised if the managing editor does not agree with them. There are good papers and bad ones. Some of the bad ones misuse their power, and maliciously injure those whom they dislike or desire to control. The public has no adequate protection from these. They need no further comment here.

The average newspaper man is a good fellow. He loves his friends and hates his enemies, and seldom neglects either of them. His friendship often finds expression in substantial favors. He gives without grudging, but like other men, he expects reciprocal treatment. Managers too frequently misunderstand and fail to appreciate him. If they always insist upon being paid the full cash value of his friendship in good advertising, they will sometimes find him sullen and exacting, and that their "pull" has been exhausted. It is impossible for a newspaper to agree to deliver a specific amount of space in its reading columns, chiefly for the reason that the public reads the amusement notes for information as it does other portions of the paper. For that reason the statements made must not only approximate the truth, but must also contain an element of novelty or fact presented in an interesting manner. It is therefore quite proper that the material presented for this department should not only be edited but controlled and restricted lest it should degenerate into bald advertising. Having lost its news features it would have no value as a part of the paper, and be of little benefit to amusement managers.

The advantage of having a capable press agent, one who can write readable and attractive stories, is obvious. The right kind of a man in this capacity will fill twice as much reading space as a poor one and save nearly all the trouble in procuring the insertion of his material.

Amusement advertisers could save much trouble and some money by a frank statement to the press as to the number of lines of display they expect to use during the season. They might even make an agreement to this effect based upon assurances from the newspapers as to their general policy relative to press notices. This understanding or agreement would disarm the suspicions of both parties, and thus remove a large cause of trouble.

Street car banners are next in value to newspaper advertising.

They are the least expensive form of advertising employed by park managers. Banners on the sides of the cars one yard wide and four yards long are the most effective. In wet weather they sometimes damage the varnish. This is the only objection to their use. We think they will pay for a good deal of varnish. They might be removed in stormy weather and save both banners and varnish. The banner and the billboard cover almost the same field. Billboards are stationary and can only be seen by the persons who pass them, while each banner may be seen many times during the day throughout the entire length of the line over which the car passes. The board has one superior advantage in that it permits the use of pictorial matter. Good pictures are very useful in attracting attention and in conveying impressions. In cities where it is possible to put billing matter on the cars we think that the boards can be dispensed with for the reason that they perform a similar service and on account of the great expense that must be incurred in a thorough billing on the boards. In case street cars cannot be used, the boards are almost indispensable to supplement newspaper advertising.

Advertisements in small local publications, score cards, bills of fare, etc., cost too much, circulation considered, for park purposes. The only justification for their use is that they sometimes furnish an opportunity for a street railway corporation to express its friendship and good-will.

Having discussed the various means of advertising we will consider the advertisement. The wording of an advertisement is very important. Common sense may suggest the best vehicle to convey our

advertisements press notices have not been included, being in appearance and, to some extent in fact, news items, they require different treatment and different talent for their creation. A good man with some newspaper training is best qualified to write them. The manager can perform a valuable service if he is able to furnish good material and suggestions from which the press agent can construct interesting statements and stories. This duty is too important to be overlooked or underestimated.

While it may be permissible to allow the imagination some latitude in writing press notices, or to use strong adjectives in display advertisements, there should be no outrage to the truth. A lie in cold print admits of no excuse or explanation. A successful business must be founded upon public confidence.

AQUATIC ATTRACTIONS FOR PARKS.

Fortunate is that park manager whose park property includes within its area some sort of body of water, be it lake, river or only a frog pond in which water lilies can be grown. The summer theater, merry-go-round and the hundred and one other artificial park attractions have come to be indispensable adjuncts to the successful up-to-date "trolley park," but a lake or sheet of good clear water is one feature that attracts young and old alike, day in and day out. Given a suitable body of water there is scarcely a better investment that can be made than a small expenditure for row boats, launches, toboggan slide and bathing houses, for these not only draw patrons



WADING POOL AT AUDUBON PARK, NEW ORLEANS.

ideas, but the expression of these ideas requires tact, skill, inventive genius and a knowledge of human nature. A good idea poorly expressed may lose its force and importance. A poor idea, skillfully expressed may pass for more than its worth. The truth of these statements applied to advertisements will be apparent to any one who will recall at random any advertisement he may chance to think of. He will usually find that the ideas of this particular advertisement are clearly and tersely expressed and stand out so prominently as to burn themselves into the memory, and that they have intruded upon his mind without his volition. There are few persons who can not remember instances when they have been influenced by these unbidden guests.

One idea or one dominant idea is enough for a car banner or a display advertisement. It is a happy circumstance that it is so, for it enables us to make more out of our material.

An advertisement should be set up right. If left entirely to a printer or a sign writer its value may be lost by poor judgment as to display or arrangement. There is also danger that the style may be so nearly the same each day that notwithstanding the matter has been constantly changed, it appears the same to a casual observer. The individual soldier loses much of his individuality and identity in the uniform of the army, and so it will be with our advertisements, if all of them appear clothed in the same type.

Specially designed letters and words both for display matter and banners can be made very effective. The slight additional expense amounts to but little.

In this brief view of the construction and wording of amusement

to the park, but in themselves return sufficient revenue over the cost of operation to go a long way toward defraying the general park expenses.

So effective is a body of water as a drawing card, that in nine cases out of ten it will be a good financial investment to create a lake by artificial means in a park where nature has not provided one, and it is surprising how much can be accomplished in this direction by the exercise of a little ingenuity. A small stream properly dammed or turned from its natural bed if need be, a natural spring, an artesian well or even connection with the city water mains, can be utilized for this purpose, and by leading the waters into a natural depression in the ground or if the case requires, into an artificial reservoir, the much-desired "lake" can be produced at insignificant cost. Perhaps it is not always expedient to create a large body of water, but even a pond is better than no water at all.

The reproductions from photographs herewith show good examples of what can be accomplished in this direction. At Audubon Park, formerly owned by the New Orleans & Carrollton Railroad, Light & Power Co., a small amount of money was spent in producing the children's wading pool, the popularity of which is attested on almost any pleasant afternoon in the year by scores of youngsters with skirts or trousers turned high out of harm's way, splashing water over each other, sailing miniature fleets of sail boats, and getting about all the fun out of life that a warm sun-shiny afternoon can bring forth. The children are usually attended by nurses or guardians, all of which, be it noted, means increased riding. It is reasonably safe to say that a wading pool of this nature can be

created in any locality at a cost not to exceed \$25 and certainly not over \$50, for it merely means the leading of a small supply of water to some slight depression in the ground. A few wagon loads of sand or small gravel dumped around the edges of the pond will add greatly to the charm of the pond, viewed from the children's standpoint.

At Raleigh, N. C., the patronage at the suburban park has been very perceptibly increased by building a wooden bathing tank and suitable bathing houses. This tank is about 90 ft. square and was formed by making a suitable excavation and laying in the bottom a wooden flooring which was rendered sufficiently water-tight by laying the timbers close together on a bed of clay. The floor is laid sloping to give a graduated depth varying from 2 ft. near one side to 9 ft. at the other, so as to accommodate those who enjoy a good swim and also those who do not like to venture beyond their depth. The bathing houses are arranged along one side. Water for the tank is obtained from a nearby stream, and by regulating the flow, the water in the tank is kept fresh and clean. The charge for a bath house is 10 cents. It cost just about \$700 to build the tank and bath-



BATHING TANK AT RALEIGH, N. C.

ing houses, and the financial returns on the investment can be judged when it is stated that on a single warm day, the receipts for rent of bathing houses has been as high as \$300, to say nothing of the extra fares collected on the cars. This idea of the bathing tank is also applicable to practically any locality. By placing two or three arc lights about the tank, the place can be patronized in the evening as well as during the day.

ARCHITECTURAL ACOUSTICS.

The subject of architectural acoustics, or the science of sound as applied to buildings, is a topic frequently arising for consideration in electric railway offices, in connection with the designing or remodeling of employees' mutual benefit association rooms, casinos, pavilions, or theaters and other buildings for park or pleasure resort purposes.

Although it is not feasible in this class of work to give the same attention to the details of acoustics as is demanded in more expensive buildings, there are a few general principles which if followed will give any room increased hearing and seeing properties with but slight additional cost. In designing a summer theater, for instance, the very idea to be carried out precludes the building of side walls, for the circulation of air and outdoor effect comprise the chief charms of the structure. Necessarily, a building without side walls does not possess the acoustic properties of an enclosed room, but even in these cases better results can be secured by following a few well-designed and easily understood principles that enter into the transmission of sound.

Conceiving the simplest possible auditorium, we would have a level and open plain with the ground bare and hard, and a single person for an audience. It is clear that the sound spreads in a hemispherical wave, diminishing in intensity as it increases in size. If, instead of being bare, the ground is occupied by a large audience, the sound diminishes in intensity even more rapidly, being now absorbed. The upper part of the sound wave escapes unaffected, but the lower edge—the only part that is of service to the audience,

is rapidly lost. It will be observed that the audibility of a speaker's voice will be greatly increased, first, if the speaker be raised above the level of the audience; second, if the seats at the rear be slightly raised; third, if a wall be placed behind the speaker; fourth, if walls be built around the audience; and, fifth, if a roof be added to prevent the sound from rising and being lost.

Theoretically, the ideal shape for an auditorium or assembly hall of any kind is a perfect egg oval with the seating occupying the lower half of the room and the curved ceiling the top half. This ideal form is possible in but very rare cases, and practically never when commercial considerations enter into the case.

The best of the practical forms for a meeting room is a rectangular shape, but expert opinion differs as to the proper relations that should exist between the length and breadth, and between these two dimensions and the height. An excellent authority states that the dimensions should be in a proportion of one in height between the floor and ceiling, to one from rostrum to the rear walls to each two in width of room across the front of the stage, e. g., 50 ft. from front to rear; 50 ft. between floor and ceiling by 100 ft. wide. Other authorities assert, however, that the length and breadth should be the same or nearly so, and the height should be twice the length. As a matter of fact, it is probable that the size of a room is a very small factor in the problem of securing good acoustics, granted of course that the room is a perfect rectangle with no irregularities or recesses. Inasmuch as the shape of the room in the class of work under discussion is usually influenced by other considerations, the actual ratio of the dimensions can probably be disregarded, bearing in mind however that a very low ceiling is always objectionable. Irregular shaped rooms with groined or arched ceilings are bad.

Of much greater importance than the ratio of the general dimensions are certain phenomena observed in connection with the transmission of sound. The acoustics of a room will be influenced by any feature that tends to distort sound. This distortion may be caused either by interference or resonance. These two phenomena are closely alike, and both occasion the same evil, the distortion of that nice adjustment of the relative intensities of the components of the complex sounds that constitute speech and music. The phenomenon of interference merely alters the distribution of sound in a room, causing the intensity of any one pure sustained note to be above or below the average intensity at near points. Resonance, on the other hand, alters the total amount of sound in a whole room and always increases it. This phenomenon is noticeable at times in using the voice in a small room or even in particular locations in a large room.

These phenomena are closely analogous to the action of water in a large basin or tank when the surface is ruffled by some disturbance, such as the introduction of the hand at certain regular intervals at the center. It will be readily conceived that the intensity of the waves will depend largely on the time intervals at which the hand is introduced. If the disturbance is timed so that each outgoing wave reinforces a wave returning from the sides of the tank, the waves will soon become very pronounced. If, however, the motions of the hand be not so timed, it is obvious that the reinforcement will not be perfect, and, in fact, it is possible to so time it as exactly to oppose the returning waves. Conversely, it will be deduced that any interfering obstruction on the surface of the water, and also the shape of the basin, will influence the coincidence of elevations and depressions, the time interval of the disturbing influence remaining constant. (The deduction is therefore plain that obstructions in a room, as posts, etc., and the presence of irregular recesses in the walls, tend to reduce the acoustic values in any room. Round posts present less interference than square posts, posts placed at regular intervals less than posts placed irregularly, and one large recess than several smaller ones irregularly located.)

These phenomena should not be confused with the more important phenomenon of reverberation. Reverberation is defined by Prof. Wallace C. Sabine, of Harvard University, as follows:

"Reverberation may be regarded as a process of multiple reflection from walls, from ceiling and from floor, first from one and then another, losing a little at each reflection until the sound is ultimately inaudible. Sound being energy, once produced will continue until it is either transmitted by the boundary walls or is transformed into some other kind of energy, generally heat. This process of decay is called absorption."

In nine cases out of ten rooms are bad acoustically, because the

to be directed to the interior of the room, seat and furniture, and the sound waves to a great extent are absorbed. Each smooth hard surface throws back the sound waves, and the sound vibrations are reflected back, surface to surface, become confused, lose their integrity, and the result is a mass of sound, filling the whole room and incapable of analysis into its distinct reflections. If one chooses he can readily observe this in almost any medium size meeting room where the walls and ceiling are bare, and the seating composed of uncovered wood or metal seats. Each syllable of the speaker or each note of music will be audible for a definite period of time after the original sound has been uttered, and thus syllable following syllable, or note following note before the previous sound has died away leads to confusion or indistinctness. Reverberation includes as a special case the echo, which may be defined as a short, sharp sound, distinctly repeated by reflection, either once from a single surface or several times from two or more surfaces.

A room in which the reverberation is excessive usually can be quickly and definitely improved, and sometimes rendered perfect acoustically, by covering the seats and walls with some soft, dead or non-reflecting material, corresponding in finish to velvet or carpets. Only the walls that return the sound waves need be so treated. This added material can be supplied in the form of heavy curtains, draperies, cushions on the seats, and mats or carpets on the floor, the general law being that the greater the amount of sound-absorbing material brought into the room the better will be the acoustics. Large, exposed surfaces of glass are bad, and windows and heavy plate mirrors should be draped with curtain material.

By experiments carried out by Professor Sabine it has been determined that several of the more common materials have the following relative absorbing power, all of them being referred to an arbitrary standard rated as 1.00:

| | |
|---------------------------------------|-------|
| Wood sheathing (chandel pine) | .064 |
| Plaster on wood lath | .034 |
| Plaster on wire lath | .033 |
| Glass | .027 |
| Plaster on tile | .025 |
| Brick set in portland cement | .025 |
| Oil paintings | .28 |
| House plants | .11 |
| Carpet rugs | .20 |
| Extra heavy oriental rugs | .29 |
| Cheese cloth | .010 |
| Cretone cloth | .15 |
| Shelia curtains | .23 |
| Hair felt | .78 |
| Linoleum (louse on floor) | .12 |
| Plain ash settees (per single seat) | .077 |
| Plain ash chairs (bent wood) | .0082 |
| Upholstered settees (per single seat) | .28 |
| Upholstered chairs | .30 |
| Hair cushions (per seat) | .21 |
| Elastic felt cushions | .20 |

In addition to the materials in a room the audience itself is a sound-absorbing factor, and greatly improves the acoustics of a room. Professor Sabine has even gone so far after making several thousand tests as to prove that an audience composed entirely of women is a better absorbing medium than one entirely of men, and referring to the same standard he has determined that the absorbing power of an isolated woman is .54, and of an isolated man is .48.

Common sawdust, sifted on the floor to a depth of $\frac{1}{2}$ in. will greatly improve the hearing properties of any room that abounds in echoes and reverberations, and this is an easy method of proving how greatly a room can be bettered acoustically by introducing absorbing non-reflecting materials.

It is bad practice to plaster solid onto terra cotta, brick or stone walls, as this increases reverberation. In rooms where the wainscoting, paneled ceiling and doors and window finish have been covered with paint and varnish until the surface of the woodwork is covered with a thick glazed enamel coating that affords good sound reflection the room may be improved by first sandpapering the painted work until all the gloss is removed and then repainting with flat colors or paint without gloss.

Wires stretched across the ceiling are generally conceded to be of no avail in preventing reverberation or echo, as the individual wires offer but little obstruction to the reflected sound waves. Wire gauze

with the meshes not over $\frac{1}{4}$ in. square stretched a little distance below the ceiling will usually prove efficacious.

Sound waves are subject to various interruptions other than from actual material obstacles in a room; for instance, if the air be overcharged with humidity it will impede the progress of the sound waves, the breath and heat and air occasioned by and ascending from a crowd, carrying a much larger portion of sound upwards than approaches horizontally. Sound follows and is carried by currents of air, hence an open hot-air register in the floor immediately in front of the stage or platform upon which the speaker or singer is standing will materially interfere with the audibility of the words or music. It is desirable that the heating, ventilating and lighting room to be devoid of all draughts or currents. Acoustics will be better if the lighting is not all done from one large chandelier in the center of the room, or if the hot air is not supplied at one central point. It is better to distribute the lights and heating registers around the sides of the room.

Sounding boards are as a rule worse than useless, as they merely augment the reverberation. They are intended to be used only in rooms that are too large for the voice, or where extraneous sounds, as nearby steam railroads, street cars, etc., require artificial reinforcement of the sound waves at their point of origin.

We are indebted to works published by Prof. Wallace C. Sabine, Eugene Henri Kelly, of Buffalo, and others for part of the data contained in this article.

WHAT A STREET RAILWAY PARK SHOULD BE.

BY SETH BARHAM, SUPT. SPRINGFIELD TRACTION CO., SPRINGFIELD, MO.

The Springfield (Mo.) Traction Co. has on its lines two parks, Doling's Park of which Mr. R. L. Doling is manager, and Zoo Park, neither of which is owned by the Traction company. At Doling's Park is a theater capable of seating about 1,500 persons.

Our experience with parks operated for the purpose of increasing street railway revenues, has been in a small city, and what would hold good in a city of this class might not be suitable in a larger place. Therefore, I limit what follows to cities of between 25,000 and 50,000 inhabitants.

The first thing, in order to make a street railway park a success, is to get the park before the people. You must have something, or do something to attract the first notice. If you have a nice, well-kept park, plenty of grass, shade trees, and natural water, with some natural or manufactured scenery effects thrown in, you will get the first visit, and the occasional visit of the pleasure seeker. This occasional trip to the park must be made a habit.

The park must be made an attractive place in day-time, a place where anybody can rest and get recreation, a place where ladies can take the children for an outing, and the first attractions should be for the children. What pleases the child pleases the mother. All children take interest in swings, hobby-horse-merry-go-rounds, ponies, donkeys and monkeys. Amusements of this kind are inexpensive; get them first.

Next, cater to all good people's picnics, lodge picnics, church picnics, private picnics and excursions. Give them rates on everything; please them.

After you have in this way got people in the way of going to the park, some daily and some "once in a while," give them evening attractions—make the park habit nightly.

At night the park must always be kept well lighted and well policed. The moral tone must be kept high. Have some kind of attraction every night, so the habit will not be broken. One of the best drawing cards for this purpose is a stock company, dramatic or operatic show with vaudeville specialties between the acts. A theater show of this kind is better than straight vaudeville because it creates a more fixed interest. To prove this, ask the average patron, leaving a good vaudeville show how he liked it. He will say "good." Ask him if he will come again tomorrow, his answer will be "I don't know." Ask the same patron when he has seen a good play of the other kind and his answer will be "yes" or "no." The idea is, the vaudeville creates uncertain results, either good or bad; while with the "stock" show as the main feature the result is certain, either success or failure, according to merit.

The charges for all amusements should be as fixed as the street car fare, and as near the same basis (5 cents each) as possible. Let the people know what they have to pay—make it fixed, and when traveling attractions are booked for special performances always make the charges conform to a usual custom. If the attraction can not be secured on that basis, do not take it. Nothing raises complaint so quickly as changing prices. All street car passengers should have a transfer ticket from the car to admit them to the park grounds. After they are inside treat everybody alike.

On these theories this company has worked in connection with a park not owned by the company during the summer of 1902. The results to the company were satisfactory, and the owners of the park made net above all expenses 15 per cent on the valuation.

DESCRIPTIONS OF PARKS.

PITTSBURG, KAN.

Forest Park, about three-fourths of a mile from Pittsburg, Kan., is leased by W. W. Bell, who has improved the park by erecting a theater of 1,000 seating capacity, and other necessary buildings. Mr.

located in a natural grove of large cottonwood and other varieties of trees where rambling walks are laid out and shady spots abound. In the center of these grounds is a large body of water upon which a well-equipped boat livery is maintained, including power launches, row boats, etc. Near the lake is a large building containing swimming pools which are among the largest in the country. These are filled with the constantly flowing hot sulphur water coming from the earth at a depth of about 600 ft. and at a temperature of about 110° F. As this is running water, it always remains clean and refreshing. This park is also used as a health resort, and in the same building with the swimming pools are a number of private bath rooms equipped with porcelain tubs, reclining cots, etc., where hot sulphur tub baths are provided. The accompanying illustrations show several views in Urbita Hot Springs Park.

PHILADELPHIA, PA.

One of the most widely-known attractions of Philadelphia is Willow Grove Park which is operated by the Philadelphia Rapid Transit Co., but as an enterprise separate and distinct from any of the company's railway properties. The park is located in Montgomery



VIEWS IN URBITA HOT SPRINGS PARK, SAN BERNARDINO, CAL.

Bell states that the park has been operated for three summers and has been very successful, with excellent prospects for 1903. The remunerative attractions have been theatrical entertainments by stock companies with vaudeville teams between acts. The park comprises 40 acres and includes a half-mile training track.

SAN BERNARDINO, CAL.

The San Bernardino Valley Traction Co., of San Bernardino, Cal., owns a mile race track located three miles from the center of San Bernardino and seven miles from Redlands, upon the company's Redlands extension. This track is used for winter meets and training of horses, and a base ball and foot ball field is contained within the race course. This has proved to be a good feeder for the company's lines and a great attraction to winter tourists. In addition to the race track a park called Urbita Hot Springs Park is owned by some of the directors of the traction company, but is operated by a separate company called the Urbita Hot Spring Co. The park is located 1 1/2 miles from San Bernardino and is under the management of Mr. A. C. Denman, Jr. The hot spring are

County about 13 miles from the city and is under the management of Mr. C. P. Weaver, special agent, with headquarters at No. 810 Dauphin St., Philadelphia. Mr. Weaver is assisted by Mr. F. W. Harrold.

In regard to the attractions and methods of operation Mr. Weaver has written us as follows:

"We have a building known as the theater in which we have moving pictures and also have had the Merry Manikins for the past two or three years as a side issue. In another building known as the Fairy Theater, in which thirty people are employed, different plays for children are given, the only way to view the performance being through lenses; this is a novelty in the theatrical line, and was first introduced last summer. We also have 'Ye Olde Mill,' which consists of a waterway running through a building with many curves and corners, the length of which is about 1,000 feet. At busy times we operate as many as twenty boats, each boat being able to seat eight people. This has proved one of our best attractions at the park. Last year we carried 300,000 people, the charge for each person riding being ten cents. We also have a scenic railway, which is in fact a scenic railway, inasmuch as it runs through tree tops.

On this investment we carried in the neighborhood of 550,000 people during a season of 95 days. We have two carrousel both of which are very popular and profitable. We have also a new mirror maze, which is considered the best of its kind in the country, and has proved a very good investment. The toboggan chutes comprise a scenic railway combined with a chute the chutes. This has done a very good business since it has been built. However, it is our intention this year to substitute another scenic railway in its place. We also have a large 'Candyland' building, photograph building, news stand, orangeade building, cigar stand, soda water fountain, phonograph building, which do good business.

"Our main attraction at Willow Grove is the music. No charge is made to hear the concerts, seats being free. Last year we had five different bands during the season, the first being Sousa and his band; second, Victor Herbert and his orchestra; third, the Kilties, a Canadian organization; fourth, Clarke's American Band of Providence, and fifth, the Royal Marine Band of Italy. This year it is more than likely that we will have seven or eight different organizations.

"The park itself operates a large casino and two smaller cafes. The trolley railway encircles the park and on busy days as many as 160 cars have been operated on that branch alone, making the headway of each car about a minute. In the park proper there are 110 acres, included in which are three large picnic groves capable of accommodating about 40,000 picnickers. Swings, kitchens, etc., have been arranged in each grove.

"The seating capacity of our music shell under the pavilion is about 4,500, and with the seats in and around the pavilion it will hold about 12,000. It is no very uncommon thing for us to have an audience seated and standing in and around the music pavilion of twenty-five thousand people. Our largest day was July 4, 1902, at which time it was estimated that the attendance at the park was over 100,000.

"One of the most important features at the park is an electrical fountain, which stands in the middle of a large lake and which is operated at night with colors. It is said to be the finest one in the United States."

MANSFIELD, O.

The Citizens Electric Railway, Light & Power Co., of Mansfield, O., operates Lake Park Casino, situated about one mile from the center of Mansfield, which is under the management of E. R. Endley. There is a theater large enough to seat 1,000 persons. Mr. Arthur J. Haycox, superintendent of the railway department of the company, writes as follows concerning entertainments and park attractions:

"In speaking of summer parks and casinos, after six years experience, I must say that I am not very much taken with the casino as a money maker for street railway companies, largely on account of the kind of entertainments that we have to put up with. Vaudeville people get about double the money they earn. Only about one act in every ten is new to the audience and worth the money paid by the railway company. The park that pays is the park that draws picnic parties. A place out in the woods, where the fare is 15 cents one way, and 25 cents round trip. Let there be swings, and boating, golf and ball grounds, buildings where speaking can take place and where the people can be sheltered from a thunder shower. Let there be beautiful flowers, a few animals, etc., free telephone service to town, free lights, plenty of tables under the trees, in fact a place where tired people can go and get away from business two or three times a week in summer. It is not necessary to provide many extra men and cars and power for this kind of a park, but with a theater it is required to carry all the people out in about 30 minutes, with the same rush to get them home. The other kind of park may not have such large crowds, but it will draw some every day, and the 'regulars' will take care of the business and the company not have to pay out several hundred dollars extra every Saturday night."

CANTON, O.

The Canton-Akron Railway Co. operates a resort called Meyers Lake, which is about 1½ miles from Canton, O., and has recently leased a property at Springfield Lake, which is some 15 miles north of Canton. At Meyers Lake a stage has been erected, also a Fig-8 toboggan, a merry-go-round and a Ferris wheel. The company owns

here about 225 acres, 90 acres being comprised in the lake, and is well equipped for summer business. On the lake are a naphtha launch carrying 100 persons, and 50 row boats. There are also two large hotels where excellent meals are served and dances may be held. At Springfield Lake a pavilion has been built and boats will be put on the lake with the expectation of doing considerable business at the resort during the coming year. The manager of the railway company is Mr. George W. Rounds.

CORTLAND, N. Y.

The Cortland County Traction Co. owns and operates Cortland Park which is located about 2¼ miles east of the city on the Tioughnioga River. The most successful attractions are moving pictures, band concerts and fireworks. Dances are held twice each week and animals and a merry-go-round furnish amusement for children.

The company sends us a copy of a circular letter that is sent to all parts of the state, which we reproduce here, believing that the form may be found useful to other companies desiring to secure picnic parties for their parks:

"The management of the Cortland County Traction Co. desires to call your attention to the desirability of Cortland Park as an ideal place for excursions and picnics during the summer months.

"The park is located on the banks of the Tioughnioga River, about 2¼ miles east of the city of Cortland on a hill commanding a view of the city. The view is perfect; standing on the hillside one sees the city resting in a valley with its churches, schools and factories the whole forming a beautiful picture not surpassed by the villages the traveler views as he climbs the lofty heights of the Alps.

"The park itself consists of two large groves of elm, maple and hemlock excellently kept and bountifully supplied with tables, benches, etc., for picnics. This year the management has made a great effort to have the park attractive. It has secured and placed in the park a menagerie which includes monkeys, bears, deer, rabbits, etc., and which will be especially attractive to the children as well as to the older people. A merry-go-round operated by electricity has been placed in the park, also a large croquet ground, which is attracting no little attention; numerous large swings have been added and nothing has been left undone to make the naturally beautiful place bright and attractive.

"Surrounding the groves are beautiful woods with well-kept walks running through them, and plentifully supplied with rustic seats for the weary, or those who desire to sit and drink in the delightfully cool air and enjoy the shade listening to the birds, or watching the antics of the squirrels and chipmunks.

"In the lower grove is a large spacious pavilion in which refreshments are served at a nominal cost. The pavilion will shelter a very large number of people in inclement weather, and can be utilized for dining for picnic parties whenever the weather will not permit of the outside tables being used.

"The park is supplied with plenty of good cold spring water. The privilege of the kitchen will be given free to picnic parties to make coffee, etc. Electric cars run frequently between the park and the city. The management desires particularly to solicit picnic parties and excursions bringing along their own eatables and picnic in the park. No admission or charge for the grounds. No intoxicating drinks sold. Write for further information and particulars."

ALTON, ILL.

The Alton Railway, Gas & Electric Co. owns a tract of 22 acres located three miles from Alton, Ill., which has been very extensively patronized by picnic and other outing parties. The resort is known as Rock Spring Park and has been improved with a lagoon, green houses and pavilion.

READING, PA.

The Allentown and Kutztown Traction Co. at Reading, Pa., owns and operates two pleasure resorts known as Dorney Park which is about four miles from the center of Reading and about four miles west of Allentown. Also Fairview Grove, about five miles west. The park manager is Mr. F. S. Kinsey, Reading.

At Dorney Park there is a theater of 3,000 capacity, a lake suitable for boating, and swimming pool, basket ball court, pavilion, merry-go-round, water toboggan, dancing pavilion, base ball grounds and a first class hotel and restaurant. Ponies are also kept for hire.

Fairview Grove is used mainly by private picnic parties and for camp meeting purposes.

Mr. Kinsey writes us as follows in regard to plans for 1903 and results in 1902:

"Our season this year will very probably begin a week or two earlier than last year, when we opened on May 24th. At Dorney Park we handled during the past season from 12,000 to 15,000 people on each of our big days, and the attendance throughout the entire season was very good, but during the month of June particularly the weather was exceptionally bad, which interfered greatly with what would have been otherwise an equally successful month.

"At the theater we find that high class entertainments pay the best. Among other attractions we had the Kilties Band for three days, Ricobono Brothers' Animal Show, the latter coming to Dorney Park as the second stopping place in this country, we having engaged them while still in Europe.

"The trout ponds at Dorney Park have made the park a famous picnicking place for the past 30 years, and we now have more than a dozen ponds stocked with exceptionally fine trout. In addition to

pool room, bar room and restaurant. This park is located on the southeastern shore of Onondaga Lake, the property being surrounded by a 16-ft. board fence. To accommodate spectators of out-door games "bleachers" seating 2,500 persons have been erected. On the lake shore is a large dock or harbor for steamboats and launches.

HOOSICK FALLS, N. Y.

The Bennington & Hoosick Falls Railway Co., of Hoosick Falls, N. Y., operates Battlefield Park, which is located about nine miles from Hoosick Falls and seven miles from Bennington. Mr. George E. Greene, president of the company, writes as follows concerning this resort:

"We have quite a beautiful park; the place is naturally attractive and we have not spent a very great amount of money on it. The park is part of the main battlefield of the battle of Bennington. The Hoosick River runs close to a heavily wooded forest which is reached by a bridge across the river from two or three acres of nice lawn upon which we have trees, flower beds and a fountain, with swings, seats and a platform for band concerts. We have some boats on the river. The park is well patronized by picnic parties and small parties during the summer and in the afternoons there are a greater or less number of people there all the while. We also have croquet and other games. Two years ago we gave six weeks vaudeville but found it did not pay. A year ago last summer we gave two weeks. Last summer we did not give any. We had band concerts Sunday afternoons, which was about the only attraction for which we expended any money. We found that there was more in it for us to simply keep a clean, attractive place, free to our patrons, where they could go into the country and into the woods and on the river without expense and without trespassing on private land, than to give vaudeville entertainments or to pay for attractions, because the revenue was not sufficient to make it an object for all the extra work and running the extra equipment and the extra chances of accident."

NATCHEZ, MISS.

The Natchez (Miss.) Electric Street Railway & Power Co. operates Concord Park which is under the management of Mr. W. B. Moorman, secretary and treasurer of the railway company. The park is attractively situated at the end of the street railway line and is about 1½ miles from the center of the city. At the park are a half-mile race track, first class baseball and football grounds, large stable room for stock, and ample grand stand and bleacher seating capacity with an exposition hall, theater building and other conveniences.

Mr. Moorman writes as follows:

"We had several theatrical companies playing here last summer and the greater number of the games played in the Cotton States League are played at this park. We are gaining for the park quite a reputation as a pleasure resort and last year, the first season, was well patronized. The entire park and buildings are under improvement and by spring we expect to open in strictly modern shape with a number of additional attractions. We are adding several miles of track to our line this winter, all of which will be in full operation by spring and will draw greater patronage than ever for the park."

MOBILE, ALA.

The Mobile Light & Railroad Co., of Mobile, Ala., which now includes the Mobile Street Railroad Co., operates Monroe Park located about three miles from the city. The park comprises about 40 acres and is reached by two street railway lines. The location is particularly favorable, the constant breezes from the Gulf making the park a most desirable resort during the heated term, and citizens freely utilize it for picnics, horse shows, flower parades, tournaments and summer outings generally. What is generally admitted to be the finest baseball grounds in the South are within the park enclosure. A theater with ample stage room and seating 750 persons, is one of the park attractions, and crowds are nightly entertained during the summer with light opera and high-class vaudeville performances. A small zoo amuses the little ones, and a



VIEW OF RIVER NEAR SANS SOUÏ, WATERLOO, IA.

this, we built, during the past fall, a hatchery, and expect to raise millions of trout this season.

"Before the coming season opens we intend to enlarge our dancing pavilion and build an annex to our theater so that at the latter place we can seat comfortably 3,000 people.

"We have not only endeavored to secure absolutely first class companies for our theater, but the musical portion of the program, both as to orchestra and players themselves, has been given careful attention, and a special effort will be made during the coming season to improve this part of the entertainment still more. We find that absolutely high grade music is appreciated throughout the entire season, whether from singers or instrumentalists. In short we shall endeavor to secure the very best that can be had, preferring to have an entertainment marked by its good quality rather than its quantity."

SYRACUSE, N. Y.

The Syracuse Rapid Transit Co. owns two pleasure resorts, Valley Theater, four miles from the center of Syracuse, and Lake Park (formerly Iron Pier), two miles from the city. Valley Theater is operated by the railway company, while Lake Park is leased. There is also a new summer park not owned by the railway, known as Rockwell Springs, which is on the company's line; this resort is most used for dancing and picnics. Valley Theater was illustrated in the "Review" for August, 1900, page 478, at the park light opera has been a most popular and remunerative attraction. At Lake Park vaudeville has been the principal entertainment; the building here is 360 ft. long and contains besides the stage, a bowling alley,

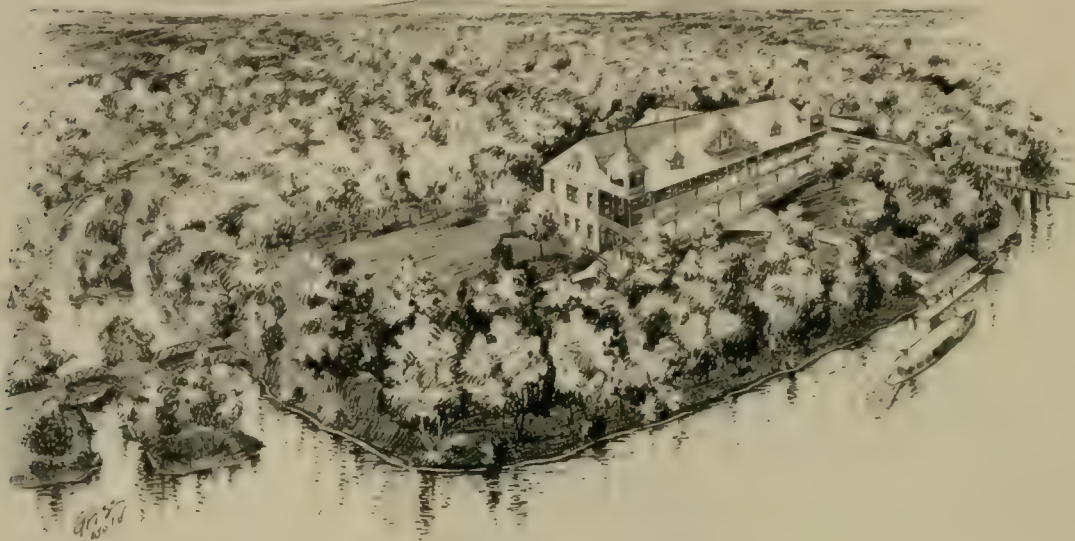
canon provides retirement. During the coming season the bay front will be renovated and additional improvements be made to the park.

KANSAS CITY, MO.

The Electric Park & Amusement Co., of which M. G. Heim, of the Home Heating Co., is president, operates Electric Park, which was described in the "Review" for October, 1900, page 578. The attractions include vaudeville entertainments, a German village, small Ferris wheel, electric fountain, bowling alley, shooting gallery, "loop the loop," etc. The manager of the park is Mr. Samuel Benjamin.

cottages are always occupied, it being almost impossible to rent one after the first of May.

Across the river from Cedar River Park is Sans Souci, owned by the Waterloo & Cedar Falls Rapid Transit Co., where has been built a summer hotel which will accommodate 150 guests. The company has 15 acres in this park, and the hotel season is from June 1st to September 1st. A great many transient guests are accommodated here, and the Chautauqua Assembly, across the river, has found it a great convenience for their entertainments to stop close to the Chautauqua auditorium. Near the hotel has been erected a band stand, and a shelter with seating capacity for 1,200 people. Two band concerts a week are given during the summer season; also moving pic-



SANS SOUCI HOTEL AND PARK, WATERLOO, IA.

WATERLOO, IA.

The Waterloo & Cedar Falls Rapid Transit Co., of Waterloo, Ia., has on its line two pleasure resorts, Cedar River Park and Sans Souci which are on opposite sides of the Cedar River, and situated two miles from Waterloo and four miles from Cedar Falls.

Cedar River Park is owned by a stock company, and contains about 200 acres of land on which are built some 150 summer homes; there is also at Cedar River Park an auditorium with a seating capacity of 2,500 people. This is used every season for two weeks by the Chautauqua Assembly, and during the rest of the time is in great demand for the use of large conventions and church entertainments. The Germans of North-eastern Iowa hold an annual German camp meeting at this park which draws about 1,200 people, and lasts two weeks. All the summer

tures are given, the bill being changed as often as found profitable.

Within a short distance from Sans Souci is located the Waterloo Country Club grounds and club house, and this organization with a membership of 200 or more has found it very convenient to make Sans Souci summer hotel its headquarters. The Rapid Transit company has a steam boat which plies between Waterloo and these parks, which is shown by the accompanying reproduction of an advertising bill, and it is found that it pleases the public to be able to take either route going to and from the parks.

The park manager is Mr. C. D. Cass, general passenger agent for the Rapid Transit Co.

The Cincinnati, Georgetown & Portsmouth Railway Co. has secured land at Highland Park, O., and will develop a summer resort there.

The Penobscot Central Railway Co. of Bangor, Me., will this year establish a pleasure resort to be known as Pushow Lake Park; it will be located about 7½ miles from Bangor.

The Blue Grass Traction Co. recently received 20 car loads of rails for its new interurban line from Lexington to Paris, Ky. About nine miles of the proposed seventeen of roadbed is graded. Work is being pushed as rapidly as the weather will permit.

Judge A. N. Waterman, in delivering an opinion in the Appellate Court on January 16th, dismissed an appeal taken by the city of Chicago from the judgment of the Circuit Court, in refusing to issue a writ of mandamus directing the West Chicago Street Railway Co. to lower its tunnel at Van Buren St. The reviewing court declares that a freehold is involved and that the case should have been taken to the Supreme Court.

Take a Delightful Steamboat Ride!

Excursion boats, fast and comfortable, a short time and money, a return the boat, which carries the beautiful scenery of Cedar River.



The STEAMER JUANITA

Will leave Waterloo at 11:15 A.M. and 7:15 P.M.

Sans Souci and Cedar River Parks

Maximum capacity 150 passengers.

Fare, 5 Cents Each Way

First class, from Waterloo to Cedar River Park, in East State and Commercial Banks, Newberry, Waterloo, or West State.

Passengers can return from park to Waterloo, or to Cedar River Park, by boat, or by land, or by car, or by train, or by bus, or by any other means of transportation.

Don't Miss Seeing the New Summer Hotel, Sans Souci.

EXCURSION POSTER

RECENT STREET RAILWAY DECISIONS.

EDITED BY J. L. ROSENBERGER, ATTORNEY AT LAW, CHICAGO.

CANNOT TAKE PART OF LOCATION CONSENTED TO AND REJECT BALANCE.

Collins v. Amsterdam Street Railroad Co. (N. Y. Sup.), 78 N. Y. Supp. 470. Nov. 12, 1902.

Where the consent of the local authorities and of the property owners was secured to the building of a street railroad over about five miles of highway, the third appellate division of the supreme court of New York holds that the company could not take part, as for example 3,100 feet, and reject the balance, building the balance of its line for such entire distance through private lands.

ABUTTER WITH NO TITLE TO LAND UNDER HIGHWAY CANNOT ENJOIN CONSTRUCTION OF STREET RAILWAY THEREIN OR RECOVER DAMAGES THEREFOR.

Kennedy v. Mineola, Hempstead & Freeport Traction Co. (N. Y. Sup.), 78 N. Y. Supp. 937. Dec. 2, 1902.

An owner of land fronting upon a highway, but who does not own any of the fee of the highway, that is, does not have any title to land under the highway, the second appellate division of the supreme court of New York holds, is not entitled to an injunction restraining the construction therein of a street surface railroad authorized by the state, or to recover damages therefor.

INJURY TO PEDESTRIAN ATTEMPTING TO ESCAPE FROM AUTOMOBILE.

Chattanooga Electric Railway Co. v. Cooper (Tenn.), 70 S. W. Rep. 72. Oct. 23, 1902.

A very old man, in crossing a street, suddenly found himself in a position of apparent peril from a rapidly approaching automobile, and, in attempting to escape, in a moment of alarm and excitement, inadvertently ran upon a street railway track, and was killed by a passing electric car. It was contended that it was error to apply the rule that a person put in a place of sudden peril by the negligent act of another, who, losing self-possession, takes the wrong step, and is injured, will not have such step imputed to him as contributory negligence. But the supreme court of Tennessee holds that it is a mistake to assume that the application of this rule is restricted to cases where the peril producing the confusion of judgment, and the consequent false effort to escape, is the negligent act of the party creating the peril. However, to get the benefit of this extension of the rule, the party injured must be without fault in putting himself in the place of peril or danger; that is, he must not recklessly or improvidently have incurred it.

ASSAULT BY MOTORMAN OFF CAR AFTER TERMINATION OF PASSAGE—PROVOCATION TO ASSAULT MITIGATES DAMAGES.

Palmer v. Winston-Salem Railway & Electric Co. (N. C.), 42 S. E. Rep. 604. Nov. 11, 1902.

Arrived at his destination, a somewhat intoxicated passenger, who had used grossly insulting words to the motorman, got out, deposited his bundles on the sidewalk, returned to the car, again got into an altercation with the motorman, then turned, and left the car, whereupon the motorman followed him up, and, two or three steps from the car, struck him on the back of the head with the lever which controlled the car, knocking him down. The fact that the party invited the assault by insulting language or provoking conduct, the supreme court of North Carolina holds, would not bar recovery in a civil action, the provocation being a mitigation, not a defense. If he had been a passenger or his passage had not been fully terminated, or if, when he left the car at his destination, the employe had immediately followed him and assaulted him, the company, the court says, conceded that there would be no question as to its liability. But to render it liable, the court holds, (1) he must

have been a passenger at the time he was stricken, or still within the sphere of its protection; or (2) the employe must have been acting at the time within the scope of his employment on its car. A judgment against the company. New trial.

VIOLATION OF STATUTE OR ORDINANCE REGULATING SPEED EVIDENCE OF NEGLIGENCE—EXPERT EVIDENCE ADMISSIBLE TO SHOW SPACE IN WHICH CAR MAY BE STOPPED.

Norfolk Railway & Light Co. v. Coiletto (Va.), 41 S. E. Rep. 740. June 12, 1902.

Statutes regulating the speed of railroad trains at certain places being regulations clearly intended for the protection of travelers, it is well settled, the supreme court of appeals of Virginia says, that any violation of them is competent evidence of negligence in an action brought by a traveler on the highway, even though the statute simply imposes a penalty for its violation. Statutes and valid municipal ordinances regulating the speed of trains or street cars stand upon the same footing. The fact that the ordinance here in question was passed after the company was given the right to operate its cars upon the streets of the city did not render it any less binding upon the company. Even direct legislative authority to a street railway company to use the streets of a city does not exempt it from reasonable municipal or police control, and it is subject to such ordinances to the same extent as natural persons.

The court also says that it is clearly of the opinion that expert evidence is admissible to show within what space a street car running under given conditions may be stopped. This is a subject not within the range of common experience and observation, but involves technical and peculiar knowledge, as to which expert evidence is admissible.

ACT AUTHORIZING TAKING OF PART OF ROAD BY ANOTHER COMPANY UNCONSTITUTIONAL.

Petition of Philadelphia, Morton & Swarthmore Street Railway Co. (Pa.), 53 Atl. Rep. 191. Oct. 13, 1902.

The supreme court of Pennsylvania says that it is in no doubt as to just what power the legislature intended to confer by section 14 of the act of 1889, with its amendment in the act of 1895. It was a clear grant of a right to a younger to enter upon the easement of an older company, and take possession of 2,500 feet of its tracks, poles, and wires, thereafter to use them for its corporate purposes. It was not material that this possession was not to be exclusive. In whatever light it was viewed, it was an authority to appropriate to a certain extent the franchise and property of the older company. The effect, the only effect, of this fourteenth section and the amendment was to transfer the property of one private corporation to a new one for the same public use, both being transporters of passengers for profit. This was unconstitutional. That a company owed its corporate existence to the act of 1889 did not prevent it denying the constitutionality of section 14 with its amendment, the section, both in its purpose and effect, being a distinct legislative enactment, so that if it be completely eliminated, all the other provisions stand in full force.

FAILURE TO CALL PASSENGERS OR OTHERS AS WITNESSES.

Yula v. New York & Queens County Railroad Co. (N. Y. Sup.), 78 N. Y. Supp. 770. Oct., 1902.

The conductor testified that he took the names of passengers on the car at the time of the accident for witnesses; but none of them was called as a witness. Counsel for the plaintiff argued to the jury that it was the duty of the company to call them, and that the presumption of law was that if called their testimony would be against the company. The court charged the jury that the company was under no duty to call them, that there was no such presumption.

and that the case had to be decided on the evidence produced, and was not to be left to the future of the company to call such passengers, and the jury was exempted to. A motion for a new trial is denied by the supreme court of New York, trial term, Queens County. It says that it is aware of no rule creating such a presumption against a party, or even permitting the testimony he presents to be looked upon less favorably, for his failure to call other persons as witnesses, except in the case of witnesses in the employ of the party, or in some other way so related to or associated with him that the law presumes that they would be favorably disposed to him if called; and in such case it must be made to appear that such persons were witnesses of the occurrence in order that the presumption may arise at all. Passengers on a car do not come in such category in respect of either party in cases like this. Prudence dictates to each party to get their names, if possible, but failure to call them as witnesses amounts to nothing.

CARE REQUIRED WITH REFERENCE TO LEDGE OR EMBANKMENT IN HIGHWAY OR ON OWN LAND—
WITH REFERENCE TO THE EQUIPMENT
AND MANAGEMENT OF CARS AND
THE CONSTRUCTION OF
TRACKS.

Galligan v. Old Colony Street Railway Co. (Mass.), 65 N. E. Rep. 48. Oct. 30, 1902.

Where tracks were within the bounds of a highway, though not in that part used for common travel, but in a cut or depression excavated for them through a ledge, the supreme judicial court of Massachusetts says that, in one sense, the ledge, being a part of the highway not within the tracks, and more than 18 inches distant from that part of the highway which they occupied, was not within the company's care. Still, its right under its location included that of maintaining and operating its road, and carried with it the right so to deal with the ledge or bank that the fall of material from it should not obstruct or endanger the running of cars upon the track. The court sees no reason why the company was not bound, as to its passengers, to exercise the same degree of care to prevent injury to them in consequence of the rolling of stones from the embankment upon the track that it would have been bound to use if the place had not been part of the highway, and had been part of a location upon the company's own land, or of one taken from private owners by the exercise of the right of eminent domain under a grant of power from the legislature. This degree of care is the same as that required with reference to the equipment and management of the cars or the construction of its tracks. It is the highest degree of care consistent with the nature of the undertaking, which is the management or operation of the road as a common carrier of passengers; or, in other words, the requirement is reasonable care according to the nature of the contract.

WHAT THE LAW MEANS BY EQUAL RIGHTS AT STREET
INTERSECTIONS AND HAVING CARS UNDER
CONTROL—\$10,885.62 FOR INJURIES.

Sesselmann v. Metropolitan Street Railway Co. (N. Y. Sup.), 78 N. Y. Supp. 482. Nov. 14, 1902.

In this case, where it affirms a judgment for \$10,885.62 for damages for personal injuries sustained by a mason 45 years of age, who had one of his hands practically ruined for the purposes of his trade and had suffered much pain, the second appellate division of the supreme court of New York says that the accident occurred at a street intersection where the rights of the plaintiff and defendant were equal; at a point where he had the right to assume that it would have its car under control, and would, as the operator of a powerful engine of destruction, be vigilant in protecting or preserving the equality of rights on the part of pedestrians and others lawfully using the highway. When the law declares that the rights of parties are equal at a given point, it does not mean that the more powerful of the two may disregard the approach of the weaker, and gain and pass the point without any regard for the latter. It means that each, having regard for the rights of the other, considering the dangers to be anticipated from a disregard of the mutual rights of

the parties, may make use of the highway in a lawful manner; and this necessarily devolves upon the defendant, in the operation of its cars at street intersections, the duty of having them under control. It is not enough that the speed shall be reduced, if that reduction of speed does not operate to give the motorman that control of his car which is necessary to the equal rights of pedestrians and others at street intersections, and it is always a question for the jury whether the car is in such control.

INJURY TO PERSON RUNNING TO TAKE CAR AND
FROM STUMBLING FALLING UPON TRACK—NO
ABSOLUTE DUTY TO STOP CAR ON SIGNAL
OF INTENDED PASSENGER.

Winchell v. St. Paul City Railway Co. (Minn.), 90 N. W. Rep. 1050. June 20, 1902.

Plaintiff signaled the motorman in charge of one of defendant's street cars of his wish to take passage thereon, then started on a moderate run towards the track and the point where the car would come to a stop. When within about six feet of the same, he stumbled by reason of some obstacle in the street, and fell upon the track, and was struck by the car and injured. The supreme court of Minnesota holds that the evidence was insufficient to support a finding of actionable negligence on the part of the company,—that the motorman was not bound to anticipate the possibility that the party might fall upon the track, and was not guilty of negligence in not having his car under such control that he could stop the same in time to avoid such an accident. Conceding that the car was being operated at an excessive rate of speed, the court says that it is clear to it that the proximate cause of the accident was the party's own involuntary act in stumbling and falling upon the track; that his injuries were the result of an accident, for which neither party was in any way responsible; and to sustain a recovery would be to establish a precedent which could not possibly be followed in the future.

The court is not aware of any rule, it says, making it the absolute duty of a street car company to stop its cars upon the signal of a person wishing to take passage thereon. It is usual and customary, no doubt, to do so, but it cannot be said to be an absolute duty. It is a matter of common knowledge that frequently, where cars are already overloaded with passengers, the motorman takes no notice of persons signaling an intention or desire to take passage, and passes them without any effort to come to a stop. The plaintiff had no right, so far as the record disclosed, to rely upon the motorman to bring his car to a stop upon this occasion. The motorman knew from the signal that he did not intend to cross the track. There was no occasion for him to do so. Nor could it be said that the motorman was bound to guard against the possibility of an accident of this kind, if it be conceded that it was his duty to stop the car at the party's signal. He was not required, in the operation of his car, to anticipate that possibly the party might stumble and fall upon the track, and to have his car so under control as to avoid a collision in such event.

RIGHT OF CONDUCTOR TO REFUSE TO RECEIVE MORE
PASSENGERS—DUTY TO WARN THOSE WANTING
TO BOARD CAR WHEN IT STOPS—WHAT ONE
SIGNALING BY STANDING BY TRACK MAY
ASSUME WHEN CAR STOPS—SUFFICIENCY
OF WARNING—STARTING CAR.

Maxey v. Metropolitan Street Railway Co. (Mo. App.), 68 S. W. Rep. 1003. June 9, 1902.

A street car company, the court of appeals at Kansas City, Mo., says, may become liable to a party seeking to become a passenger, even though it did not stop to take on passengers. The court concedes that the car may stop to let off a passenger, and be justified in refusing to take on others, for some sufficient reason,—such as being already sufficiently filled, or, perhaps, being behind regular time, and another car closely following, and the like. Yet while the company has this right, a person desiring to get on, who goes out into the street and signals (as by standing by the track) at a place where the car stops for passengers, is justified in assuming that the stop then and there made is in response to his signal, or for the double purpose of letting passengers off and taking him

on. and the company's servants, being presumed to have ordinary sense, will be charged with a knowledge of such assumption of the person desiring to get on; and if, for any reason, it is not desired to receive such person as a passenger, it is the duty of the proper servant to warn him if he attempts to get on the car. So, therefore, it can make no difference, up to the time when the person is made aware that more passengers are not desired, whether the car, in point of fact, stopped for the sole purpose of letting a passenger off.

We have already seen, the court says further on, that in certain situations—such as a car fully loaded—the conductor has a right to refuse to receive more passengers, and therefore to warn those seeking passage to keep off. It is therefore clear that, if the conductor warned plaintiff in a tone of voice loud enough for her to hear, he was not guilty of negligence, even though she did not hear, unless he saw that she did not heed him, and was in such position as that his starting up was reasonably certain to injure her. It was error to make the conduct of the conductor, as to care or negligence, depend upon whether plaintiff heard him. His act should not be characterized by the degree of plaintiff's hearing or attention. If he gave the warning in a voice sufficiently loud to arrest the attention of an ordinary person, he, in that particular respect, was not guilty of negligence. And if he signaled for starting the car without discovering that she had disregarded his warning and had put herself in a hazardous position, he should not be held to have been negligent.

CROSSING OF STEAM RAILROAD TRACKS IN STREET—
WHO TO BEAR EXPENSE OF CONSTRUCTING AND
MAINTAINING CROSSING—STREET RAILWAY
NO ADDITIONAL BURDEN—AUTHORITY OF
ENGINEER OF STEAM ROAD WITH RE-
GARD TO REPAIRS—STEAM ROAD
MUST SUPPLY SAFETY GATES.

Central Passenger Railway Co. v. Philadelphia, Wilmington & Baltimore Railroad Co. (Md.), 52 Atl. Rep. 752. June 19, 1902.

The adjudged cases, the court of appeals of Maryland says, are quite in accord in holding that, when a new road or way is constructed across an old road or way, the owner of the new way must not only bear the expense of making and keeping in repair the new way, including the cost of such structural changes in the old way as are rendered necessary by the construction of the crossing, but he must, in addition, make compensation to the owner of the old way for the property or easement appropriated for the occupancy of the new way. And this doctrine, as below explained, the court holds, is applicable where one railway track crosses another railway track on the bed of a city street, to which street neither railway company has any other right than the permission given by the municipality to lay tracks thereon.

It is indisputably true, the court says, that a railway or a railroad company which, under authority obtained from the city, lays its tracks along or across an opened and subsisting city street, acquires thereby no exclusive right to the use of the street; but it does not thence follow that it secures no rights of any kind which another company subsequently seeking to use the same track, or a part of the same track, is bound to recognize. There may well be no exclusive right in the company to the use of the street as against the public generally, or as against a parallel or competing road, and yet there may be, and certainly is, a right in the company to use its own tracks upon the street, and to use them to the exclusion of any other company, unless the other company procures the right to use those tracks upon making due compensation. This is true not only with reference to a longitudinal use of the tracks, but also concerning the bisecting of a track at right angles, and its use in that way.

There are two elements of damage in the ordinary crossing of an established way by a new way, and these are: First, the cost of the construction and of the maintenance of the new way, including structural changes in the old way made necessary by the building of the new way; and, secondly, the value of the easement or property belonging to the owner of the old way, and which may be impaired or appropriated by the new way. Both of these must be paid by the person who constructs the new way. In cases such as this one, where a railway crosses a railroad in the bed of a city street, the second of these two elements of damage does not exist,

because when a steam railroad is located on a street the company takes its rights subject to the rights of the public to use the street in a reasonable and lawful manner, and since the street railway is not an additional burden to the street, but simply such a use as the public are entitled to have made of the street, the steam railroad takes its right in the street subject to the right of the street railway company to lay its tracks across the former's tracks, and the steam railroad is not entitled to recover any compensation for such crossing as for an additional burden.

The common-law doctrine that whatever structures are necessary for the crossing of an old way by a new way must be erected and maintained at the expense of the party under whose authority and direction the crossing is made is applicable to railways and railroads which intersect each other upon the public streets of a city, unless that doctrine be modified by statute. Outside of statutory provisions there is neither precedent nor authority for requiring the owner of the subsisting way to contribute any part of the expense rendered necessary to enable the owner of the new way to cross the old way. The crossing of the old way is made for the benefit of the second comer, and not for the benefit of the owner of the old way; and, even, though both occupants claim under licenses from the same municipality, common justice dictates that the one for whose exclusive benefit the crossing is made should defray the expense of constructing it. And as the continuance of the crossing is as much for his benefit as was the construction of it in the first instance, it is equally obvious that he should maintain it wholly at his own cost.

Moreover, the court holds that there is included in the proposition just stated the following corollary, viz.: That the engineer of the railroad company shall have the right to say when and in what manner and to what extent repairs or renewals shall be made, and, that if they are not made by the street railway company, they may be constructed at its expense by the steam railroad company. As it is the duty of the street railway company to keep the crossing in repair, so that it may be used not only by itself, but by the steam road, whose tracks the crossing in some measure interrupts, and as the steam road requires more durable and substantial construction than a street railway needs, it is altogether reasonable and proper that the decision of the questions as to when, in what manner, and to what extent the repairs ought to be made should be left to the engineer of the steam railroad company.

Nothing said in this judgment is to be understood, however, as justifying the demand made by the steam railroad company that the street railway company must pay one-half of the cost of safety gates or other similar appliances required under an exercise of the police power for the protection of the public at the crossing. Such appliances it is the duty of the steam railroad company to supply.

INJURY TO PASSENGER AFTER ALIGHTING BY CATCH-
ING FOOT IN ROPE ATTACHED TO CAR BY
SOME BOY.

La Fond v. Detroit Citizens' Street Railway Co. (Mich.), 92 N. W. Rep. 99. Nov. 11, 1902.

As a passenger alighted from a car and passed around it her foot caught in a rope that was dragging, and she was seriously injured. The testimony abundantly proved that some boy who was in the habit of hitching sleds or cans or something of the sort—at least, that was the natural and necessary inference from the testimony—had left that rope there. Bear in mind, too, the supreme court of Michigan says, to what part of the car the rope was attached. It was not attached above, but below, the projection, which was practically level with the platform. Moreover, it was some time after dark. Of course, the only way a rope of this sort could be discovered would be by close examination. None of the men on the back of the car saw it until some one was struck by it, except the one who passed around it when he alighted. From the testimony of one witness, who alighted about 7½ minutes before the accident occurred, one would be justified in inferring that the rope had been on from that time. But that it was the custom not to permit boys to hitch on cars, was the only inference that could be drawn from the testimony with regard thereto. The circuit judge was of the opinion that no actionable negligence was shown, and directed a verdict for the company. And in this opinion the supreme court concurs. That on one occasion a rope had been found

attached to another car of the company's, and was cut off, the court says was a circumstance so unusual that it could not be held that its occurrence entailed upon the company the duty of providing for a special and continuous inspection to prevent a repetition of such a trespass. The conductor of this car was not shown to have had any knowledge of it, nor to have had any reason to expect that such a rope had been left dangling in the rear of this car.

DEMANDING SECOND FARE OF PERSON ASKING FOR A
CERTAIN CAR AND BOARDING IT BEFORE IT
REACHES ITS TERMINUS—SIGN ON CAR NOT
TO BE TAKEN AS SHOWING WHICH WAY IT
IS GOING—SHOW OF RESISTANCE AU-
THORIZING USE OF FORCE IN
EJECTION.

McGarry v. Holyoke Street Railway Co. (Mass.), 65 N. E. Rep. 45.
Oct. 29, 1902.

The story of the party suing was that he hailed a car, in the city of Holyoke, near the city hall, when it was going in the direction of the postoffice, and asked the conductor whether it was a Mountain Park car. On being told that it was, he got on the car, paid the fare demanded, and rode to the terminus of the road at the postoffice, where the car stopped. After it had gone about as far as the city hall on the return trip, another fare was demanded. The supreme judicial court of Massachusetts is of the opinion that the party was wrong in refusing to pay the second fare. It says that the conductor might have thought that he took the car on its trip from the park to the city to make sure of a seat on its return trip to the park, or that he asked the question to identify the route on which the car was then proceeding. But it was not for the conductor to speculate as to his purpose in taking the car. He asked a plain question, and the conductor gave a correct answer. He did not ask whether the car was going to Mountain Park. Nor was there anything in his contention that he was justified in thinking that the car was on its way to the park, and refusing to pay his fare, because it had on it the sign "Mountain Park," and he had noticed that on other cars run by the company the sign was changed when the cars were running in different directions, and always had a sign exposed to indicate the terminus they were bound for. The company was not bound to adopt the same system on all its cars.

If the plaintiff made the conductor understand that he would resist being put off, that the conductor was justified in using force in putting him off, especially after again telling him, and for the third time, that he must pay his fare or get off. If the conductor had to use force to put him off, and he resisted, the mere fact that he landed on his head was not sufficient to warrant a finding that undue force was used. Furthermore, the court says that it would have been better if the car had actually stopped before the conductor put his hands on him; but it apparently deems sufficient the man's admissions that it had then "almost stopped," and "by the time he had me off the car, I guess the car was stopped."

ORDINANCE AUTHORIZING A ROADBED ABOVE GRADE
SUBJECT TO REPEAL—TRACKS TAKEN IN BY EX-
TENSION OF CITY LIMITS MAY BE ORDERED RE-
MOVED TO CENTER OF STREET AND PLACED
AT GRADE—GROUND OCCUPIED MAY BE
REQUIRED TO BE PAVED—CONSTRUC-
TION PRESUMED TO BE
INTENDED.

Snouffer v. Cedar Rapids & Marion City Railway Co. (Ia.), 92 N. W. Rep. 79. Oct. 28, 1902.

If it be assumed for the purposes of argument that a city ordinance was a reasonable and valid exercise of municipal authority, and constituted a contract between the city and the railway company, which ordinance provided for two parallel paved roadways of 25 feet each, separated by a 20-foot strip carrying the railway tracks and ballasted with stone to a height which would render crossing the same with carriages impracticable except at street intersections, the supreme court of Iowa says that it was still competent for the city to repeal or modify the privilege granted, whenever, in the ex-

ercise of a reasonable discretion, it should find that the convenience and safety of the public or the proper improvement of the street required it.

With reference to a legislative grant of authority to construct and maintain a street railway, the court says that, while authorizing the use of the highway for this purpose, it thinks it must be held that such use was subject to the reserved power of the state by itself or by its local municipality to enact all reasonable measures to protect the general public in the use of the street for the primary purposes for which streets and highways are established. When, therefore, by the extension of the city limits, a portion of the street railway was brought within the jurisdiction of municipal authority, it was neither more nor less than a street railway occupying a city street, and amenable to municipal regulation, like all other instrumentalities of its kind.

Again, the court says that it needs no argument to demonstrate that the side or margin of the highway may be the most natural and convenient location of a street railway in a rural neighborhood, but it is even a plainer proposition that when, by increase of population, the city expands, and the rural highway becomes a city street, lined on either hand with residences or places of business, a track so located and used for the frequent passage of swiftly moving cars may become an intolerable inconvenience and source of peril, especially to those upon the immediate front of whose property it operates. And the court declares that it has no hesitancy in holding that the remedying of such condition by requiring the track to be removed to the middle of the street is a reasonable regulation, which the city may enforce.

There is nothing unreasonable, the court further says, in requiring the company to put its tracks at grade, and to pave the ground that it occupies in the street wherever such paving is duly ordered. The statute contemplates it. Code, sections 834, 835. Such construction gives the general public unrestricted access to and use of the entire street from curb to curb, subject to the right of the company to the proper use of its track. With rare exceptions, it is the universal plan adopted wherever street railway systems exist. In the absence of express qualification, it is the kind of construction which the law presumes to be intended.

VALIDITY OF CITY ORDINANCE REQUIRING COMPANIES TO REMOVE ALL DIRT AND SNOW FROM
BETWEEN THE TWO OUTERMOST
RAILS OF THEIR TRACKS.

City of Chicago v. Chicago Union Traction Co. (Ill.), 65 N. E. Rep. 243. Oct. 25, 1902. Rehearing denied Dec. 3, 1902.

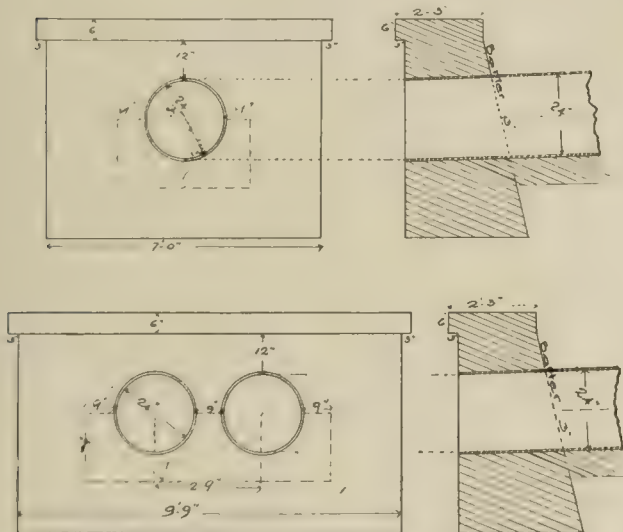
Section 1716 of the Revised Code of Ordinances of the City of Chicago provides: "The several street railway companies at any time operating railroad tracks on and along the surface of any of the streets, avenues or alleys of the city of Chicago are hereby, respectively, required to remove all dirt, snow and other accumulations from so much of the surface of each street, avenue or alley now or hereafter containing any of their railway tracks, as lies between the two outermost rails of such tracks, and also from such additional surface, in width, as may be prescribed in any ordinance relating to or affecting any such street, avenue or alley, and shall, respectively, clean such portions of said street, avenue or alley and remove entirely from and out of such street, avenue or alley all such dirt, snow and accumulations at least once in each week, and as much oftener as the commissioner of public works shall, in writing, direct; such dirt, snow and accumulations to be removed and disposed of in accordance with the ordinances of the city relative to the removal of street cleanings, and subject to the rules and regulations of the department of public works in that behalf." Section 1717 reads: "Any street railway company operating a street railway upon or along the surface of any street, avenue or alley in the city of Chicago which shall refuse or neglect to clean any part of a street, avenue or alley, as required by the last preceding section hereof, shall, upon conviction thereof, be fined in a sum not less than \$50 nor more than \$200 for each and every case of such refusal or neglect."

This ordinance, the supreme court of Illinois holds, is a reasonable and valid exercise of the police power, and that it should be

obeyed and enforced accordingly. It says, among other things, that the permission or license given the company to use the street did not operate to deprive the city of the general power or control over the street delegated to the municipality by the general assembly of the state. The city, as the representative of the state, is invested with power to enact and enforce all ordinances necessary to prescribe regulations and restrictions needful for the preservation of the health, safety, and comfort of the people. The exercise of this power affects the public, and becomes a duty, the performance whereof is obligatory on the city. The city could not, by the terms and conditions of the ordinance granting the license to lay the tracks and operate the street railway in the street, deprive itself of this power or relieve itself of this duty; nor could the company, by any contractual terms of an ordinance, exempt itself from the proper and reasonable control of the municipal authorities in matters affecting the health, safety, or comfort of the people.

CONCRETE CULVERTS ON THE UTICA (N. Y.) & MOHAWK VALLEY RY.

In building the Little Falls extension of the Utica & Mohawk Valley Ry. exceptional care was taken in the formation of the road-bed and particularly in the matter of providing adequate drainage. To the end that track surface and alignment would be preserved



SECTION AT END WALLS, SINGLE AND DOUBLE BARREL CULVERTS.

against disturbance in times of excessive water falls, streams were frequently diverted from their natural courses to other locations, and when necessary to cross a spring or stream, or to build through low or marshy land, concrete culverts were put in of ample proportions to prevent any excessive accumulation of water along the line of track.

At several points where the conditions demanded it the tracks were carried over streams on small bridges made up of concrete abutments and short steel spans, each bridge being designed separately to suit the conditions.

We are indebted to Mr. Frederick Phillips, division engineer for the Utica & Mohawk Valley Railway Co., for the following data and accompanying illustrations setting forth the method employed in building the concrete culverts on this line.

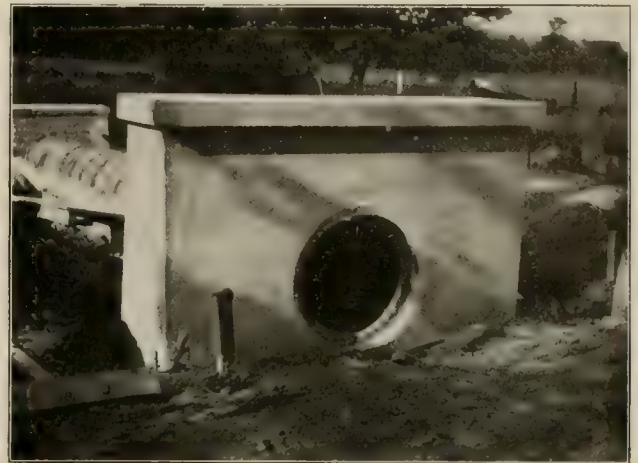
The general form of culvert adopted as standard comprised a length of vitrified pipe of double strength, 24 in. in diameter, bedded on a foundation of concrete throughout its entire length, and having its ends set in concrete end-walls.

The form and approximate dimensions of both single and double barrel culverts will be understood from the sketches.

In building the pipe was laid on concrete foundation, having a thickness of 6 to 9 in. Where the soil was boggy with little supporting power, 18 to 24 in. of sand and gravel, rammed in layers, was put in under the concrete. The concrete was carried half way up

the sides of the pipe throughout the entire length, as the engravings show, and dirt filling was put in over the whole to grade. In the end-walls, the concrete was carried down approximately 2 ft. below the bottom of the pipe, depending on circumstances. In some cases a greater depth was required in order to get below the frost line.

The materials utilized were as follows: All masonry concrete; gravel taken from vicinity of work; and portland cement. The



SINGLE BARREL CULVERT BEFORE FILLING IN.

proportions for concrete in the smaller structures in most cases were: 1 part packed cement; 3 parts loose sand; 7 parts clean gravel. In the early part of the work the proportions 1:2:5 and 1:3:5 were used in some of the culverts, but with the materials at the company's disposal, using the sand and gravel of the vicinity, it was found that the best proportions, as determined by experiments and tests, were as previously stated: 1:3:7. In the foundations, however, 1:4:8 has been found very acceptable.

In placing the materials in culvert work it was found economical to have one form made up and this was used for all of the end



DOUBLE BARREL CONCRETE CULVERT SHOWING END WALL.

walls. The one form served for nearly all the single culverts on the line, as it was used over and over again. Of course a different form was needed for the double culverts.

The Elmira (N. Y.) & Seneca Lake Railway Co. had to suspend service for several days about the middle of January, owing to its inability to secure a snow plow.

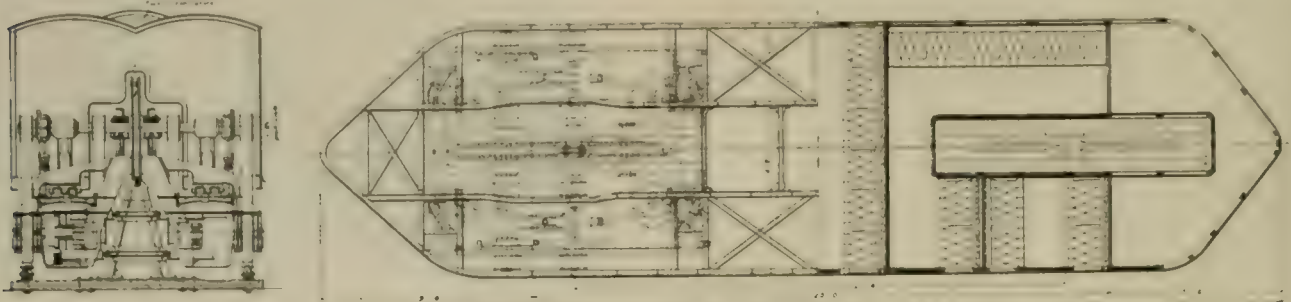
The Norfolk (Va.) Railway & Light Co. has announced that hereafter fares will be 5 cents straight. The company had been selling six tickets for 25 cents. The increased cost of operating, due to the high price of coal, is the cause of the change.

THE MANCHESTER-LIVERPOOL MONORAIL.

The Manchester & Liverpool Electric Express Ry. with which the name of Mr. F. H. Behr has been associated for several years has at last obtained the sanction of Parliament to construct a monorail between Manchester and Liverpool and the work of construction has recently been commenced. This project has been before the public for a long time and a paper by Mr. Behr in regard to this road was published in the "Review" in August, 1901, page 504, in which the general plans of the road were outlined. A more complete description of the details of this road was published in the Tramway & Railway World for November, 1902, from which the following statements are taken. The total length of the new line will be $34\frac{1}{2}$ miles and it will have a double track throughout. Both the termini in

will be 3 in. wide and the base 5 in. wide. The rail is $5\frac{1}{2}$ in. deep. The head is 2 in. thick from the face to the web. The four guide rails will be laid longitudinally, two on each side of the trestle. These rails will weigh $30\frac{1}{2}$ lb. per yard and will be of a two-headed pattern, the outer or contact face being $1\frac{3}{4}$ in. wide and the inner face being $1\frac{1}{8}$ in. These rails will be $3\frac{1}{4}$ in. deep from face to face and will be laid so that the center line of lower set will be 1 ft. $1\frac{1}{2}$ in. above the surface of the ties, and the upper ones 2 ft. 9 in. to 16 in. above the ties. They will be held in position by angle steel plates bolted across the trestle. The guide rails will not actually bear against the sides of the trestles but will be supported by the bolts by which they are held and the angle plates which are riveted across the trestles from side to side.

It is intended to run single cars as trains, Mr. Behr being of the



PLAN AND SECTION OF MONORAIL CAR.

Manchester and Liverpool are located centrally in these cities. The greater part of the road is straight and the few curves which it contains are of comparatively long radii.

There is a great diversity of grades along the route varying from 1 in 25 to 1 in 1,168. A feature of the grades is the steep ascent 1 in 30 for nearly 1,200 yards from the station at Manchester, and 1 in 25 for a similar distance from the station at Liverpool. These grades are for the purpose of acceleration of speed on starting from either end of the railway and of retarding the cars on approaching the termini. It is intended to establish a ten-minute headway of trains between the two stations and the trains will perform the journey in 20 minutes which will require a speed of 110 miles an hour.

The main track rail, or monorail, will be supported on a continuous trestle-like structure which will rest on ordinary wooden ties 9

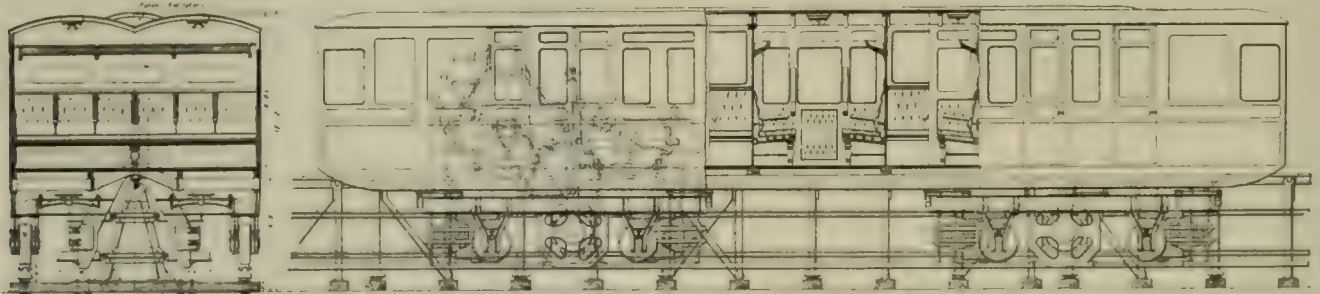
feet long, 10 in. wide and 5 in. thick. These ties will be spaced 3 ft. center to center except where joints in the rails occur where they will be 2 ft. $\frac{1}{8}$ in. between centers. The triangular frames which support the monorail will stand 3 ft. $11\frac{1}{2}$ in. above the surface of the ties and will be 2 ft. 8 in. wide at the base, narrowing to 12 in. wide at the top. The side limbs of the trestle will consist of $3\frac{1}{2} \times 3 \times \frac{1}{2}$ -in. angle steel. At the top of each trestle the side pieces will be held together by a cross angle plate of $\frac{1}{2}$ -in. steel 6 in. deep with a 3-in. angle piece. Each trestle will have a steel sole plate which will be bolted to the tie, and the side piece of the trestle will be formed with a flange at the bottom which will be riveted to the sole plate.

Five rails will be used in connection with the system; the monorail and four guide rails. The main track rail, or monorail, will be in 35-ft. lengths and will weigh $103\frac{1}{2}$ lb. per yard. The face of the rail

opinion that, at the rate of speed at which they propose to run, it will be unsafe to couple the cars into trains. The use of couplings, he considers, would introduce a source of danger which should not be attempted where such high speed is to be attained.

Three classes of cars have been designed and approved for the line which will accommodate respectively 72, 50 and 38 passengers. For the initial service the smaller cars, which are shown in the accompanying illustrations, will be employed. These will be 41 ft. 10 in. long over all, 11 ft. wide, and 11 ft. 9 in. high from the surface of the ties. From the floor of the car to the top of the roof will be 6 ft. $8\frac{1}{4}$ in. They will be formed with pointed ends to reduce the resistance of the wind and when fully equipped each car will weigh 39 tons.

The principal feature of the car construction is the main central



ELEVATION AND SECTION.

frame of steel forming the lower part of the car which is placed like a saddle upon the trestle. The sides of the frame extend down to within 6 in. of the sole plates. Each car will be provided with four continuous current motors having a normal capacity of 160 h. p. at full speed, of 720 r. p. m., but which will be able to work up to 320 h. p. each for short periods during acceleration. The motors are arranged in pairs which are placed near each end of the car, one motor of each pair being on opposite sides of the trestle and each pair forming a distinct driving set. The motors will be placed low in the car in order to keep the center of gravity of the car below the monorail. Each of the motors weighs about $2\frac{1}{4}$ tons.

There are four guide wheels at each side of the car which bear against the faces of the guide rails. These wheels are 2 ft. in diameter and have a bearing face of $4\frac{1}{4}$ in., and on one edge a flange of

ft. long, 10 in. wide and 5 in. thick. These ties will be spaced 3 ft. center to center except where joints in the rails occur where they will be 2 ft. $\frac{1}{8}$ in. between centers. The triangular frames which support the monorail will stand 3 ft. $11\frac{1}{2}$ in. above the surface of the ties and will be 2 ft. 8 in. wide at the base, narrowing to 12 in. wide at the top. The side limbs of the trestle will consist of $3\frac{1}{2} \times 3 \times \frac{1}{2}$ -in. angle steel. At the top of each trestle the side pieces will be held together by a cross angle plate of $\frac{1}{2}$ -in. steel 6 in. deep with a 3-in. angle piece. Each trestle will have a steel sole plate which will be bolted to the tie, and the side piece of the trestle will be formed with a flange at the bottom which will be riveted to the sole plate.

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There are four guide wheels at each side of the car which bear against the faces of the guide rails. These wheels are 2 ft. in diameter and have a bearing face of $4\frac{1}{4}$ in., and on one edge a flange of

1 in. They revolve horizontally with the flange downward. The guide wheels are considered the most important factors in the operation of the car as they comprise the special provision for safety. The flange for each wheel will be below the edge of one of the guide rails which will make it impossible for the driving or trailing wheels on the car to leave the track rail. A certain amount of lateral play is admitted through the use of springs but this is limited to the point where the guide wheel flanges bear against the under side of the guide rails.

There are four vertical wheels for each car which constitute the main track wheels. Two of these are drivers and two are trailers. The former are 4 ft. 4 in. in diameter and the trailers 3 ft. 5 in. in diameter. The wheels are 5 in. wide and have a central groove on their faces 2 in. deep and 3 in. wide in which the track rail bears. These wheels are located at considerable height above the motors and are boxed in the interior of the cars. The distance between the center lines of the motor shaft and driving wheels is 4 ft. 6½ in. and connections will be made by means of sprocket chains. The velocity of the chains will be from 1,800 to 1,900 ft. per minute. The two motors at each end of the car will be connected to the same driving wheel.

The current for operating the road will be generated at a station to be erected at Warrington which is exactly midway between Manchester and Liverpool. It will be a tri-phase alternating current of 15,000 volts, and five sub-stations will be located along the line where the current will be transformed into continuous current at 650 volts. The motors are to be wound for 600 volts. The current will be collected on the cars from two conducting rails, one being at each side of the trestle near the ends of the ties. The conductors will be 5 in. wide on the surface and 9 in. high from the surface of the ties. Circular brushes 1 ft. 9 in. in diameter will be placed at the sides of the car to collect the current from the side rails. There will be four of these brushes on each side of the car.

It has been calculated that the power required during acceleration will be 1,114 h. p. and throughout the run after speed is attained it will require 515 h. p. per car or 129 h. p. per motor. It is intended to equip the cars with high speed Westinghouse brakes which will be able to retard the car at the rate of 3 ft. per sec. per sec., which will bring the car to a stop in about 1,380 yards. In addition to this method of braking a resistance will be used through which the motors will be short circuited so that the remaining adhesion on the driving wheels will be utilized for braking. With the motors short circuited and the Westinghouse brakes applied the two combined will stop the car within a distance of 768 yards.

A method of electric semaphore signalling is to be employed which is largely automatic. When the car starts from a terminal it puts the first semaphore to the danger point and an indicator in the signal cabin shows the words "line blocked." A similar operation is repeated when the car passes the second semaphore signal. On coming to the third semaphore the operation is repeated and in addition the circuit is established through the first semaphore causing it to drop and the indicator corresponding to it in the cabin to change to the words "line clear." It will thus be seen that there is always one complete section blocked immediately behind each car. The line from Manchester to Liverpool is divided into 5 sections of nearly 7 miles between each signal post. If the car passes the signal when it is at danger a circuit is closed which causes an electric gong to ring continuously and the motorman of the car is thus warned that the car ahead has, for some cause, been stopped at a minimum distance of seven miles in front of his own car. The same circuit which rings the gong also operates a circuit breaker, in doing which it cuts off the current from the car motors and it also automatically puts on the Westinghouse brakes. If the semaphore is lowered the gong circuit is not complete and the gong does not ring. If for any cause the car should run backwards past a signal it would immediately put the signal two stations behind it back again to danger. Signal cabins will be placed along the line each of which will be in charge of one man. The cabin will be furnished with two sets of electrical apparatus, one for the up and one for the down line. The indicators in the signal cabins show the words "up line clear," or "up line blocked," "down line clear," or "down line blocked."

The cabins will be connected with each other and with the transformer stations and the generating station by telephone.

It is believed that this line offers almost absolute safety from collisions as there are no grade crossings or switches, and there will never be more than two cars on one track from end to end whatever the number of passengers carried. A high fence will enclose the line from end to end. The terminal stations at Manchester and Liverpool are practically similar buildings. The level of the rails will be about 60 ft. above the street level which will necessitate the use of elevators for the passengers. The cars will be transferred from one track to the other by means of turn tables operated by hydraulic power. The station buildings will be of brick and steel construction and will contain the store rooms and executive offices of the company.

PROPOSED IOWA INTERURBAN.

The Commercial Club of Omaha, Neb., has been asked to give its indorsement and moral support to the Des Moines & Omaha Electric Railway. This is a proposed line from Des Moines, Ia., to Omaha, Neb.

Mr. Lyman Waterman of Omaha is the chief promoter of the enterprise. Mr. Waterman is manager of the Creston (Ia.) Electric Light, Heat & Power Co. That company has under construction a road from Winston, Ia., to Creston, Ia., a distance of 40 miles. In addition to this section the proposed road would cover the 84 miles from Omaha to Spaulding, near Creston, and the section from Winterset to Des Moines.

Mr. Waterman is at present working on that part of the road from Omaha to Spaulding. The cost of this section is placed at \$250,000. It is expected that free right of way will be obtained and that, possibly, township bonds may be voted by some of the towns along the route.

The road would run midway between the Burlington and Rock Island roads and would traverse a fertile farming country not closely touched by any railroad. It is proposed to run a branch into the coal fields north of Corning, Ia.

With the entire road completed Omaha and Des Moines would be within 150 miles of each other by rail, which is at least 10 miles less than any present route.

The road will be of standard gage and will do a regular freight and passenger business.

DECATUR TRACTION & ELECTRIC CO.

The directors of the Decatur Traction & Electric Co. met on January 12th and declared a dividend of 1½ per cent. This is the first cash dividend in the history of the company. Ten years ago a dividend of 1½ per cent was paid in stock. The capital stock of the company is \$250,000.

During the past year the company carried 2,100,000 passengers, an increase over the preceding year of 350,000. The largest single day's business was \$900 or 18,000 cash fares. Two new cars were added to the equipment during the year. About a mile of track was relaid with new 62-lb. steel rails which, with street improvements, cost about \$30,000.

During the present year the company expects to make some extensions and to relay more of the old track with new steel rails. It is intended to add four new double truck cars to the equipment very soon. It was suggested, at the directors meeting, that the conductors and motormen be given an increase of one cent per hour in their wages. The suggestion was approved but no definite action was taken. There was no change made in the directorate or management.

RAILWAY COMPANY BUYS ELECTRIC PLANT.

Announcement has been made of the sale of the Scottdale (Pa.) Electric Light, Heat & Power Co.'s plant to the Pittsburg, McKeesport & Connellsville Railway Co. of Pittsburg. The latter company now controls light and power plants at Scottdale, Uniontown, Connellsville, Dawson, and Mt. Pleasant. The terms of the transaction have not been made public.

The purchase dates back to January 1st. Charles H. Loucks, cashier of the Scottdale First National Bank, has been appointed trustee to complete the business of the old company.

THE PROGRESS OF ELECTRIC TRACTION IN GREAT BRITAIN.

The electric tramway fever in Great Britain shows no signs of abating. No week passes but what we hear of new enterprises in this field, while of those lines already in operation the financial success varies greatly. Among the chief conditions likely to affect the prosperity of tramway undertakings, we may mention the construction and equipment; the management; the supply of power; the steady growth of traffic; competition; initial outlay and a due provision for depreciation. The construction of electric tramways, as of electric railways, still remains an open question.

In Great Britain the electric tramway is still in its infancy, the great growth is yet to come, and it promises to assume vast proportions.

In 1898 the track mileage was 365 and the number of cars 2,117; in 1900 the numbers were 576 and 3,033 respectively, while in 1901 they had risen to 777 and 3,821, showing an increase of 112 per cent over 1898 in track mileage and of 73 per cent in cars. The figures for capital invested were, in 1898: Companies, £9,800,000; 1900, companies £14,500,000, and municipalities, £2,750,000; and in 1901: Companies, £19,750,000, municipalities, £10,520,000. Thus 1901 shows an increase of 210 per cent over 1898, and the capital invested in this country in electric tramways compares very favorably with that of the United States, which can claim a seniority of at least 10 years in this kind of electric traction, and where the mileage is more than 30 times greater than in Great Britain.

A great number of new schemes have been prepared for the next session of Parliament; by far the greater number of projects are for linking together small towns in agricultural or industrial districts rather than for purely urban service. One proposal is to connect the County of London from the termini of the London County Council boundaries with many outlying towns. The London United Tramway Co. (in which Mr. Yerkes has an interest) has already done much in this direction in the west and southwest of the metropolis, and is seeking power for road widening at certain points. The British Electric Traction Co. has annexed south and southeastern suburbs and with Croyden as the center, proposes extensions to Carshalton, Mitcham, Beddington, Wellington, Penje, etc.—thus penetrating the beautiful rural districts of Surrey and eastwards to Beckenham, Bromley, Farnboro, Chelsfield, Halstead and Lewisham, about 12 to 14 miles in all. There are new schemes for Kent to radiate from the existing lines at Greenwich. Several promoters are busy providing rival enterprises for Stroud, Rochester and Chatham and thence to Rainham, Gravesend and Maidstone. The most notable of the new provincial schemes is that of the Nottingham & Derby Tramways Co. for a large network between the County Boroughs of Notts and Derby; the lines varying in length from 10 to 17 miles and radiating in all directions; this, it will be seen, is an important enterprise. Birkenhead and Chester (15 miles) are to be linked; Gosport, Fareham, Porchester and Cosham are to encircle Portsmouth Harbor. These are some of the principal schemes but there are many others. We may look forward to the time when it will be possible to travel from south to north throughout Great Britain by the trolley line as in the United States.

But meanwhile local authorities and municipal bodies raise innumerable difficulties and prevent through services, as, for instance, in the Potteries district, and more recently at Birmingham and Bournemouth. Middleton is now connected with Manchester by the electric tramway line inaugurated at the end of December; the road is 6 miles in length, and the journey from end to end is covered in 40 minutes; the fare is 3½d, whereas on the Lancashire & Yorkshire Ry. the third-class return fare for the same journey is 8d.; the new competitor is likely to prove a formidable rival with its continuous 15-minute service. The average weekly receipts for Manchester Tramways total no less than £8,000, the passengers carried being well over 1¼ millions. The 11 miles of track laid down at Wolverhampton on the Lorain surface contact system have so far proved entirely satisfactory, but the crucial test will come with snow and ice; 23 cars are in daily use.

In considering the question of urban electric tramway management, experience and reason are in favor of promotion by companies rather than by municipalities, and for the following reasons:

The enterprise, which is a commercial one, is founded on capital borrowed on the security of the rates, and electric tramways cannot be considered a suitable investment for public funds. They are a purely speculative venture; the prosperity they enjoy is absolutely dependent on their having and retaining a heavy traffic—one might say in most cases a monopoly—which might at any moment—so engineers tell us—be destroyed by the long looked for improvement in motor omnibuses, or the invention in this field promised us before long by Mr. Edison which is to render all present electric tramway systems obsolete. In London and other large cities the risk to the ratepayers is increased besides by the prospect of numerous competing tube lines and by the imminent electrification of suburban lines by the great railway companies. Furthermore, every sign of the times points to industrial redistribution in the near future. The use of electric power and the facilities for transmission to a great distance make it advisable and possible for large factories to be established in outlying districts, where land and rates are cheap instead of in cities where rents and taxes become every year more prohibitive; the example of the British Westinghouse Co., in establishing its works at Trafford Park well outside Manchester, and of having a small township for the employees around the works, cannot fail to be followed, more especially in those districts connected by interurban electric tramway lines with facilities for establishing a practical freight traffic obviating re-lading. Thus will a substantial portion of the passenger traffic in cities be diverted into rural districts and where will then be the prosperity of the municipal tramway lines? The burden will fall on the diminished number of rate payers.

The treatise of Mr. McDonald McColl, the late chief bookkeeper to the Glasgow corporation, draws attention to the principle that in tramway and railway undertakings revenue should be charged not only with the cost of maintenance, but also with the depreciated value of buildings, plant and equipment, altogether apart from the repayment of loans constituting the capital outlay. The permanent way is the most rapid item of depreciation in the equipment of a tramway, and in Glasgow we find that the revenue is charged with £450 per mile annually to meet the cost of renewals, the average life of the permanent way being reckoned at 10 years.

Now that there is so much in the air concerning the electrification of suburban lines, it is interesting to hear of a new development in steam traction which is expected to serve better than electricity for heavy local traffic. The Great Eastern Ry. has been seriously engaged for some time trying to solve the problem of carrying no less than 6,410 passengers to town by one branch alone during one certain half hour of the morning (7:30 to 8:00 a. m.) without overcrowding. During that half hour eight trains from the Wood street district disgorge their crowds at Liverpool street station. Taking the aggregate number of seats for those eight trains, there should be plenty of room for all, and yet the overcrowding seems inevitable because the public does not spread itself evenly over all the trains. The length of platforms at the terminus prevents the use of more than 15 coaches, which carry together 852 passengers. An electric motor car or locomotive running at the briefest intervals would, the railroad company points out, fail to cope with such congestion of traffic. The Great Eastern, which has been using petroleum locomotives whenever the price of oil is less than that of coal, is building at the Stratford works a locomotive for burning coal, which is to revolutionize steam traction and put off the day of electrification.

D. N. D.

SEEING WASHINGTON OBSERVATION CARS.

The Washington Railway & Electric Co., of Washington, D. C., is running special observation cars for visitors to the capital, known as "Seeing Washington Observation Cars." The cars used in winter are elegantly upholstered and electrically heated while in the summer commodious open coaches are used, insuring under all conditions the comfort of the passengers. About 25 miles of road are covered and over one thousand points of interest are passed. An expert guide is on each car. The trip is made twice daily including Sundays. It occupies about two hours and the round trip fare is 50 cents.

CONNECTICUT STREET RAILWAYS.

The report of the railroad commissioners of the state of Connecticut for 1902 has just been issued, a large portion of which is devoted to the street railways of the state. The street railway companies were first required to make annual reports to the railroad com-

missioners in 1895 and a comparison with some of the items of the first report with similar items in the present report shows the growth of street railway traffic in the state to have been large. There were then 317 miles of street railway, and there are now 517, an

TABLE No. 1.

| Number. | STREET RAILWAYS. | From— | To— | Length of main tracks. | Length of sidings and turnouts. | Total computed as single tracks. | Motive power. | Capital authorized by charter. | Stock issued. | Bonds issued. |
|---------|--|-----------------|---|------------------------|---------------------------------|----------------------------------|---------------|--------------------------------|-----------------|-----------------|
| 1 | Branford Lighting & Water Co. | East Haven | Branford. | 5.151 | 1.356 | 6.507 | Elect'y. | \$500,000.00 | \$200,000.00 | \$300,000.00 |
| 2 | Bristol & Plainville Tramw'y Co. | Bristol | Plainville, Forestville. | 7.337 | .587 | 7.924 | " | 1,000,000.00 | 100,000.00 | 135,000.00 |
| 3 | Conn. Railway & Lighting Co. | Bridgeport | New Britain, Waterbury, Derby, Milford, Shelton, Saugatuck, Norwalk, and South Norwalk. | 151.720 | 7.560 | 159.280 | " | 15,000,000.00 | 15,000,000.00 | 9,850,000.00 |
| 4 | Danbury & Bethel Street R'y Co. | Danbury | Bethel. | 10.637 | 1.096 | 11.733 | " | 323,000.00 | 320,000.00 | 200,000.00 |
| 5 | Danielson & Norwich St. R'y Co. | | Road under construction. | | | | " | 50,000.00 | | |
| 6 | E. Hfd. & Glas'b'y St. R'y Co. | East Hartford | Glastonbury. | 9.755 | .447 | 10.202 | " | | | 200,000.00 |
| 7 | Fair Haven & Westville R.R. Co. | New Haven | Westv., M'towe., E. Hav., F. Hav., Mt. Carmel. | 68.475 | 2.753 | 71.228 | " | 5,000,000.00 | 3,000,000.00 | 1,133,000.00 |
| 8 | Farmington Street R'y Co. | West Hartford | Unionville. | 9.700 | 1.100 | 10.800 | " | 189,000.00 | 189,000.00 | |
| 9 | Greenwich Tramway Co. | E. Portchester | Mianus. | 5.568 | .189 | 5.757 | " | 600,000.00 | 125,000.00 | 150,000.00 |
| 10 | Hid., Man. & Rockv'e Tram. Co. | Burnside | Manchester, Rockville. | 16.897 | .440 | 17.337 | " | 500,000.00 | 300,000.00 | 200,000.00 |
| 11 | Hartford & Sp'ng'd St. R'y Co. | East Windsor. | Mass. State Line. | 13.000 | .473 | 13.473 | " | 500,000.00 | 400,000.00 | 400,000.00 |
| 12 | Hartford Street Railway Co. | Hartford | Wethers'd, W. Hfd., Rainb., Elmwood, E. Windsor Hill, E. Hfd., Newington. | 75.081 | 2.385 | 77.466 | " | 2,000,000.00 | 1,000,000.00 | 2,500,000.00 |
| 13 | Manufacturers' Railroad Co. ² | New Haven | | 1.364 | | 1.364 | " | 20,000.00 | 20,000.00 | |
| 14 | Meriden Electric Railroad Co. | Meriden | Wallingford. | 18.100 | 1.400 | 19.500 | " | 1,000,000.00 | 1,000,000.00 | 500,000.00 |
| 15 | Mer., Southington & Com. T. Co. | Meriden | Compounce. | 11.642 | .693 | 12.335 | " | 500,000.00 | 200,000.00 | 175,000.00 |
| 16 | Middletown Street Railway Co. | Middletown | Portland. | 9.050 | .875 | 9.925 | " | 200,000.00 | 135,000.00 | 150,000.00 |
| 17 | Montville Street R'y Co. | Norwich | New London. | 10.463 | .204 | 10.667 | " | 300,000.00 | 250,000.00 | 250,000.00 |
| 18 | Newington Tramway Co. ³ | | | | | | " | 500,000.00 | 250,000.00 | 140,000.00 |
| 19 | New London Street Railway Co. | New London | | 7.492 | | 7.492 | " | 600,000.00 | 250,000.00 | 350,000.00 |
| 20 | Norwich Street Railway Co. | Norwich | Baltic, Yantic, T'ville, Laurel Hill. | 17.004 | .650 | 17.654 | " | 400,000.00 | 400,000.00 | 600,000.00 |
| 21 | People's Tramway Co. | Danielson | North Grovesendale. | 15.939 | .500 | 16.439 | " | 100,000.00 | 10,000.00 | |
| 22 | So. Man. L't, Power & Tram. Co. ⁴ | So. Manchester | Manchester. | .795 | | .795 | " | 200,000.00 | 50,000.00 | |
| 23 | Somers & Enfield Electric R'y Co. | | Road under construction. | | | | " | 200,000.00 | 50,000.00 | |
| 24 | Stamford Street Railroad Co. | Stamford | | 12.490 | .200 | 12.690 | " | 200,000.00 | 92,340.00 | 75,000.00 |
| 25 | Suffield Street Railway Co. | Suffield Center | Mass. State Line. | 4.706 | .208 | 4.914 | " | 300,000.00 | 50,000.00 | |
| 26 | Torington & Winchester St. Ry. Co. | Torington | Winsted. | 12.559 | .471 | 13.030 | " | 1,000,000.00 | 200,000.00 | 150,000.00 |
| 27 | The West Shore Railway Co. ⁵ | Savin Rock | Woodmont. | 4.370 | .120 | 4.490 | " | 200,000.00 | 80,000.00 | 30,000.00 |
| 28 | Winchester Avenue R. R. Co. ⁶ | New Haven | West Haven. | 18.070 | 1.880 | 19.950 | " | 1,000,000.00 | 800,000.00 | 500,000.00 |
| 29 | Worcester & Conn. East'n R'y Co. | | Road under construction. | | | | " | 50,000.00 | | |
| Total. | | | | 517.454 | 26.079 | 543.533 | | \$32,232,000.00 | \$23,571,348.00 | \$17,488,000.00 |

1 Operated by Hartford Street Railway Co. 2 Business of this company consists of moving freight cars of steam railroads in New Haven to and from manufacturing concerns. 3 Operated by Hartford Street Railway Co. and Connecticut Railway & Lighting Co. 4 Operated by Hartford, Manchester & Rockville Tramway Co. 5 Operated by Fair Haven & Westville Railroad Co. 6 Operated by Fair Haven & Westville Railroad Co.

TABLE No. 2.

| Number. | STREET RAILWAYS. | Floating indebtedness. | Capital stock, bonds, and floating debt per mile of road operated, including sidings. | Cost construction. | Cost equipment. | Cost of construction and equipment per mile of road owned. | Cost of construction per mile of road operated. | Gross earnings. | Gross earnings per mile operated. | Gross earnings per mile run. | Operating expenses. | Operating expenses per mile operated. | Operating expenses per mile run. | Net earnings. | |
|---------|---------------------------------------|------------------------|---|--------------------|-----------------|--|---|-----------------|-----------------------------------|------------------------------|---------------------|---------------------------------------|----------------------------------|---------------|------------|
| 1 | Branford Lig. & Wat. Co. | | 53,788.22 | \$252,850.65 | No equip. | \$68,501.38 | \$68,501.38 | \$22,833.20 | \$6,374.14 | \$.183 | \$11,645.88 | \$2,260.80 | \$0.005 | \$21,187.92 | |
| 2 | Brist. & Plain. Tram. Co. | \$1,500.00 | 29,846.41 | 239,214.96 | \$34,461.22 | 37,306.43 | 32,609.34 | 41,316.91 | 5,831.54 | .195 | 31,850.55 | 4,341.13 | .15 | 9,466.96 | |
| 3 | Conn. Ry. & Ltg. Co. | 260,000.00 | 154,507.78 | 24,523,339.38 | | 161,675.50 | | 1,106,868.35 | 7,295.47 | .2147 | 668,454.34 | 4,405.84 | .129 | 438,414.01 | |
| 4 | Dan. & Bethel St. Ry. Co. | 21,500.00 | 46,151.87 | 423,084.55 | | 51,746.05 | 39,705.21 | 77,780.18 | 7,312.22 | .2235 | 56,548.13 | 5,516.17 | .163 | 21,232.00 | |
| 5 | Dan'l's'n & N'h St. Ry. Co. | | Road under construction. | | | | | | | | | | | | |
| 6 | E. H. & Glas't. St. Ry. ³ | 840,000.00 | 58,024.93 | 3,744,232.75 | | 20,602.30 | | | | | | | | | |
| 7 | Fair Hav. & Westv. R.R. | | 17,500.00 | 107,041.82 | | 60,051.23 | 54,680.29 | 980,171.18 | 10,201.93 | .1908 | 627,786.73 | 6,534.20 | .122 | 352,384.45 | |
| 8 | Farmington St. Ry. Co. | | | | | 16,140.43 | 11,035.21 | 36,004.86 | 3,711.82 | .1724 | 34,997.83 | 3,608.02 | .1675 | 1,007.03 | |
| 9 | Greenwich Tram. Co. | 133,117.26 | 67,416.58 | 333,775.11 | | 66,698.05 | 71,924.16 | 23,259.75 | 4,177.39 | .1736 | 15,142.29 | 2,719.52 | .1130 | 8,117.46 | |
| 10 | H. M. & R. Tram. Co. | 7,000.00 | 29,213.81 | 390,749.64 | | 175,678.52 | 33,522.41 | 23,125.88 | 130,903.01 | 7,404.08 | .2772 | 104,987.57 | 6,934.18 | .222 | 26,005.44 |
| 11 | Hart. & Sp'ng'd St. Ry. | 20,000.00 | 60,862.46 | 532,488.57 | | 263,030.50 | 62,732.23 | 41,007.09 | 44,709.42 | 3,439.18 | .1636 | 36,982.35 | 2,844.79 | .1271 | 7,727.07 |
| 12 | Hartford St. Ry. Co. | | 7,267.34 | 2,738,581.05 | | 872,517.15 | 48,096.03 | 39,329.50 | 780,658.37 | 8,616.95 | .182 | 536,880.51 | 5,926.68 | .125 | 248,677.86 |
| 13 | Manufacturers' R.R. Co. ⁴ | 13,000.00 | 24,193.53 | 28,258.00 | | 8,810.31 | 27,176.18 | 20,717.01 | 8,752.03 | 6,416.86 | | 3,364.43 | 2,833.16 | | 4,888.20 |
| 14 | Meriden Elec. R.R. Co. | 161,400.00 | 85,200.00 | 1,639,790.96 | | 52,182.00 | 93,313.42 | 40,480.44 | 138,552.88 | 7,654.86 | .2011 | 89,237.17 | 4,931.35 | .1295 | 49,206.71 |
| 15 | M., S. & Comp. Tram. | 4,375.00 | 30,755.98 | 378,972.98 | | | 32,552.22 | | 50,286.52 | 8,704.87 | .1653 | 35,443.40 | 2,611.31 | .1095 | 14,842.93 |
| 16 | Middletown St. Ry. Co. | 5,800.00 | 29,298.73 | 575,679.89 | | | 40,450.81 | | 40,113.81 | 4,432.46 | .2135 | 27,787.77 | 3,070.47 | .1479 | 12,326.04 |
| 17 | Montville St. Ry. Co. | | 46,873.53 | 432,160.13 | | 78,944.26 | 48,847.78 | 41,302.69 | 89,760.88 | 8,578.88 | .3923 | 47,809.28 | 4,569.36 | .2069 | 41,951.60 |
| 18 | Newington Tram. Co. ⁵ | | | | | | | | | | | | | | |
| 19 | New London St. Ry. | 48,209.18 | 240,944.86 | 108,259.29 | | 53,977.59 | 31,782.73 | 70,167.99 | 9,823.32 | .2885 | 40,730.70 | 5,702.18 | .1673 | 28,437.29 | |
| 20 | Norwich St. Ry. Co. | 38,000.00 | 36,139.12 | 551,587.27 | | 121,164.75 | 39,758.41 | 32,015.11 | 109,814.99 | 6,458.20 | .2736 | 66,661.19 | 3,920.32 | .1061 | 43,153.80 |
| 21 | People's Tram. Co. | 26,516.96 | 62,444.00 | 1,025,000.00 | | 64,307.87 | | 60,032.00 | 3,766.36 | .1560 | 44,618.20 | 2,801.20 | .1016 | 15,883.71 | |
| 22 | So. Man. L't, P. & Tram. ⁴ | | 12,578.62 | 11,821.69 | No equip. | 14,870.05 | | | | | | | | | |
| 23 | Som. & Enfield Elec. R'y Co. | | | | | | Road under construction. | | | | | | | | |
| 24 | Stamford St. R. R. Co. | 143,016.78 | 24,448.92 | 232,724.28 | | 26,900.17 | 28,473.05 | 25,022.86 | 63,983.65 | 5,122.79 | .1605 | 40,210.68 | 3,219.42 | .1046 | 23,773.07 |
| 25 | Suffield Street Ry. Co. | 24,414.16 | 14,939.88 | 61,908.93 | | 10,511.65 | 15,388.98 | 13,155.31 | 4,696.10 | .0880 | 3,408.06 | 736.94 | .0660 | 1,128.04 | |
| 26 | Tor. & Winch. St. Ry. | 34,490.00 | 29,508.00 | 353,133.47 | | 45,332.83 | 31,726.75 | 28,117.96 | 47,215.03 | 3,759.46 | .2020 | 25,079.64 | 1,096.95 | .1070 | 22,135.29 |
| 27 | The West Shore Ry. Co. | | 24,498.66 | 102,651.38 | | 8,091.47 | 25,341.15 | 23,490.00 | | | | | | | |
| 28 | Winchester Ave. R. R. ⁶ | 106,784.18 | 61,243.21 | 772,189.41 | | 436,557.65 | 66,947.81 | 34,465.85 | | | | | | | |
| 29 | Worc. & Ct. Estn. Ry. Co. | | | | | | | | | | | | | | |
| Total. | | \$1,929,914.34 | 7,215.98 | 39,854,101.71 | 2,924,054.60 | 82,670.45 | 70,419.45 | 3,937,771.46 | 6,957.77 | .2032 | 2,550,236.69 | 4,606.09 | .1816 | 1,887,534.77 | |

1 Including gas and electric properties. 2 Including gas and electric plants and equipment. 3 Operated by Hartford Street Railway Company. 4 Business of this road consists of moving freight cars of steam railroads in New Haven to and from manufacturing concerns. 5 Operated by Hartford St. Ry. Co. and Conn. Railway & Lighting Co. 6 Amount paid to contractors: road under construction. 7 Operated by Hartford, Manchester & Rockville Tramway Co. 8 Operated by Fair Haven & Westville Railroad Co. 9 Operated by Fair Haven & Westville Railroad Co. 10 Operated by Fair Haven & Westville Railroad Co. 11 The Winchester Ave. R. R. was operated during the year under a traffic agreement with the Fair Haven & Westville R. R. Co. under which the former road received \$97,345.67, being 27.15 per cent. of the gross income, viz.: \$358,547.23.

missioners in 1895 and a comparison with some of the items of the first report with similar items in the present report shows the growth of street railway traffic in the state to have been large. There were then 317 miles of street railway, and there are now 517, an

per cent in mileage, 9 per cent in earnings, 17 per cent in the number of passengers carried, over the same items for the previous year. The present number of street railways reported is 29. There were 32 companies last year, 9 of which were merged into the Con-

section Railways & Lighting Co., and six new companies have since been added to the list. The six new companies are The Branford Lighting & Water Co., the Danielson & Norwich Street Ry., the Greenwich Tramway Co., the Somers & Enfield Electric Railway Co., the Suffield Street Railway Co. and the Worcester & Connecticut Eastern Railway Co. There are several other street railway lines in the process of construction in different parts of this state. The Danbury & Harlem Traction Co. has a partially completed line extending from Danbury to a junction to the Harlem R. R. at Gold-

All of the railways of the state have been inspected by the railroad commissioners as required by law, and found to be in a satisfactory condition. The mileage of all of the street railways of the state in operation on June 30, 1902, was 517.454 miles of main track exclusive of sidings and turnouts, and 543,533 miles of single track including sidings and turnouts, showing an increase for the year of 25,227 miles. The bonded debt of all the companies is \$17,488,000, paying \$33.796 per mile of road. The floating indebtedness of all the companies is \$1,929,914, paying \$3.729 a mile of road. The cost of con-

TABLE 3.

| Number. | STREET RAILWAYS. | Net earnings per mile operated. | Net earnings per mile run. | Dividends. | Interest. | Taxes paid state. | Capital stock issued per mile of road owned. | Bonds issued per mile of road owned. | Miles run. | Passengers carried. | No. of pay- ing passen- gers per mile of main track oper- ated. | No. of pay- ing passen- gers per mile run. | No. of em- ployees. | ACCIDENTS. | |
|---------|---|---------------------------------|----------------------------|------------|---------------------|-------------------|--|--------------------------------------|------------|---------------------|---|--|---------------------|------------|----------|
| | | | | | | | | | | | | | | Killed. | Injured. |
| 1 | Branford Lighting & Water Co., | \$4,113.24 | \$.118 | | \$6,875.00 | \$1,711.45 | \$38,827.41 | \$29,180.56 | | 662,765 | 127,482 | | | | |
| 2 | Bristol & Plainville Tramway Co., | 1,230.22 | .0150 | \$6,000.00 | 6,930.00 | 1,637.00 | 13,630.10 | 18,400.61 | | 212,335 | 845,980 | 3.9 | 35 | | |
| 3 | Connecticut Railway & Lighting Co., | 2,849.66 | .0850 | | 429,366.59 | 88,337.98 | 98,866.31 | 61,626.68 | | 5,151,467 | 26,455,490 | 4.262 | 790 | 2 | 87 |
| 4 | Danbury & Bethel St. Ry. Co., | 1,926.05 | .061 | 9,600.00 | 10,235.86 | 2,853.00 | 30,033.67 | 18,862.29 | | 347,880 | 1,895,155 | 4.116 | 45 | | 18 |
| 5 | Danielson & Norwich St. Ry. Co., | | | Road | under construction. | | | | | | | | | | |
| 6 | E. Hfd. & Glastonbury St. Ry. Co., | | | | | | | 20,502.30 | | | | | | | |
| 7 | Fair Haven & Westville R. R. Co., | 3,667.73 | .0686 | 137,500.00 | 57,737.47 | 48,759.19 | 43,811.61 | 16,546.19 | | 5,137,357 | 25,016,350 | 212,006 | 3,752 | 830 | 52 |
| 8 | Farmington St. Ry. Co., | 103.82 | .0048 | | | 764.33 | 19,484.53 | | | 218,832 | 294,649 | 30,376 | 1.41 | 22 | |
| 9 | Greenwich Tramway Co., | 1,477.86 | .0605 | | 3,750.00 | | 22,449.71 | 26,939.65 | | 133,961 | 465,195 | 83,548 | 3.47 | 20 | |
| 10 | Hfd., Manchester & Rockville Tram. Co., | 1,469.89 | .055 | | 10,238.30 | 6,263.35 | 17,754.63 | 11,836.42 | | 473,431 | 1,298,960 | 62,503 | 2.61 | 75 | 9 |
| 11 | Hartford & Springfield St. Ry. Co., | 573.52 | .0265 | | 7,583.00 | 2,525.00 | 30,769.23 | 30,769.23 | | 200,968 | 883,722 | 64,756 | 2.89 | 4 | 3 |
| 12 | Hartford St. Ry. Co., | 2,690.07 | .057 | 60,000.00 | 106,208.17 | 40,181.68 | 13,318.94 | 33,297.37 | | 4,291,176 | 19,160,210 | 174,171 | 3.68 | 621 | 62 |
| 13 | Manufacturers R. R. Co., | 3,584.52 | .0710 | | 29,139.44 | 6,607.45 | 55,348.02 | 27,624.31 | | 649,012 | 3,266,349 | 143,076 | 3.757 | 90 | |
| 14 | Meriden Elec. R. R., | 2,231.52 | | | 8,757.29 | 2,335.98 | 17,179.17 | 15,031.78 | | 333,634 | 961,830 | 70,862 | 2.971 | 43 | 20 |
| 15 | Mer., Southton & Comp. Tram. Co., | 1,093.56 | .0453 | 6,000.00 | 7,458.07 | 1,584.62 | 14,917.12 | 16,574.68 | | 187,860 | 949,787 | 87,514 | 4.220 | | |
| 16 | Milltown St. Ry. Co., | 1,361.99 | .0056 | | 12,500.00 | 4,600.00 | 23,894.73 | 23,893.73 | | 228,760 | 1,521,901 | 113,819 | 6.582 | 23 | 4 |
| 17 | Montville St. Ry. Co., | 4,039.51 | .1833 | 15,000.00 | 6,999.70 | 4,200.00 | 32,977.16 | 18,467.22 | | 243,309 | 1,475,053 | 154,914 | 4.828 | 40 | |
| 18 | Newington Tram. Co., | 2,517.88 | .1075 | 11,250.00 | 18,695.17 | 5,300.00 | 14,702.39 | 20,583.38 | | 401,323 | 2,528,198 | 128,607 | 5.440 | 55 | |
| 19 | New London St. Ry. Co., | 4,121.14 | .4212 | | 15,000.00 | 5,658.00 | 25,095.67 | 37,643.51 | | 382,582 | 1,180,918 | 73,964 | | 45 | 12 |
| 20 | Norwich St. Ry. Co., | 965.10 | .04 | | | | | | | | | | | | |
| 21 | People's Tram. Co., | | | Road | under construction. | | | | | | | | | | |
| 22 | So. Mau. Lt. Power & Tram. Co., | | | | 2,067.45 | 2,125.17 | 7,385.10 | 6,000.00 | | 354,254 | 1,642,683 | 106,294 | 3.465 | 45 | 1 |
| 23 | Somers & Enfield Elec. Ry. Co., | 1,903.36 | .0619 | | 305.21 | 274.16 | 10,624.74 | 51,858 | | 51,858 | 91,922 | 19,533 | 1.772 | 13 | |
| 24 | Stamford St. R. R. Co., | 1,393.36 | .0619 | | 8,390.00 | 1,934.95 | 15,924.83 | 11,943.63 | | 233,283 | 956,972 | 76,198 | 4.000 | 27 | |
| 25 | Suffield St. Ry. Co., | 1,762.51 | .0850 | | | | 18,306.64 | 6,864.99 | | | | | | | |
| 26 | Torrington & Winchester St. Ry. Co., | | | 40,000.00 | 33,704.09 | 16,937.52 | 44,272.27 | 27,670.17 | | | | | | | |
| 27 | The West Shore Ry. Co., | | | Road | under construction. | | | | | | | | | | |
| 28 | Winchester Ave. R. R. Co., | | | | | | | | | | | | | | |
| 29 | Worcester & Conn. Eastern Ry. Co., | | | | | | | | | | | | | | |
| Total, | | 2,451.66 | .0716 | 297,850.00 | 782,740.33 | 244,768.88 | \$45,558.35 \$45,282.47 | 33,796.24 | 19,375,730 | 91,564,028 | 161,769 | 4,725 | 2,903 | 15 | 277 |

¹ Including gas and electric properties.

² Included in report of Fair Haven & Westville R. R. Co.

³ Operated by Hartford St. Ry. Co.

⁴ Business of this company

consists of moving freight cars of steam railroads in New Haven to and from manufacturing concerns.

⁵ Operated by Hartford St. Ry. Co. and Conn. Ry. & Lighting Co.

⁶ Operated by Hartford, Manchester & Rockville Tramway Co.

⁷ Operated by Fair Haven & Westville R. R. Co.

⁸ Computed on \$23,571,248.00 capital stock issued as

appears in Table 1.

⁹ Computed on \$23,421,248.00, having deducted \$150,000.00 from amount shown in Table 1.

For the reason that, while the Danielson & Norwich St. Ry. Co., the Somers & Enfield Electric Ry. Co., and the Worcester & Conn. Eastern Ry. Co. each show an issue of \$50,000 capital stock, the roads are under construction and report no mileage.

en's bridge. Owing to financial complications, work upon this line has been temporarily suspended. A line from New Haven to Derby is in process of erection; also one from Mt. Carmel, through Cheshire and Milldale to Southington where it connects with the Meriden, Southington & Compounce tramway. The Willimantic Traction Co. has several projected lines under construction and the Stamford

struction and equipment of the roads is reported at \$42,778,156, which is \$82,670 per mile of road. The gross earnings of the companies for the year ending June 30, 1902, were \$3,937,771, the operating expenses were \$2,550,236, and the net earnings \$1,387,534. Dividends have been paid by nine companies upon \$6,170,000 of capital stock amounting to \$297,850. No dividends have been reported paid on \$17,401,248 of capital stock. The total car mileage for the year has been 19,375,730. The gross earnings per mile run were 20.32 cents, the operating expenses per mile run were 13.16 cents and net earnings per car mile run were 7.16 cents. The number of employees in the operation of the street railways is 2,903. The number of passengers injured in the operation of the street railways was 292 as against 255 for the previous year of whom 15 were killed. The number of passengers injured was 174, of whom 1 was killed; the number of employees injured was 9 of whom 3 were killed; the number of other persons injured 49, of whom 11 were killed. The details of operation of the various roads of this state are shown in the accompanying tables.

ENGINEERING EXPOSITION AT LONDON.

An international engineering, machinery, hardware and allied trades exposition is to be held at the Crystal Palace, London, from March 2, to May 31, 1903, in which Australia, New Zealand and the South African Colonies of Great Britain will be especially represented, and it is believed that the exposition offers a particularly good opportunity to American manufacturers who desire to extend their trade with Great Britain and her colonies in the Southern Hemisphere. Mr. Alfred Chasseaud, St. James Bldg., 1133 Broadway, New York City, has been appointed United States Commissioner for this exposition and will be glad to furnish information concerning floor space, diagrams, and other information that may be desired.

FINANCIAL AND STATISTICAL STATEMENTS OF CONNECTICUT STREET RAILWAYS.

Street Railway Co. has extended its lines to Sound Beach and from thence in a northerly direction to connect with an extension of the Greenwich Tramway Co. The Meriden Street Railway Co. is also completing an extension of its line through the borough of Wallingford, and the Hartford & Springfield Street Railway completed an extension connecting with the Hartford Street Railway Co. in South Windsor early last year.

| | 1901 | 1902 | Increase. |
|-------------------------------------|----------------|-----------------|-----------------|
| Capital stock issued, | \$8,137,948.00 | \$23,571,248.00 | \$15,433,300.00 |
| Bonds issued, | 6,968,000.00 | 17,488,000.00 | 10,520,000.00 |
| Floating indebtedness, | 822,593.74 | 1,929,914.31 | 1,107,320.60 |
| Cost of construction and equipment, | 15,816,288.52 | 42,778,156.31 | 26,961,867.79 |
| Gross earnings, | 3,629,783.62 | 3,937,771.46 | 307,987.84 |
| Operating expenses, | 2,298,063.88 | 2,550,236.69 | 252,172.81 |
| Net earnings, | 1,332,976.75 | 1,387,534.77 | 54,558.02 |
| Dividends, | 283,300.00 | 297,850.00 | 14,550.00 |
| Interest paid, | 645,100.14 | 782,740.33 | 137,639.59 |
| Taxes paid State, | 186,094.78 | 244,768.88 | 58,674.10 |

| | Miles. | Miles. | Increase. |
|--------------------------------------|------------|------------|------------|
| Length of road exclusive of sidings, | 492,227 | 517,454 | 25,227 |
| " " including sidings, | 615,835 | 643,533 | 27,698 |
| Miles run, | 18,138,124 | 19,375,730 | 1,237,606 |
| Passengers carried, | 78,222,462 | 91,564,028 | 13,341,566 |
| Number of employees, | 3,180 | 2,903 | |
| Number of persons injured fatally, | 15 | 14 | |
| " " not fatally, | 240 | 277 | 37 |

VENTILATION OF STREET CARS.

The ventilation of street cars in some localities is one of the most troublesome of the smaller annoyances with which the general manager has to contend. In some degree the matter of ventilation is of comparatively less importance in warm climates than it is in colder sections of the country, and while little, if any, complaint is heard from street car passengers in southern cities the managers of most of the roads in places where extremes of temperature are wide, are more or less constantly in receipt of complaints in regard to the ventilation of cars. The views of individuals on this subject, however, are so varied that with the best of intentions it is almost impossible for the general manager to frame rules in regard to regulating the ventilation which will be acceptable to all. While fresh air is considered desirable by perhaps the majority of street car passengers, there is always a certain proportion of them who object very vigorously to the cold air and who prefer foul air to taking any chances of catching cold by sitting in a draft. On the other hand we frequently see passengers who go to the other extreme, preferring to stand on the outside of a closed car, even in the severest weather. Some attempts at municipal regulation in regard to ventilation have been tried in a few localities, but the result of this has amounted to but little. Owing to the diversity of opinions and habits of the various passengers it would seem that the duty of maintaining the proper ventilation must largely devolve upon the conductor. There can be no hard and fast rules laid down as to the number of ventilators to be left open in the car or the temperature at which it must be maintained owing to the fact that the windows and ventilators are liable to be manipulated by any of the passengers according to their tastes, and the conductor can hardly refuse to open or close a ventilator at the request of a passenger, even if the action be contrary to the wishes of other passengers. It therefore devolves upon the conductor to maintain as even a temperature and as good ventilation as possible, and if obliged to close the ventilators for the passenger who objects to the draft he can watch his opportunity to open it again when the passenger leaves the car. It is only by constant vigilance that crowded cars can be maintained in proper condition as regards ventilation, especially in severe weather.

Inquiry among the builders of electric cars elicits the fact that there is very little call from the railroad companies for any special styles of ventilators other than the usual deck sash.

The J. G. Brill Co. writes that with but one exception it has never been called upon to install any special ventilating device. This was for a lot of cars furnished the Pennsylvania Railroad for operation at Atlantic City, N. J. In these cars special hoods of galvanized iron were provided at each end which led into the ducts surrounding the electric heaters. Owing to the motion of the cars these ducts lead the cold air directly to the heaters and the roofs of the cars were equipped with globe ventilators to carry off the impure air. It was claimed at the time that this was a highly satisfactory method of ventilation, but on subsequent orders for cars for the same company this feature was omitted.

The Barney & Smith Car Co. states that the only means of ventilating employed in its cars is the pivoted ventilator sash in the deck, and the ventilators hinged at one end, which are controlled by an operating lever at one end of the car.

The California Car Works, of San Francisco, reports that the subject of ventilation has never received much attention in that part of the country, chiefly owing to the mildness of the climate and the fact that no heating apparatus is required in the cars during the winter months. Besides this, the California type of car is almost universally used in this section of the country and the weather is rarely so severe as to cause much inconvenience to a passenger riding in the open section of the car.

The John Stephenson Co. always provides for the ventilation of its cars in the construction of the deck sashes. Its short side-seat cars are usually 12 in. lower than the long cross seat cars and on the former type all deck sashes are pivoted and are opened or closed by the conductor, as they are within reach of his hand. On the cross-seat cars the deck sashes are operated by bronze handles. The most usual method is to connect three deck sashes together with bronze strips, which may be opened or closed with a

handle connected with the center window. In this case, three deck sashes are operated simultaneously. Another method is to open and close every alternate deck sash by the movement of a lever at the end of the car. The latter method is in vogue on the elevated roads in New York.

The Niles Car & Manufacturing Co. also provides for ventilation only by means of deck sash.

The variations in atmospheric conditions in different parts of the country is sufficient to explain the fact that there is no great uniformity as to the rules promulgated by the different street railway companies in regard to maintaining ventilation upon their cars. In general the roads may be divided into two classes, namely, those which issue positive instructions as to how the ventilators are to be manipulated, and those which leave the entire subject to the judgment of the conductor. Under the former class is the St. Louis & Suburban system whose book of instructions to the conductors and motormen contains the following rule:

"Conductors will regulate the heat and ventilation of their cars for the best comfort of patrons, giving preference to those requiring the most protection.

"Heaters should not be turned on when the temperature is above 40° F. and should be handled in the same manner as ventilators when the cars are crowded. By this is meant that if the car is crowded ventilators should be opened, at least one or two on each side, and the heaters turned off. As the load thins out close the ventilators and turn on the heat again. Keep both your car doors closed."

Mr. T. M. Jenkins, general manager of this system, states that in addition to the foregoing rules bulletins are issued from time to time calling conductors' attention to the subject of ventilation and giving other instructions in this line. During the cold weather the company uses a signal system at various stations along its lines which indicates the amount of heat, if any, that should be turned on. In passing one of these stations the conductor on the car looks at the signal displayed and regulates the heat accordingly. A notice is framed and posted in a prominent position in all of the cars of this system which reads:

"Conductors will regulate the heat and ventilation of their cars to the best comfort of patrons, giving preference to those requiring the most protection."

Mr. D. A. Hegarty, of the Railways Company General, writes that all conductors employed by this company are given thorough instructions in the matter of ventilating the cars under their charge, as the company considers it a vital question to keep the cars clean and odorless. During the season when closed cars are in service the company uses two kinds of heaters, electric heaters and steam coils, the latter being for the large interurban cars. The company employs a mechanic whose business is to look after the regulation of the heat in the cars, and has found such a man necessary, as many of the conductors do not use good judgment in relation to the atmospheric conditions prevailing. This man also looks after the ventilation of the cars when he is on duty, regulating their heat. During mild weather, when no heat is used on the cars, the division foremen see that the conductors keep the cars ventilated and cleaned. At all of the company's car barns, when the cars are through with their daily run they are thoroughly cleaned and all the windows opened to ventilate them so that on going out in the morning they are clean and odorless. Keeping them in this condition is a somewhat difficult matter in the winter time, as the slush and mud carried in the cars during inclement weather keep the floors damp during the day, and owing to the street dirt which is tracked in it is almost impossible to keep the cars well ventilated.

The Tacoma Railway & Power Co., Tacoma, Wash., is favored by climatic conditions which makes the matter of ventilation of little consequence. Mr. W. S. Dimmock, manager of the company, writes that no heaters are used in the cars and that on short lines the doors are opened so frequently that the cars can be kept well ventilated. On long interurban lines where the doors are not so frequently opened the conductors are instructed to keep the cars well ventilated through the transoms in the upper deck. When Mr. Dimmock was manager of the Omaha & Council Bluffs system he had thermometers placed both inside and outside of the car and the conductors were told to keep the thermometers on the inside of

the cars at 55° F. during the winter season. This was accomplished by means of watching the electric heaters and the ventilators in the upper deck. This was considered a good check on the use of power and was a means of saving current that had previously been wasted, from the fact that inspectors were liable to board the car at any time, and if the thermometers were found to be more than three or four degrees either way from the temperature prescribed the conductors were laid off for 10 days for the offence. This made them watch the conditions of the heaters and ventilators very carefully. No trouble was experienced on the cars of the short lines, but on the large interurban cars unless the transoms were watched very carefully a great many complaints were received in regard to the atmosphere.

The York Street Railway Co. issues orders to its conductors to ventilate the cars by opening the top ventilators when necessary, but no fixed rules have been established. This company has a few cars equipped with what is known as Pullman ventilators, which Mr. J. P. Dusman, general manager of the company, states may be very good things, but which he has frequently observed are seldom used by the passengers. Some of these ventilators are inserted in the overhead windows, which the conductor generally keeps open and the others are used upon the large window sash, and are under the control of the passenger. These were almost always found closed and for this reason the company believes that special ventilators count for but little.

In regard to the ventilation of the cars of the Los Angeles-Pacific Railroad Co., Mr. E. P. Clark, president of the company, writes us as follows: "The question of ventilation of street cars is one that can hardly be disposed of by any general rules for the reason that there are as many different notions in regard to that subject as there are people who ride in the street cars. Their notions are generally controlled by their physical comfort and their physical comfort is largely the result of personal habits. Some people will not sit inside the car even in the coldest weather, while others will sit inside and be constantly disturbed by the imaginary closeness of the car when, as a matter of fact, the door is being opened and closed at every street crossing. Others will shiver and complain if the door is opened and lets in a gust of fresh air. Some will insist on having the ventilators all open at the top of the car, while others will suffer from fear of taking cold by having the cold air blowing down over their heads and backs. Our custom in this regard is to instruct our conductors to watch the peculiar temperaments of passengers as closely as possible, and if there are some particularly nervous and very sensitive passengers who, by their actions, indicate that they are being disturbed by the windows or ventilators being open or by the same not being open, to use as much discretion as possible and try to please them. Then when this has been done to find out if it has not displeased some other of their fellow passengers. There is practically no royal rule for pleasing everybody in the matter of ventilation; what is comfort for one person is positive discomfort for another, and this is particularly true of the patrons of street cars."

The Columbus Railway Co., of Columbus, O., disposes of the subject of the ventilation of its cars by issuing to its motormen and conductors from time to time notices concerning heating and ventilation. Several of these notices are quoted herewith and a number of them are in the nature of suggestions merely indicating to the conductor the best method of securing the desired ventilation and leaving considerable to his personal judgment.

"When cars are crowded, heaters should be shut off and one or two of the forward ventilators opened, unless the weather is stormy or severely cold. When car is nearly empty and car has cooled down, turn on the heat.

"During rainy or snowy weather, when clothing and car floor are damp, it is especially necessary to give attention to ventilation of car.

"You cannot please all in the matter of heat or ventilation. Use your best judgment in keeping your car at a moderate temperature and free from foul air. Open or close ventilators or doors at the request of passengers. It is not necessary to leave them long in either position, and by complying with the request you make friends.

"When car is running, the air can be changed in a few seconds by opening forward deck windows.

"When within 200 ft. of end of line, open both doors and the

foul air will be swept out. Don't leave them open long enough to chill the floor and seats.

"Never use the heater when it is warm enough to have door open. Most people prefer a car that is too cool to one that is too hot. They prefer clean, cool air to warm, foul air.

"Always remember that no fixed rules can take the place of intelligent attention on your part."

The Los Angeles Railway Co. informs us that its conductors are instructed always to have some of the transoms open no matter what the conditions of the weather may be. The company also makes a special effort to keep its cars scrupulously clean and it is very rare that any complaints in regard to unpleasant odors on the cars are received.

The Interurban Street Railway Co., of New York City, instructs its conductors that when the temperature is above 40° F. they are to keep at least four of the ventilators open and when it is below 40° there is to be only one ventilator open, and that at the front of the car, unless some passenger shall request that this ventilator be closed or that more may be opened. In such case, the conductor as far as possible pleases the passenger. When the temperature is below 40° F. the heat is turned on and consequently, unless a passenger desires otherwise, when the cars are heated, there is at least one ventilator open and that one in the front of the car.

The Harrisburg Traction Co., of Harrisburg, Pa., heats its cars sufficiently to make riding comfortable in the cold weather and the ventilators are generally kept closed, but the conductors are requested to throw open the doors at the end of the trip to thoroughly ventilate the cars without having the deck sash open while the cars are running.

The Calumet Electric Street Railway Co., of Chicago, insists upon its conductors using their best discretion in ventilating cars, and even in cold weather requires the rear deck lights on either side to be open. Upon some of its new cars, in which there is a smoking compartment, the deck lights are always kept open.

The Capital Traction Co., of Washington, D. C., issues the following rule bearing on the subject of ventilation, which explains the idea of the company in this respect: "Cars must be kept well ventilated and curtains lowered on sunny side. At least two ventilators will be kept partially open at all times. If any 'cranky' passenger gets on and closes these ventilators conductor will not say anything to him or interfere, but as soon as such passenger leaves the car, will immediately open the ventilators. Beyond the above instructions conductors will use their best judgment as to how many ventilators and windows should be opened and how wide, according to the weather and the number of people on the car. In cold weather doors should be kept closed as much as possible."

Mr. T. E. Mitten, general manager of the International Railway Co., of Buffalo, N. Y., writes us that the only apparent way to "keep peace in the family" is to instruct the conductors to keep open one ventilator in the front and one at the rear of the car. This insures a circulation of air through the car and the conductor is further to be governed by the last request made by any passenger.

The Fairhaven (Conn.) & Westville Railroad Co. tries to enforce, as far as possible, the rule to keep the ventilator windows open, but finds that this causes considerable complaint from one class of passengers that too much cold air is coming into the car, and from others that there is not enough.

The Birmingham (Ala.) Railway, Light & Power Co. issues the following rule in regard to the ventilation of cars: "Conductors will use their best judgment in keeping cars in such condition as to please the greatest number of passengers. At all seasons of the year two or more transom windows are to be opened each trip on all lines of the company. Immediately after turning the register conductor will see that the transoms are opened."

In the Denver City Tramway Co.'s cars all ventilators are kept wide open in warm weather and during rush hours, and inspectors are instructed to give this matter special attention and to enforce the rules. Mr. John A. Beeler, vice-president and general manager of the company, writes that he finds that this is one of the most important questions with which he has to deal, as many people prefer to walk rather than ride in a crowded, ill-ventilated car. The company's standard car is the combination car, one-half being open and half closed. It has been found that a great majority of the passengers carried prefer to ride in the open portion of the car

all the year around, which shows that the traveling public in this locality not only appreciates but demands fresh air.

The Cincinnati Traction Co. requires its conductors to keep open the front ventilator on one side of the car and the rear ventilator on the opposite side.

Mr. T. J. Nicholl, vice-president and general manager of the Rochester Railway Co., writes as follows on the subject of ventilation: "The question of ventilation is one that probably causes us more trouble than any other connected with the operation of our system, but so far the municipality has not undertaken to regulate it, and I really do not see very well how it could. We have instructed our conductors to keep open a sufficient number of ventilators at the back end of the cars at all times, no matter how cold the weather may be, but it must necessarily be left to their judgment as to how long they shall be open, according to the outside temperature. They are not always permitted to carry this order into effect, however, as some of our patrons will not submit, and often, as soon as the conductor opens the ventilators, a passenger will get up and close them; it is, therefore, a very difficult matter to regulate. In the center of the city we require passengers to alight from the cars at the front end and board them at the back end. This allows both doors to be opened and permits a draft through the car which insures a change of air at frequent intervals for some moments on each trip. Some of our patrons complain of this, but nearly all are satisfied, as they have every evidence of the desirability of fresh air from a sanitary point, and of the effect of the rule in expediting the movements of the car."

In a large number of cities, however, from which we have heard, no special directions as to ventilation are issued to the conductors, leaving them to use their good judgment in keeping the cars as well ventilated as possible. General rules of this kind are issued in Portland, Ore.; San Francisco, Cal.; Davenport, Ia.; Memphis, Tenn.; Augusta, Ga.; Council Bluffs, Ia.; Seattle, Wash.; Syracuse, N. Y.; Oakland, Cal.; San Antonio, Tex.; Austin, Tex.; Birmingham, N. Y.; Anderson, Ind.; Jersey City, N. J., and Spokane, Wash.

From the fact that in so many cities no definite rules are laid down in regard to ventilation and the matter is left almost entirely to the judgment of the conductor, and, further, as it is found even where special and definite rules are laid down that these cannot be enforced should a passenger make objection to them, in the absence of special automatic ventilating devices the question of ventilation rests practically with the judgment of the conductor when not modified by the specific demands of the passengers.

INCREASE IN PAY FOR BOSTON ELEVATED EMPLOYEES.

The Boston Elevated Railway Co. issued an order on January 19th that will result in an increase of wages or otherwise materially benefit more than 5,000 employees. It is said to be the most liberal scheme of wages ever offered by any railway company. The action is all the more notable for the reason that it was entirely voluntary upon the part of the management. Every man in the car service will profit to some extent as a result of the order. In an interview, General Wm. A. Bancroft, the president of the company, said:

"The company has determined to make a large addition to the compensation of its car service men. It will amount to nearly a quarter of a million dollars annually. We believe in maintaining the very best service and feel satisfied that our employees are unexcelled anywhere in a like service. Positive merit will be recognized by special compensation at the end of each year for every man whose record is of sufficient excellence. Veterans in the service will receive a higher rate of wages than is now paid, the amount depending upon the length of service. Men who wear themselves out in the service and become incapacitated as a result of age will receive a substantial contribution to their support."

The general order increasing wages, which was made effective Jan. 24, 1903, is as follows:

1. **LEARNERS.** Learners while breaking in as conductors or motormen, will be allowed one dollar per day for each day of not less than ten hours.

This is also applicable to men learning to be brakemen or motormen of the Elevated Division.

2. **MINIMUM PAY.** Extra conductors and motormen of surface lines will be guaranteed a minimum amount of \$1.50 per day for each 10-hour day during which they have reported and are on hand awaiting work for the required full day, whether work falls to them or not.

Extra brakemen, guards and motormen of Elevated Lines will be guaranteed a minimum amount of pay for each full 10-hour day during which they have reported and are on hand awaiting work for the required full day, whether work falls to them or not, as follows: Motormen, 15 cents per hour for 10-hour day; guards, 13.7 cents per hour for 10-hour day; brakemen, 12 cents per hour for 10-hour day.

3. **THREE CLASSES OF STARTERS.** Starters will be divided into three classes, to be paid respectively \$2.25, \$2.35 and \$2.50 per day.

4. **REGULAR RATE OF PAY OF GUARDS AND BRAKEMEN OF ELEVATED LINES.** The regular rate of pay of guards is fixed at 21 cents an hour, in place of 20 cents.

The regular rate of pay of brakemen is fixed at 18½ cents an hour, in place of 17½ cents.

5. **EXTRA COMPENSATION TO BLUE-UNIFORMED MEN WEARING SERVICE STRIPES.** One service stripe will hereafter be awarded to blue-uniformed men only for each five years of continuous service in the surface or elevated service of this company.

Blue-uniformed men now wearing, or hereafter becoming entitled to wear service stripes, will be paid an increase of wages as follows: For one stripe, 5 cents per 10-hour day, or ½ cent per hour; for two stripes, 10 cents per 10-hour day, or 1 cent per hour; for three or more stripes, 15 cents per 10-hour day, or 1½ cents per hour.

This will be added to the regular rates of pay governing employment in the car service, which includes inspectors, starters, station masters, collectors, and all other blue-uniformed men in both surface and elevated service.

6. **REWARD.** At the end of the calendar year a payment of \$15 will be made to each blue-uniformed employee of either surface or elevated lines, including station masters, who has rendered continuous and satisfactory service throughout such calendar year. This will apply to first year men who have been six months or more in such continuous employment prior to the end of the calendar year. It is intended as a reward for meritorious service only.

7. **SUPPORT OF AGED BLUE-UNIFORMED EMPLOYEES.** It is also the intention of the company, in the case of a blue-uniformed employee who in the judgment of the management is unfit to perform any duty in the service of the company, and who has been continuously employed by the company for a period of 25 years, or who has reached the age of 60 years and has been continuously employed by the company for a period of 15 years, to contribute to the support of such employee a sum not exceeding \$25 per month during the rest of his lifetime.

It has also been announced that until further notice the Boston Elevated Railway Co. will sell to its employees the best Scotch household coal for \$5.50 a ton at the wharf. This is a reduction of \$1 a ton from the price heretofore charged, and is made possible by the lower cost at which the company has been able to obtain coal abroad. Employees who have already paid for coal that has not yet been delivered will be allowed a rebate of \$1 a ton.

METROPOLITAN LEASE RATIFIED.

The holders of the stock trust certificates of the Interborough Rapid Transit Co., of New York, have ratified the arrangement to lease the property and franchises of the Manhattan Railway Co. Under this arrangement the Interborough company guarantees 6 per cent on the stock of the Manhattan up to Jan 1, 1906, and 1 per cent additional if earned. More than 90 per cent of the stock trust certificates of the Interborough Rapid Transit Co. voted for the lease.

A small minority of the stockholders of the Manhattan is said to have objected to certain terms of the lease on the ground that the Interborough company has practical liberty to put all earnings into the property, outside of the 6 per cent guaranteed.

GERMAN CONSTRUCTION LADDER.

The accompanying illustration shows a light repair truck for line repairing which was recently described in the *Zeitschrift für Kleinbahnen*. This is used by the street railway companies of Aix-le-Chapelle, Germany, and weighs only from 800 to 1,000 lbs. It is built by an electrical works of that city and costs about \$95. The ladder is provided with two sets of wheels as shown. When it is drawn by hand the large wheels are in service and the small wheels are raised from the ground. The ladder can also be towed behind

line from Danville to Champaign. If the right of way is made available by property owners along these routes it is probable that these extensions will be built by the coming fall. The extension of the Danville Street Ry. to the Western Brick Co. plant will be commenced as soon as the weather will permit and the line is to be in operation by the first of June or possibly sooner. An extension of the systems into Germantown is also contemplated but there are a number of obstacles in the way of railroad crossings, and negotiations are now on foot which, if favorable, will permit the construction of this line. The company has purchased a number of new cars



A GERMAN LADDER WAGON.

a car to the point where repairs are required and in this case the small wheels come into service, being flanged iron wheels and are set at the proper gage to run on the railway tracks. The ladder is capable of being mounted at various angles and it may be adjusted so as to clear a passing car while the men are at work on the overhead system. The accompanying illustrations show two positions in which the ladder can be adjusted.

NEW LINE FOR DELAWARE, O.

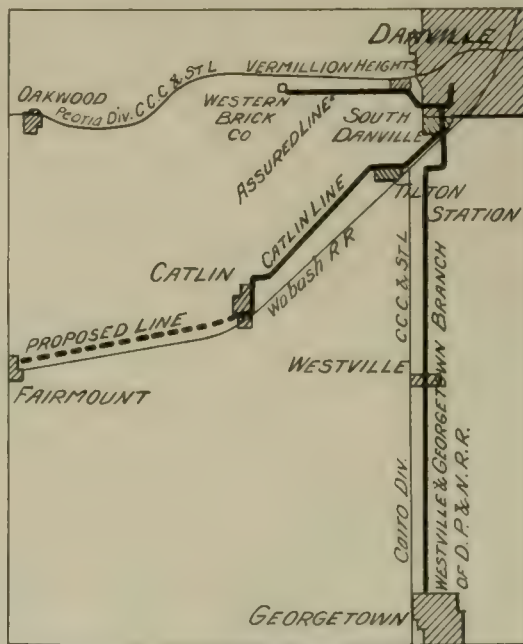
The Delaware & Magnetic Springs Railway Co. has now in course of construction a single track railway between Delaware, O., and Magnetic Springs, a health and pleasure resort 12 miles out of the city. The Magnetic Springs and Park Hotel which was originally operated by different interests has been purchased by the company and will be opened to guests March 15th. The new road was projected by Mr. T. N. Kerr who is the promoter and manager of the company and who is supervising the construction work.

The culverts along the line have all been built and the grading is more than half completed. The ties and poles have been distributed along the line for 7 miles out from Delaware. The company intends to build a new 400-room hotel at the Springs and to extend the present line to Richwood, 6 miles north, to Marysville, 12 miles south, and eventually into Columbus, O. Traffic arrangements have been practically completed whereby the new company will have terminal facilities at Delaware and it will make direct connections with the cars of the Columbus, Delaware & Marion Electric Ry. to Columbus. Mr. John B. Taggart, of Delaware, O., is chief engineer of the company.

ELECTRIC RAILWAYS OF DANVILLE, ILL.

The accompanying map shows the interurban lines in the vicinity of Danville, Ill., which are either in operation or proposed. The line from the Western Brick Co. plant to Danville is to be built by the Danville Street Railway & Light Co. which operates the system in the city of Danville. The other lines shown are owned by the Danville, Paxton & Northern Railroad Co. An extension of the Georgetown line to Ridgefarm is under consideration as well as a

which will be delivered within the next 30 days and all of its present equipment is to be thoroughly overhauled and repainted in the near future. During the past year some of the overhead lines were replaced and improved and part of the line was double tracked. With



MAP OF ELECTRIC RAILWAYS IN DANVILLE, ILL., AND VICINITY.

the completion of the track renewals which are to be made during the year the company will have its entire road and equipment in first-class condition.

The annual banquet and smoker of the Employees' Aid Association of the Binghamton (N. Y.) Railway Co., was held in the association rooms on January 14th. Card playing, music and refreshments were the attractions.

NEW WORKS OF THE ALLIS-CHALMERS CO.

The Allis-Chalmers Co. has now in operation its new works at West Allis, near Milwaukee, and, although the equipment of the plant is not yet complete, a large volume of work is already being done. The old Edward P. Allis plant is relieved of the overcrowded conditions which have long prevailed, and the engine-building capacity of the West Allis works is already such that, although much new business has been accepted beyond what would have been possible without the new facilities, the old plant is in shape to more easily care for the extensive milling machinery business, and other branches of the company's work. Pumping engines, blowing engines, and engines for electric generator driving and other lines of service will constitute the principal product of the West Allis plant.

plant, electric traveling cranes are everywhere in use for carrying material, not only within the shops, but also in the intervening yard spaces. More than 75 electric cranes of various types are installed, most of them made by Pawling & Harnischfeger, of Milwaukee, while the Shaw Electric Crane Co., of Muskegon, Mich., and the Northern Engineering Works, of Detroit, are also represented.

The essential and distinctive features of the plant as a whole are its great size when ultimately completed and the provisions for extension from time to time up to ultimate completion without alteration of previous construction, hindrance of production or loss of balance between department capacities. In general, it may be said that the design of the works is an adaptation of the "unit system" upon a large scale. The complete plan contemplates 12 such units within the ground space available, and of these 12, three are now in operation. It is estimated that the productive capacity of the



MAIN BAY IN NO. 1 MACHINE SHOP, NEW ALLIS-CHALMERS WORKS.

As stated on page 188 of the "Review" for March, 1901, the new works were designed personally by Mr. Edwin Reynolds, now consulting engineer of the Allis-Chalmers interests, as an addition to the Milwaukee plant of what was then simply the Edward P. Allis Co. The ground plan of the projected works, as published at that time, has been followed with but minor changes in the actual construction. Such being the case it is unnecessary at this time to repeat the details of the arrangement of the buildings and grounds. It will be remembered that the location is a few miles west of Milwaukee, in direct connection with the Chicago, Milwaukee & St. Paul and the Chicago & Northwestern railways, from and to which roads cars of materials and finished product may be transferred by an elaborate system of trackage throughout the grounds and buildings, served by locomotives belonging to the Allis-Chalmers Co. Building capacities, floor areas and yard spaces are proportioned for correct manufacturing balance among all departments, the experience of 25 years at the old works having been drawn upon for data upon which to base the adjustment of the new. In addition to the railroad transfer facilities among the various portions of the

three-unit plant will be, when fully equipped, about equivalent to that of the Milwaukee works, but with a materially smaller working force than the latter, due to the more advantageous arrangement of the new plant. When the growth of the company's business shall have required the completion of the whole 12 units, the new works will be four times as large as now and, together with the old works, will constitute a capacity five times as great as the latter. When the vast business of the old works for the past few years is considered, some realization may be had of the magnitude of the new plant when its four-fold capacity is developed.

The accompanying engraving showing a bird's eye view of the West Allis works gives a good idea of the way they will appear when the office building and five shop units have been erected. The office structure is shown in the extreme foreground, and to the left from it extends the pattern department, consisting of a four-story storage building with a one-story pattern shop in connection with it. The storage building is of strictly fireproof construction; all steel work is encased in concrete, floors are of arched concrete, windows are of wired glass in iron frames, etc. The building is divided at

intervals by fire walls, and each section is served by an elevator. A system of electric trolley hoists on overhead I beam tracks is used in handling heavy patterns to and from cars by which they are carried between the storage and foundry buildings.

The foundry is parallel to the pattern shop and storage building, separated by a storage yard 95 ft. wide. This yard is served by a 10-ton high-speed traveling crane used in carrying charges of iron and coke to the pillar cranes which are located at the inclines leading up to the cupola charging floors. Attached to the hook of this traveling crane is a scale by which loads are weighed directly, avoiding delay and rehandling of material at platform scales. This crane is also used in breaking castings, carrying a drop-weight to any point of the yard.

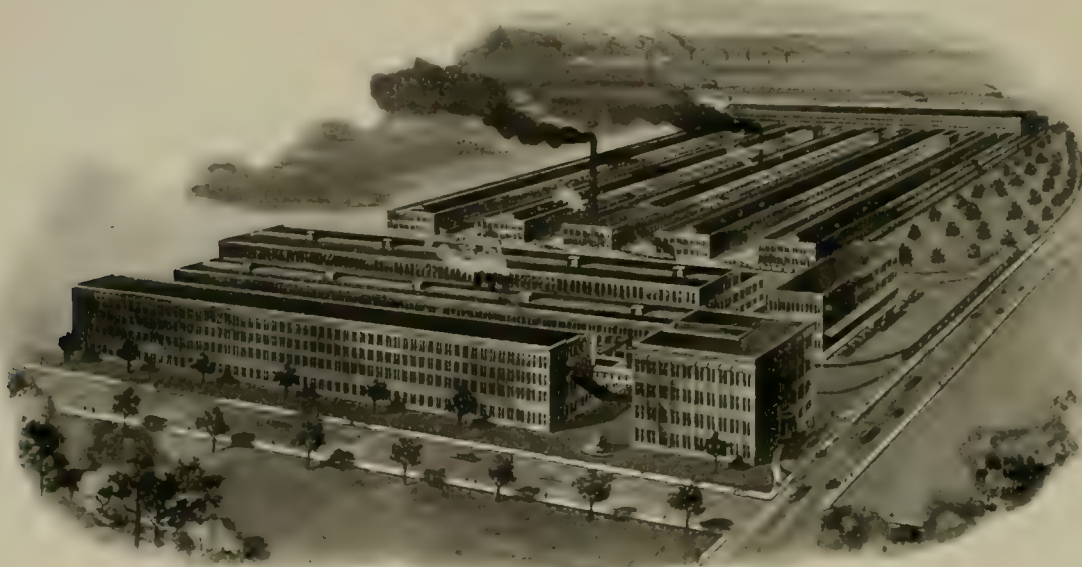
The foundry building is 220 ft. wide and 565 ft. long, consisting of a main bay and two side bays. An 80-ton Shaw crane and two cranes of less capacity serve the main bay, the side bays being also suitably equipped. For lighter work, as in core setting, there are installed at each side of the main bay and in one side bay 5-ton traveling wall cranes, or cantilevers, running upon specially arranged tracks below the main bridge cranes. These are novel and very convenient machines, relieving the large cranes of much small work. Three large cupolas are in use, blast being supplied by motor-driven

The erecting shop is 76 ft. wide, and in connection with it is the shipping room, 39 ft. wide. The former is very high, the tracks for the 75-ton traveling crane being 60 ft. above the floor, thus allowing ample height for the erection of large vertical engines. Extensions of this shop will not be continued at this height, as the present length of 565 ft. is expected to be sufficient for that portion of the product of the complete works requiring this special elevation.

Between the shop units and extending across the 124-ft. flask storage space between the foundry and the shops are runways for 40-ton traveling cranes for use in handling materials, rough castings, etc.

The power plant, situated at one end of the third shop unit, is thus centrally located with respect to the five or six units to which it is designed finally to furnish power, light, etc. Here are placed at present five 300-h. p. Reynolds vertical tubular boilers, with room for seven more. Outside the boiler room are cisterns from which the boiler feed water is drawn. These cisterns are fed from artesian wells located at various points about the grounds and operated by air lifts. The chimney is 175 ft. high, with an 8-ft. straight flue, and is constructed of Alphonse Custodis hollow radial tile.

Steam is generated at 125 lb. pressure and the boilers are connected in pairs to the steam header in the engine room. Here are



BIRD'S EYE VIEW OF ALLIS-CHALMERS PLANT.

Green rotary blowers. Core rooms, a chemical laboratory and ample storage facilities for foundry sand and other supplies are properly provided.

Placed transversely to the foundry, their ends separated from it by a space of 124 ft., are the shop units, each 166 ft. wide, 575 ft. long, 66 ft. apart and all terminating at the erecting shop which parallels the foundry. Extensions to the pattern building, the foundry and the erecting shop are to be made by increase of their length; the shop units, however, are individually complete and extensions of these departments must be by erection of additional units. Of the three now in operation, the first, at the right of the bird's eye view, is machine shop No. 1, the second is machine shop No. 2, and the third is the blacksmith shop and power plant. The interior of the first unit is shown in the engraving herewith, this shop being the one designed to handle the heavier work, and equipped with the more massive and heavy tools. Here is a floor plate 24 x 200 ft., in connection with which a number of portable tools of various types are in use. In both machine shops the heavier tools are within the main bays, the lighter machines being placed in the side bays and galleries.

The blacksmith shop is a structure entirely similar to the machine shops, but shorter by the amount devoted to the power plant. A 6-ton steam hammer is here installed, in addition to smaller ones and a full equipment of other machinery, forges and furnaces for handling all but the most exceptional forgings required.

located three generating units driven by Reynolds-Corliss non-condensing vertical engines, and space is allotted for three additional units of a similar type. The initial installation of three units comprise a 550-kw. General Electric generator and Crocker-Wheeler machines of 300 kw. and 100-kw. capacity. The two future units will be of 550 kw. each. Direct current at 250 volts is generated and distributed about the works for driving tools, elevators, cranes, etc., as well as for lighting. A very complete switchboard stands at one side of the engine room.

A two-stage cross-compound air compressor supplies air at 100 lb. per sq. in. for pneumatic tools and hoists, as well as for the air lifts in the artesian wells. Prescott fire pumps, triplex electric boiler feed pumps, and other essential equipment are included.

The heating apparatus consists of exhaust and live steam heaters for water, which is circulated through the various buildings by engine-driven centrifugal pumps. This installation of direct hot-water heating was made by Evans, Almira & Co., New York City.

The Chicago & Northwestern and the Chicago Great Western railroads have found it necessary to post a notice to the effect that engineers must not race with the electric cars. These roads parallel the line of the Aurora, Elgin & Chicago Railway Co. for several miles, and it is said that there have been some exciting contests between the engineers and the motormen.

ACCIDENT AT NIAGARA POWER PLANT.

BY O. E. DUNLAP.

A fire that occurred in the transformer station and on the bridge connecting the transformer station with power house No. 1 of the Niagara Falls Power Co. on the night of Thursday, January 29th, crippled 350 miles of electric railways in the Niagara vicinity, shut off the municipal and domestic lighting of Buffalo, Niagara Falls, Lockport and the Tonawandas, and forced fully 150 industrial establishments to shut down until repairs were made. Since electricity was first applied for light, heat and power purposes there has never been such a disaster in connection with a generating and transmission plant as this one at Niagara Falls.

The accident was due to lightning that entered the transformer station and started a fire in the basement. After burning a short time undiscovered it caused a short circuit and this opened the circuit breakers in power house No. 1. It is believed that the short circuit set fire to the insulation of the other cables, which, spreading, developed a general short circuit. This made necessary the using of the emergency switch to open the fields of the generators. The fire was first discovered at 10:45 p. m., and it was after midnight before it had been put out. In that time the transformer station had suffered severely, both from fire and water, and the bridge across the inlet canal was badly burned on its interior, while the 52 cables that had run through it from the power house to the transformer station were entirely destroyed. Under these conditions it was impossible to deliver any current over the bridge and through the transformer installation until repairs had been made. The service of 50,000 electrical horse power was cut off by the cable destruction. None of the generators was injured, and power house No. 1 was not damaged.

Before the fire was out the engineers were starting the work of temporary repairs. Laborers were hired from the crowd that had gathered. Headlights were brought into service to replace the electric lights. The fire also left the power house without telephone connections which was hard on the company as well as its patrons.

In the absence of a telephone service the Niagara Falls Power Company engaged several carriages for the use of messengers. These messengers hurried in all directions informing the employes of the company they were wanted immediately at the power house, while they also secured things necessary for the work of the night. Within one hour after the fire was out over 200 men, including carpenters, were at work making repairs. Six hours after this the cables of the 2,200 volt connections between the power house and transformer station had been replaced and were ready for a resumption of the long distance service. It was found that the air blast transformers had been wet, and some of the 1,875-kw. transformers were substituted. This required important changes of connections. Water had also reached the 22,000-volt bus-bars and wiring, and so an entirely new installation of these had to be designed and installed. This occupied until early afternoon Friday, and then when the current was turned on there were short circuits in three of the transformers, caused by water, and this delayed the renewal of the service until shortly after 5 o'clock Friday afternoon. This, however, was in time to light up the darkened cities, and to aid the electric railways to transport the evening crowds. This work was carried out under the direction of Supt. P. P. Barton.

As a result of the fire the service of the International Railway Co., of Buffalo, was embarrassed to some extent.

In Buffalo the company threw in its storage battery and started its steam plant, but was forced to reduce the number of cars in operation throughout Friday. In Lockport a portion of the electric plant was idle. Cars between Buffalo and Lockport and Buffalo and Niagara Falls were infrequent. In Buffalo it was observed that throughout Friday people congested the starting points on all car lines in order to get abroad, having been early to find that with the lessened service there was little hope of getting on cars except at principal points. Niagara Falls fared better than the adjoining cities. There was but a short interruption to the light and trolley service, because the local electric line is fed current through the rotaries located in the north-east corner of the power house, the cables not passing near the fire scene. Current from the same source is also supplied to the station of the Buffalo & Niagara Falls Electric Light & Power Co. a short distance from the power house.

ANNUAL DINNER OF NEW ENGLAND STREET RAILWAY CLUB.

The third annual meeting and dinner of the New England Street Railway Club was held at Hotel Somerset, Boston, Mass., on Thursday evening, January 22d. About 400 members and guests were present, and the occasion was one of the most enjoyable ever held in the history of the club. The secretary and treasurer's report showed the club to be in most satisfactory condition, both as regards membership and finances.

After the reception the company gathered in the new banquet room of the Hotel Somerset and enjoyed an unusually fine menu.

Mr. Frank Ridlon, president of the Frank Ridlon Co., of Boston, was made toastmaster, and succeeded in keeping the diners in a continual state of merriment. Toasts were responded to by E. P. Shaw; F. Clay Chadbourne, railroad commissioner of Maine; Fuller C. Smith, railroad commissioner of Vermont; H. M. Putney, railroad commissioner of New Hampshire; John Graham, of Bangor, Me., and Secretary Neal.

The election of officers resulted as follows: President, H. E. Farrington, master mechanic Boston & Northern Street Ry., Chelsea, Mass.; first vice-president, E. E. Potter, general manager Union Street Railway Co., New Bedford, Mass.; secretary and treasurer, J. H. Neal, of Boston, Mass. Vice-presidents for states: Maine, W. G. Meloon, of Portsmouth; New Hampshire, H. A. Albin, of Concord; Vermont, A. J. Crosby, of Springfield; Rhode Island, H. W. Young, of Woonsocket; Connecticut, J. S. Thornton, of Putnam.

OLEAN, N. Y., POWER HOUSE.

The new power house, No. 2, of Olean (N. Y.) Street Railway Co. is one of the chief points of interest of the company's recent extension. The power house is located about one mile east of Ceres, N. Y., convenient to a 600-acre gas territory owned by the company.

The building is a fire-proof brick and steel structure 68 x 72 ft., having a height of 20 ft. at the eaves. The equipment consists of two Franklin water-tube boilers and two 300 h. p. Hamilton-Corliss engines each connected to a 200-kw. General Electric generator.

The fuel used is gas piped from wells on the company's own territory, the supply being automatically regulated.

The switchboard connections are made with lead covered cable laid in conduits, all steam pipes are lagged with asbestos, and the workmanship throughout is of the highest grade. The power house is to be surrounded by about an acre of ornamental grounds which, when completed, is expected to make the plant very attractive in appearance.

SPRINGFIELD ROAD CHANGES HANDS.

It is announced that the negotiations for the acquisition of the property of the Springfield (Ill.) Consolidated Railway Co., by Louisville, Ky., capitalists, have been brought to a successful close. The new concern will be known as the Springfield & Central Illinois Railway Co. The stock and bonds of the old company, amounting to \$750,000, will be taken over at 75 per cent of their face value. The new company, it is said, will issue stock and bonds to the amount of \$3,750,000. A large part of the proceeds of this sale will be expended on the interurban extensions to the neighboring towns, Girard and Riverton. It is expected that the ultimate result will be a complete interurban system with Springfield as its center.

The finances of the company are being handled by the Columbia Finance & Trust Co. of Louisville.

The new corporation is supported by nearly the same interests that control the Springfield & St. Louis Railway Co. The latter company was organized to construct a road from Springfield to East St. Louis, Ill.

It is announced that the Philadelphia & West Chester Traction Co. of Philadelphia, Pa., is to issue a \$600,000 4-per cent mortgage to retire the present \$400,000 of 5-per cent bonds, fund the floating debt and provide for improvements.

ELECTRICALLY OPERATED OIL CIRCUIT BREAKER.

The rapid increase during recent years in the size of central stations and of the currents and voltages handled therein has necessitated great development in the methods and apparatus for controlling electric currents. It has been found necessary where high tension alternating current is handled to discard the old hand-operated knife blade switches for some means of auxiliary control. This permits the actual switching devices to be located with regard to the general design of the station and satisfactory lay-out of the circuits, and concentrates the controlling and indicating apparatus within a small space.

One apparatus of this kind is the Westinghouse type C high tension power operated oil-break circuit breaker. This circuit breaker, which is operated by electro-magnets, is erected in a masonry structure, with each pole and its oil tank in a separate fire-proof compartment. There are two stationary contacts to each pole, one connected to the incoming lead and one to the outgoing lead. Each contact is mounted in a large porcelain insulator fastened to a cast iron frame. This frame, which also supports the oil tanks, is supported by a soapstone slab at the top of the masonry structure.

The movable contact for each pole consists of a U-shaped copper bar secured to the lower end of a vertical wooden rod. In the closed position one of the U-shaped parts connects the two stationary contacts of each pole. The wooden rods extend up through the top of the structure and down between the two stationary contacts and are connected above the structure by a common cross bar. This cross bar is supported by a system of levers giving a vertical straight-line motion. It is raised by enclosing magnets, assisted at the beginning of motion by a pair of balancing springs. A toggle joint automatically locks this system of levers when the circuit-breaker is in the closed position.

The toggle joint is released by a blow from the tripping magnet, whereupon the cross bar drops and opens the circuit. The break takes place first at the main contacts then at a removable plug attached to the stationary contacts. This plug, which receives all the effects of any sparking that may occur, may be easily replaced.

The heavy sheet-metal oil tanks are lined with insulating cement molded to fit closely about the terminals and moving contacts, leaving just room enough for the free movement of the parts in oil. After the entire breaker is erected and adjusted, the tanks are put in place and filled. The level of the oil is shown by a small sight gage. Suitable levers are provided for handling the tanks which may be lowered away from the contacts and removed without disturbing the rest of the circuit-breaker.

A small double-pole, double-throw knife switch is mounted on each circuit-breaker. This switch is used with the indicating and tripping circuits and is operated by the motion of the circuit-breaker levers. The controlling and indicating devices, which are suitably mounted at the operating platform, consist of a controlling switch, an electro-mechanical tell-tale indicator, and a lamp. The controlling switch is of the drum type and has three positions, "closed," "off" and "open." If the switch be thrown to the "open" position it will remain in that position when the hand is removed, but if it be thrown to the "closed" position it will automatically turn to the "off" position, when the hand is removed. In the "off" position the switch connects the control circuit so that if the circuit breaker opens through the operation of any of the automatic devices the lamp will be lighted. If the circuit be opened by the operator's throwing the switch to the "open" position the lamp will not be lighted. The electro-mechanical indicator shows the operator whether the circuit breaker is opened or closed.

The circuit-breaker is automatically opened by a polyphase overload relay, connected to series transformers in the main circuits. This relay is mounted on top of the masonry structure. It operates on the principle of the single-phase induction motor. It consists of counter-weighted sectors swinging between the poles of an alternating-current electro-magnet. Part of each pole is surrounded by a short circuited strip of copper, which acts to retard the magnetic flux and thus produces a shifting field. This tends to move the sectors, which carry a contact closing the tripping circuit of the circuit-breakers.

The current for the closing and tripping magnets may be derived from any source of low-voltage direct current supply.

RAILWAY PROJECT FOR PORTO RICO.

A concession has been granted to the Vandergrift Construction Co., of Philadelphia, to build an electric railway between Ponce and San Juan in the island of Porto Rico. This concession also carries with it the exclusive right to the use of a number of water falls on the island. The Vandergrift Construction Co. intends to develop the power of these water falls and to build an electric railway for the transportation of freight and passengers between Ponce and San Juan. The power developed at the water falls will be used for operating this road and in addition, will provide lightning and power in the various towns through which the road passes and also on numerous plantations along the route. The company's engineers are now going over the territory in order to select the best route and are securing data for preparing the plans and specifications. The road will be equipped in a first-class manner with large double track interurban cars which will operate at high speeds for passenger service, and with freight locomotives and the necessary cars for the transportation of merchandise and car-load freight. The company will be known as the Porto Rican Railway & Power Co.

YORK COUNTY TRACTION CO.

The annual meeting of the York County Traction Co., York, Pa., was held last month, as also the meetings of the various subsidiary companies. The directors elected for the York Street Railway Co., the York & Dallastown Electric Railway Co., the York & Dover Electric Railway Co., the York & Manchester Electric Railway Co., the Red Lion & Windsor Street Railway Co., the York Haven Street Railway Co., the Wrightsville & York Street Railway Co., the York & Hanover Street Railway Co., the Penn Park Street Railway Co., the Colonial Street Railway Company and the Wellsville Street Railway Co. were: W. H. Lanius, president; W. F. Bay Stewart, George S. Billmeyer, Grier Hersh, John W. Stacey, George P. Smyser and W. A. Himes.

The annual report of President Lanius gave a brief history of the work done in 1902 and the treasurer's report showed a very gratifying increase in passenger receipts. During the year the total receipts were \$90,268; the number of car miles run was 446,480.

ROANOKE ELECTRIC RAILWAY SOLD.

The property of the Roanoke (Va.) Railway & Electric Co. was purchased on January 17 by the owners of the Lynchburg (Va.) Traction & Light Co. The property comprises 18½ miles of track in and about Roanoke, all the stock, bonds and equipment of the Roanoke Company.

The following were elected officers of the company: R. D. Apperson of Lynchburg, president; Charles R. Miller of Philadelphia, vice president; F. H. Shelton of Philadelphia, secretary and treasurer. In addition to the named, the board of directors includes: John D. Horsley, R. Colston Blackford, and A. T. Powell, all of Lynchburg. J. W. Hancock of Roanoke, formerly manager of the old company, was elected manager.

The old company's plans for improvements will all be carried out by the present management.

HYDROCARBON MOTOR CARS.

The Oelwein & Northwestern Iowa Interurban & Street Railway Co. has been incorporated for the purpose of constructing and operating interurban roads between Oelwein and the surrounding towns. The following officers have been chosen: John Jamison, president; Dr. Geo. Given, vice-president; Wm. A. Reed, secretary; John Hanson, treasurer. The authorized capitalization is \$200,000. It is said that the road will be equipped with hydrocarbon motor cars.

An act recently passed the lower house of the New Hampshire legislature, authorizing the Concord (N. H.) & Montreal R. R. to acquire the Concord Street Ry. and other property, and authorizing physical connection of the Manchester (N. H.) Street Ry. with the electric branches of the Concord & Montreal R. R.

PERSONAL.

MR. J. W. HANCOCK was recently re-elected general manager of Roanoke (Va.) Railway & Electric Co.

MR. H. S. MCKEE, of Pittsburg, Pa., was elected a director of the Rochester (N. Y.) Railway Co. at its annual meeting.

MR. W. I. WYATT, of Glens Falls, N. Y., has been appointed master of transportation of the Hudson Valley Railway Co., of Waterford, N. Y.

MR. F. N. ROOT, president of the Root Track Scraper Co., of Kalamazoo, Mich., was a caller at the "Review" office in the early part of the month.

MR. P. S. BERTRAND, formerly assistant superintendent of the Peoria (Ill.) Gas & Electric Co.'s works, has been made general manager of the company's plant at Springfield, Mo.

MR. E. J. W. DIETZ, was on January 15th, appointed traffic manager of the Aurora, Elgin & Chicago Railway Co., with headquarters at room 1409 No. 100 Washington St., Chicago.

MR. H. A. ALBIN, superintendent of the Concord (N. H.) Street Ry., was elected one of the vice-presidents of the New England Street Railway Club, at a meeting held in Boston on January 22d.

MR. HIRAM EDWARD MANVILLE, of Milwaukee, Wis., secretary of the H. W. Johns-Manville Co., was married on January 28th, to Miss Henrietta Estelle Romaine, daughter of Frank Hall Romaine, at the Church of Heavenly Rest, New York.

MR. FRANK S. GIVEN, of Columbia, Pa., recently received a solid silver loving cup from the men working under him as a token of their esteem. Mr. Given is general manager of the Lancaster County Railway & Light Co., which controls several roads operating in Lancaster County, Pa.

MR. F. W. LATIMER recently resigned as general manager of the People's Traction Co., of Galesburg, Ill. Mr. Latimer's connection with the company has been of great value in building and operating the road, and his resignation is regretted by the company. His successor has not been appointed.

MR. GEORGE H. GIBSON has resigned his position with the Westinghouse Company's Publishing Department to go with the B. F. Sturtevant Co., Boston, Mass. Mr. Gibson was formerly on the editorial staff of the Engineering News and is a graduate of the Engineering School of the University of Michigan.

MR. JOHN E. HARVELL has been appointed superintendent of the Southside Railway & Development Co. of Petersburg, Va., and also of the Richmond & Petersburg Electric Railway Co. Mr. Harvell has been with the Southside Railway & Development Co. and the Virginia Passenger & Power Co. for the past eighteen years.

MR. GEO. W. BRINE, vice-president and treasurer of the Georgia Railway & Electric Co., of Atlanta, has been appointed general manager of that company. Mr. Brine is one of the best known and most capable officers of the company. He was manager of the electrical department of the Georgia Electric Light Co. for 10 years before it was merged with the Georgia Railway & Electric Co.

MR. E. W. WINTER has been elected president of the Brooklyn Rapid Transit Co. to succeed Mr. J. L. Greasinger. Mr. Winter is a steam railroad man of long experience, having been president of the Northern Pacific Railroad and having held a number of other important positions. He has been closely identified with the management of the Brooklyn Rapid Transit Co. for several years.

MR. CHARLES O. KRUGER, of Philadelphia, Pa., has been appointed general manager of the Philadelphia Rapid Transit Co. Mr. Kruger has advanced steadily to his present position. He was first identified with the People's Traction Co. When the Union Traction Co. was formed he was made treasurer. Recently he has been a vice-president and assistant general manager of that company. Mr. Kruger is a young, able and energetic man, and his career of promotions has been based on merit.

MR. GUY M. WALKER, who is well known to many of our readers by reason of his connection with the Everett Moore syndicate as counsel, is the subject of a very complimentary sketch in the *Financier* of New York for Jan. 5, 1903. Mr. Walker is a native of Indiana, having been born at Ft. Wayne. He is a graduate of De Pauw University and also a graduate of the Law School. He has traveled extensively in China, Japan and Europe and a residence of ten years in China has made him an authority on questions relat-

ing to that empire. He may be classed as one of the Indiana authors, of whom there are so many in the present generation, though Mr. Walker's writings have been on the more serious subjects of finance and transportation. The pamphlets he has written on these subjects have had a large circulation; that on "Municipal Bonds," 35,000 copies; "What Shall We Buy?" 50,000; "Interurban Railways," 100,000 copies and "Railroads and Wages," 200,000.

MR. FRED W. KINMOUTH has been appointed trainmaster of the Glens Falls, N. Y., division of the Hudson Valley Railway, with headquarters at Glens Falls. Mr. Kinmouth has been associated with the road for several years. He was formerly superintendent of the Glens Falls, Sandy Hill & Fort Edward Street Railroad Co. and upon the organization of the Hudson Valley Railway Co. became superintendent of the Glens Falls division of the road. Subsequently he became associated with Niagara Falls, St. Catharines & Toronto Railway Co.

MR. FRANK J. BRAMHALL has resigned as chief of the advertising department of the Michigan Central Railroad to accept a similar position with the Southern Pacific at San Francisco. The resignation became effective February 1st. Mr. Bramhall has been with the Michigan Central for 20 years and organized the department of which he was chief. He is one of the pioneers of the present vigorous and effective methods in railroad advertising. Besides his advertising work Mr. Bramhall has devoted considerable time to writing in the fields of history, biography and economics.

MR. EDWIN C. FABER has been appointed general manager of the Elgin, Aurora & Southern Traction Co., with headquarters at Aurora, Ill. Mr. Faber will be remembered as general superintendent of the Cleveland Electric



E. C. FABER.

Railway Co., to which position he was appointed April 1, 1901, after some nine years of service with that company in subordinate positions. He resigned as general superintendent of the Cleveland Electric Railway May 15, 1902, at the time of the sale of that property to its present owners, and entered upon duties under Mr. I. A. McCormack, former manager, who had recently accepted a position with the New York Central & Hudson River railroad. August 1, 1902, Mr. Faber went with the General Electric Co. in the department

devoted to the operation of the company's light and traction properties, it being interested in quite a number located in different parts of the country, and filled this position with marked success until his resignation to become manager of the Elgin-Aurora line. On the occasion of Mr. Faber's resignation at Cleveland he was the object of the most flattering demonstration on the part of the employes of that company and was presented with a silver loving cup as a testimonial of the good wishes of the men who served under him.

COL. HENRY GOSLEE PROUT, who has been the editor of the *Railroad Gazette* since 1887, has resigned that position to accept the office of first vice-president and general manager of the Union Switch & Signal Co. In 1863 Col. Prout enlisted in a Massachusetts regiment and went with the Army of the Potomac through the Wilderness campaign. In 1865 he was mustered out and two years later entered the University of Michigan, where he graduated with the degree of civil engineer. After a few years' work on railroad surveys and construction he entered the service of the Khedive of Egypt as a Major of Engineers, in which service he remained about four years. After the first year he went to Sedan in command of an expedition to Kordofan and Darfour, and was afterwards sent to the head of the Nile as Governor-General of the Provinces of the Equator. After his return to America he was for more than a year signal engineer to the company out of which the Union Switch & Signal Co. grew. In March, 1887, he became editor of the *Railroad Gazette*, in which position he attained an enviable reputation founded upon his high professional skill and his character as a man. In recognition of Col. Prout's splendid work as editor and journalist he was given a degree of Master of Arts

by Yale University last year. In addition to his editorial work Col. Prentiss is a distinguished speaker and lecturer. He has also done a great deal of consulting and expert work for engineers and officials of many important railroads, and he is the editor of the Railroad Division of the Encyclopedia Britannica and is a member of numerous societies, clubs and associations, all of which he has served in some official capacity.

MR. JILSON J. COLEMAN has severed his connection with the Johnson electric railway properties of Eastern Pennsylvania and New Jersey to open an office in New York City as financial council and expert in all matters pertaining to electric railway finance, construction, operation and maintenance. Mr. Coleman's thorough training in electric railway work peculiarly fits him for this new undertaking. He commenced his railway life in 1876 as office boy with the Louisville (Ky.) Ry., and during his 26 years of experience since then he has filled practically every position from clerk to president and his various connections have placed him at different times in charge as manager of every class of electric railway enterprise, including city and suburban roads and lines operated by horse, cable, trolley and conduit systems. From Louisville Mr. Coleman went to Cleveland at the request of Mr. Tom Johnson and his brother, the late Mr. A. L. Johnson, and for four years he was identified with the Johnson enterprises in Cleveland, Allentown, Pa., Yonkers, N. Y., and Brooklyn. Mr. Coleman held the office of general manager of the Nassau system in Brooklyn until it was sold to the Brooklyn Rapid Transit Co., when he formed connection with the St. Louis Car Co. as eastern representative. Two years afterward he was called to St. Louis to make an expert report on the proposed consolidation of the St. Louis properties, and after the merger he remained in charge of the consolidated company. After some months he resigned that position and went to Washington, D. C., as general manager of the Washington Traction & Electric Co. He remained there until a change occurred in the controlling management when he resigned to take charge of the electric railway enterprises projected by the late Mr. A. L. Johnson in Eastern Pennsylvania and New Jersey which position he has held until his recent resignation for the purpose of going into business for himself. In addition to his consulting work, Mr. Coleman will act as eastern representative for a few Western manufacturers of electric railway apparatus.

OBITUARY.

MR. SAMUEL DE COURSEY, president of the American Railways Co., Philadelphia, died at his home in that city on January 27th, from the effects of an attack of grip. Mr. DeCoursey was born at Queenstown, Md., Dec. 28, 1839; he was educated at St. James' College and went to Philadelphia in 1854. Mr. DeCoursey was engaged in the dry goods business as a young man but later became largely interested in railroads. In 1888 he was elected vice-president of the Western New York & Pennsylvania R. R. and in 1892 was made president, serving until 1900, when this road was absorbed by the Pennsylvania. He was also a director of the Fairmount Park Transportation Co. Mr. DeCoursey is survived by his widow, a son and two daughters.

MR. ABRAM STEVENS HEWETT, whose death occurred on January 18th, was a man of commanding influence in industrial affairs, having been connected during his whole business life with the iron works which he founded soon after he graduated from college and which grew into the present Trenton Iron Co. which is now one of the prominent concerns of the country. Mr. Hewett was born near Haverstraw, N. Y., July 31, 1822, and attended the district school where he was prepared for college. He obtained his college course by winning a prize established for the student passing the best entrance examination, this prize paying his tuition fees through Columbia College. He was graduated in 1842 after which he studied law while serving as a tutor in college and as acting professor of mathematics for a time. He was admitted to the bar in 1845. As an iron manufacturer Mr. Hewett came in close contact with many street railway companies especially those in New York City for which his concern furnished rails. In a letter to the "Daily Street Railway Review" at the time of the American Street Railway Association Convention in New York, 1901, Mr. Hewett stated that the grants originally made for the Second, Third, Sixth and Eighth Ave. lines were offered without cost to Cooper, Hewett & Co. who had been making special rails for many years. The late Peter

Cooper, who was the controlling power in the firm although not the head of it had all his life refrained from having any interest in grants made by the city of New York for public improvements and was unwilling that any member of his family should in future be placed in the false position of being charged with having profited by public grants. The original grooved rail used by the railways in New York was designed by Mr. Hewett as well as the center bearing rail subsequently used, which was designed to prevent vehicle traffic on the tracks. Mr. Hewett first entered public service in 1867 when he was one of the United States Commissioners to the Paris Exposition of that year. His report at this time upon the iron and steel industries of the world was published by Congress and translated into a number of languages. He was elected to Congress in 1874 where he served continuously until 1886, in which year he was elected mayor of New York over Theodore Roosevelt and Henry George, respectively the Republican and People's candidates. He was an active promoter of the New York Rapid Transit Ry. and in 1901 was presented with a gold medal by the Chamber of Commerce in recognition of his service in securing rapid transit. Mr. Hewett was a director of a number of large concerns including the United States Steel Corporation, the American Bridge Co., the Morton Trust Co. and a number of railroads. In 1885 he married Sarah A. Cooper, only daughter of Peter Cooper. His eldest son, Peter Cooper Hewett has made a special study of electric lighting and has recently produced a new type of electric lamp and a static converter for changing alternating to direct current, both of which promise great economy.

HIGH TENSION RAILWAY SYSTEM.

The Stanley Electric Manufacturing Co. of Pittsfield, Mass., has made the following official announcement concerning the high-potential electric railway which it is perfecting:

"The work we are prepared to do is the running of long distance heavy, high speed trains with the stations from 50 to 75 miles apart; there are no sub-stations and the high potential current is applied direct to the locomotive. The control wires will be carried along the track so that steam locomotives can be used on the same tracks without interference with the electric system; there will be neither third rail nor static transformers along the line, simply a power house located at from 50 to 75 miles apart and control wires connecting them. The locomotives will be more expensive than any locomotives built on any of the present schemes but the amount of copper used will more than compensate for the increased cost of the locomotive, since the locomotives, control wires, etc., will cost about \$75 per h. p. against costs from \$100 to \$200 per h. p. for wires on present low potential systems. The cost for sub-stations and copper combined, for a low potential system, is placed at something over \$250 per h. p. The new system will cost less than \$75 per h. p. and will do work which the present low potential systems will not do, viz.: that of hauling a long train at a considerable distance from the station. The best thing that is being done now is at Baltimore where the feeder cost runs up to over \$200 per h. p. and the distance from the station is only three miles. At ten miles from the station the system which has been installed in Baltimore would be absolutely prohibitive on account of the feeder cost.

"The system is not that of the Ganz Co. but is the result of the work of our engineers on patents under which we have secured rights from engineers in this country and abroad, our plan only being made possible by the combination and to an entirely new form of dynamo with a new form of motor control which permits the use of high voltages directly on the car and absorbs no energy in resistance or other such wasteful methods as are now used in the series parallel method of motor control."

A fire occurred at Steubenville, O., on January 13th, which destroyed the plant and machinery of the Steubenville Traction & Light Co., with all the machinery. The city was supplied with light by this company. The loss is placed at \$20,000.

On January 15th a fire occurred at Newark, N. J., which destroyed one of the North Jersey Street Railway Co.'s barns. The barn was on the Bergen and South 10th St. line. It was a one-story frame structure 60 x 500 ft. Twenty-five passenger cars, two sweepers and one snow plow were burned.

HEAVY SNOW PLOWS FOR PHILADELPHIA.

The J. G. Brill Co., of Philadelphia, recently completed an order of 30 snow plows for the Philadelphia Rapid Transit Co. The order called for 17 shear-board plows for double track work and 13 of the nose type for the single track lines in the heart of the city, both of which are illustrated herewith. The curved form of the upper plates of the plows has proved effective in rapid work and the snow is rolled over and deposited at a fair distance outside the



BRILL SHEAR-BOARD PLOW.

rails. The plows are adjustable; the nose plow may be raised 9 in. from track and the lower plate of the shear plow 6 in. Ordinarily, in service, the bottom of the plow is kept about 2 in. from the rails. Straight link chains passing over chain wheels resting on the end sills, are wound on other chain wheels located in the cab and the raising and lowering is easily and quickly accomplished by means of a 24-in. horizontal wheel which operates a worm gear.

The steel plates of both types of plows are $\frac{3}{8}$ in. thick and 4 ft. from top to bottom. The shear boards are 12 ft. 4 in. long and the plates on either side of the nose plow 6 ft. 9 in. The bottom of the plows is horizontal for the full width of the track and then sheared on an incline, giving an elevation of 2 in. at the ends, for the purpose of avoiding cobble stones and high places in the pavement near the track. The plates of the shear plows are backed up with oak; a vertical blocking for the upper plate $3\frac{3}{4}$ in. thick, and a horizontal blocking back of the lower one, $6\frac{3}{4}$ in. deep. The plow posts are composed of sections of 60-lb. T-rails, secured to the ends of the car body and having top and bottom steel guides secured to the plows. The plates of the nose plows are held by heavy castings. The guides and T-rail posts are the same as in the shear plows, except that the lower ends of the posts are secured to the $3 \times 3\frac{1}{2}$ -in. bars which are on either side of the truck, and are brought around the ends for that purpose. The pull irons are located at the center of the plow plates about 20 in. from the rail-heads.

The cab of the shear plows is 18 ft. 9 in. long, over sheathing, and 6 ft. 10 $\frac{1}{2}$ in. wide, its total length over diagonal end sills



BRILL NOSE PLOW.

being 28 ft. 6 in. Truss rods, which are anchored at the ends of the sills are brought up to the letter board and supported by $\frac{3}{4} \times 2\frac{1}{2}$ in. iron straps extending down to the sill, with a toe at bottom inserted in sill. These straps are securely bolted to the side posts. The side sills are 5×12 in., and the diagonal end sill 4×12 in. There are six cross posts, four of which are $5\frac{1}{2} \times 12$ in. and two are 5×10 in.

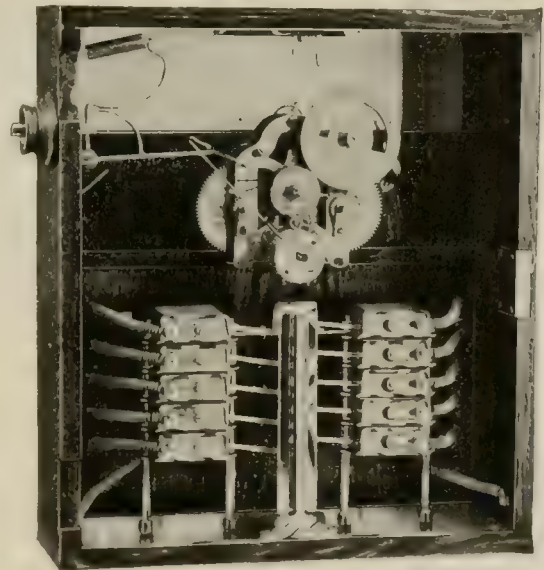
The cab of the nose plow is 18 ft. 6 in. long, and 6 ft. 10 $\frac{1}{2}$ in. wide. The side sills are $5\frac{1}{2} \times 12$ in., two cross joists are $5\frac{1}{2} \times$

12 in. and two 8×12 in. The cabs of both plows have 36 in. sliding doors, and the central sash of the hexagonal ends is arranged to drop. The roofs are substantially built with $\frac{7}{8} \times 1\frac{1}{2}$ -in. rafters and six $1\frac{1}{4} \times \frac{3}{8}$ -in. steel rafters. Ice scrapers, or diggers, are a part of the equipment of the cars. They are stayed to the body with a $\frac{3}{4}$ -in. rod, which passes through a spring, allowing sufficient play to prevent injury by catching on obstructions other than ice and packed snow. The scrapers are operated by a foot pedal in the cab, and when lowered retain a position about $\frac{1}{4}$ of an inch from the crown and inside of the rail.

The $3 \times 3\frac{1}{2}$ -in. side bars which extend along the sides of the trucks from plow-post to plow-post, give enormous resisting power to the plows, especially at the lower edge, where the largest resistance is required. The trucks have toggle-jointed brakes, carried between the wheels, and are operated by means of a horizontal brake wheel on a vertical shaft, which is connected to a horizontal shaft extending across the car. The wheel base is 7 ft.

WAGONER WATCHMAN'S CLOCK.

The Waggoner Watchman's Clock Co., of Grand Rapids, Mich., has placed upon the market a reliable and efficient watchman's clock, the interior of which is illustrated herewith. It is so constructed that it will give an alarm when registering and will sound



INTERIOR VIEW OF CLOCK.

an alarm when short circuited by accident or otherwise, at the same time registering the exact time the circuit was closed. It is impossible to destroy the dial or record by closing the circuit as is possible with some clocks, for the registering armature or hammer works with a vibrating motion and with such rapidity that it is impossible to tear the dial. This defect has often done injustice to the honest watchman as it is impossible to tell whether the clock has torn the dial itself or whether it has been manipulated by the watchman. In case the watchman fails to register for any reason, such as sickness or being accidentally hurt, an alarm rings at the central station until the clock is registered.

It can be made to serve as an automatic fire alarm as it will register and ring an alarm, and at the same time, by an annunciator alongside the clock, indicate on what floor or station the fire may be located. If a fire should break out it rings the alarm in as many places as desired, continually. It is thrown in circuit by thermostat connections which are operated by the heat of the building when it reaches from 160 to 200 degrees.

The clock is so constructed, that if desired it will register its number. Each clock has a number, and if several be placed in a series of factories, each will register its number at the central station on a strip of paper if the watchman fails to register the clock within 10 minutes over the regular time. This clock is made to register either with a magnetic generator or with a battery system.

It is simple in construction, easily maintained and installed and is sold direct to user. The makers are willing to supply any responsible firm with a clock for a good day trial, believing that its merits will readily recommend it to any intending purchaser.

SOLIDIFIED OIL.

BY J. N. BRUCK, VICE-PRESIDENT AND GENERAL MANAGER BRUCK SOLIDIFIED OIL CO., BOSTON, MASS.

The problem of perfect lubrication for electric car motors and journals has been made a special study by the writer and after years of investigation and experiment he claims to have produced a solidified oil that lubricates perfectly and it is now presented to the public in a thoroughly tested and reliable form.

For years compounds or greases of various kinds have been manufactured and placed on the market as substitutes for heavy liquid oils with indifferent results, as all saponified greases must necessarily contain water, alkalies and acids, to harden or saponify them into a grease, and which the writer claims renders it unfit for lubricating purposes, as it will not stand cold weather, it becoming so hard at a low temperature that the grease will not lubri-



ST. LOUIS CAR FOR ST. LOUIS & SUBURBAN RAILWAY CO.

cate the bearing; and then in summer weather grease becomes so soft that it runs through and the motors require frequent replenishing to prevent the bearings running hot and causing trouble, loss of time and the expenditure of many thousands in the course of the year in repairs.

The importance of perfect lubrication for electric car journals and motors has become a very serious question and one that every railroad man is interested in. It is claimed the new process is perfect. The solidified oil is made from 23° gravity oil of over 450° fire test, and 350 viscosity, and no acid, alkali or water is used, the absence of these latter ingredients accounting in part for the fact that solidified oil is not affected by the heat or cold.

Solidified oil is fast supplanting saponified greases and liquid oils wherever the former have been tested, the unvarying result of every test showing in favor of the solidified oil greater efficiency, and a great reduction of friction over any grease in use on railroads today. Solidified oil is now in use on car journals and has been running from three to six months without replenishing, and car motors have been run 30 and 90 days without replenishing.

The writer also claims that he is making a solidified oil that feeds through felt wicking in winter weather as well as summer, which is a very important item and one that should be of very great interest to every electric railway man in the world. The writer claims to be the only person who has discovered a sure, reliable and economical method of lubricating car journals in all temperatures, climates and under all conditions of traffic and especially for high speeds. Solidified oil is made by the Bruck Solidified Oil Co., of 256 Dover St., Boston, Mass.

The first car was run between Charlevoix, Pa., and Monongahela, Pa., on the Pittsburg Railway Co's. new line, on January 16th.

It is said that the Circleville, O., authorities oppose the entry into that town of the Scioto Valley Traction Co. The company may go around the town on its way to Chillicothe.

AUTOMOBILE TOWER WAGON IN FRANCE.

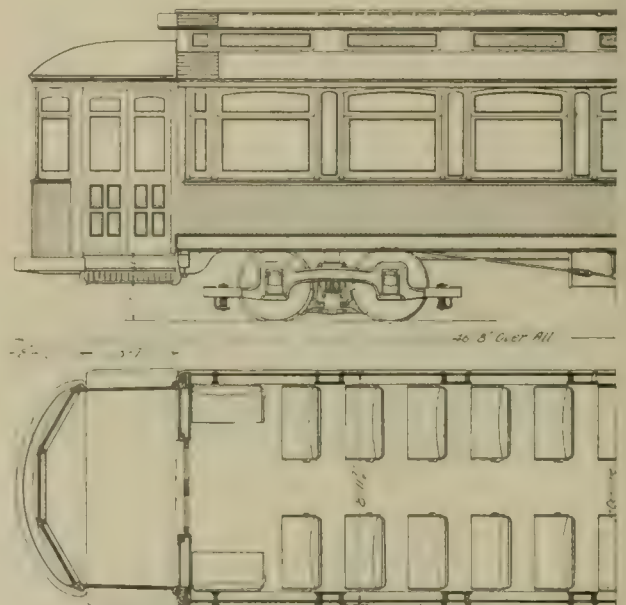
U. S. Consul Haynes reports from Rouen, France, that La Compagnie de l'Est Parisien has recently had constructed a power-driven tower wagon, capable of carrying six workmen and 1,100 lb. of material. The wagon is being used in repairing overhead trolley wires. The platform can be elevated to a height of 20 ft. and projected from either side of the wagon. It will support two workmen and will not interfere with passing cars. The tower is in two sections, the top section sliding inside of the lower one. When the wagon is not in use or is in transit the top section may be lowered and the railing folded down.

The vehicle is driven by a two-cylinder horizontal 12-h. p. engine. It is said that this method is found to be 50 per cent cheaper than animal traction.

NEW CARS FOR ST. LOUIS & SUBURBAN.

The St. Louis Car Co. is furnishing 20 cars to the St. Louis & Suburban Railway Co., the general plans of which are shown in the accompanying illustrations. These are large cars of the semi-

convertible type, the length over all being 45 ft. The length over the corner posts is 34 ft. and the over-all width measures 9 ft. 2 in.; they have a seating capacity of 52 passengers. The cars, as will be seen in one of the illustrations, are vestibuled at each end and the



HALF-PLAN AND ELEVATION OF CAR.

bottoms of the cars are formed of channel steel. The windows are of plate glass throughout and are provided with Pantasote curtains. The inside finish of the car is mahogany, as are also the ceilings,

and all the trimmings are of nickel plated bronze. The cars are provided with St. Louis Car Co's. patent walk-over seats, covered with canvas lined rattan, there being 26 seats in each car. The cars are mounted on St. Louis Car Co's. No. 47 short wheel base trucks having solid steel side frames and each car is provided with St. Louis Car Co's. arc head lights. The general arrangements of

are provided with detachable steel friction plates which are heavy file-cut and tempered to secure friction on the rails without the use of sand, and these can be recut until worn out at a small cost. The shoes are 14 in. long on the track bearing surface and have a rise of 9 in.

It is intended that these brakes should be applied under the rear

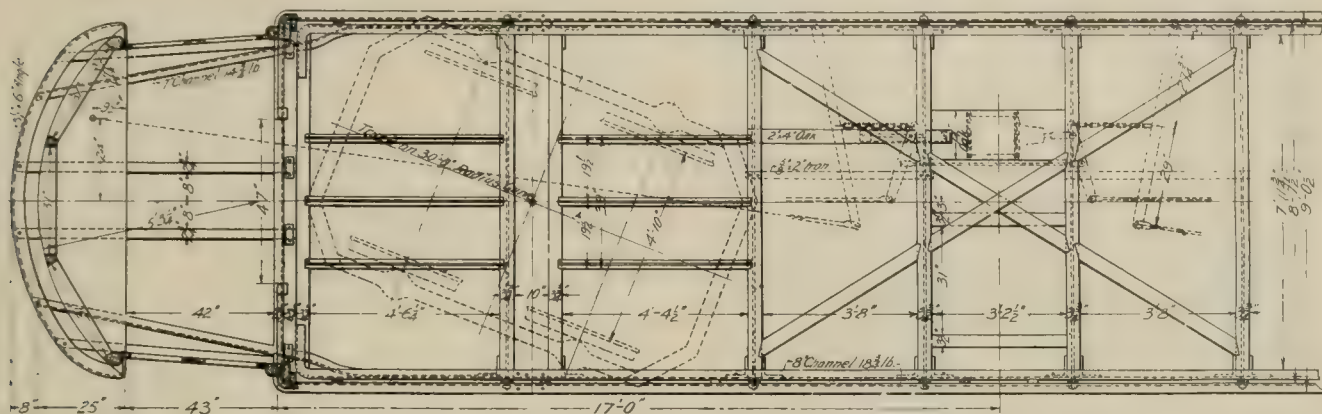


DIAGRAM OF FLOOR FRAMING, ST. LOUIS CAR.

the car, showing design of framing and general dimensions, are shown in the accompanying drawings.

FRESH EMERGENCY BRAKE.

A new type of emergency brake has recently been invented by Mr. Henry Fresh, of Cumberland, Md., which is illustrated in the accompanying engraving. The principal feature of this brake mechanism is what is known as a "chock-block" which bears equally upon the wheel and upon the track. In the accompanying illustration this block G is shown in position supported by two bars, one of which, called the hanger bar H, is pivoted to the side frame of the truck by a stud which projects through a slotted hole. The other bar F, which supports the block is fastened to a lug E, projecting from the shaft C, on which is a second lug B, placed at an angle to lug E which serves to regulate the position of the "chock-block." The slot on the bar H permits this block to move in a forward and upward direction for releasing the brake, and this operation is controlled by a lever on the car platform connecting with the lug B. The brake may also be supplied with a scraper or steel

wheels, or upon the rear truck of a car so as to leave the front wheels free in passing over curves. Upon double truck cars there is provided a circle draw-bar which leaves the truck free to adjust itself to curves. The brake is exceedingly simple in design and is easily applied and there are no wheels, latches or springs to get out of order. It requires no expensive repairs and is easily attached to any type of cars. The brake is manufactured by Fresh & Speicher, of Cumberland, Md.

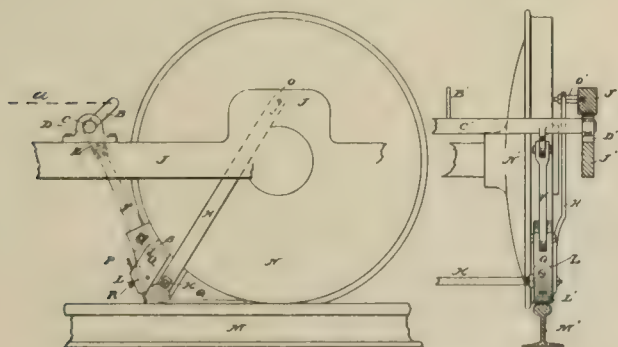
THE KEYSTONE TRAVELER.

The Mayer & Englund Co., of Philadelphia, has commenced the publication of a small monthly periodical that has for its mission the avowed purpose "of bettering the business of the Mayer & Englund Co. and its customers." The monthly has been appropriately named the "Keystone Traveler," and the publishers announce that it will cost nothing but the time it takes to read it. The January number, which is Volume I, No. 1, contains 24 pages of reading matter cleverly prepared and displayed. Descriptions and illustrations of Mayer & Englund specialties are interspersed with very readable fables and witticism, the whole making a combination that ought to go a long way toward accomplishing the end in view. When one has perused the first issue of the Keystone Traveler there can be little doubt left in his mind that the particular business of the Mayer & Englund Co. is the making and selling of high-class supplies for electric railways. The periodical will be sent regularly, free of cost, to any manager, engineer or purchasing agent interested in street railway matters.

AIR COMPRESSORS FOR NEW YORK SUBWAY.

M. F. C. Randall, general sales agent for the Christensen Engineering Co., last month closed, among other orders, contracts for 350 No. 2 air compressors, governors and other parts of an air brake apparatus for the subway cars of the Interborough Rapid Transit Co. of New York City. He also took orders from the Rhode Island Co., of Providence, for 233 No. 1 straight air brake equipments, and it is of interest to note that when these have been installed every double truck electric railway car in the state of Rhode Island will have been equipped with Christensen air brakes.

Coal and cattle interests in the vicinity of Elmira, Ill., are advocating the building of an electric road to connect that town with the main line of the Chicago, Burlington & Quincy R. R., at Kewanee, so constructed that freight cars may be interchanged with the Burlington.

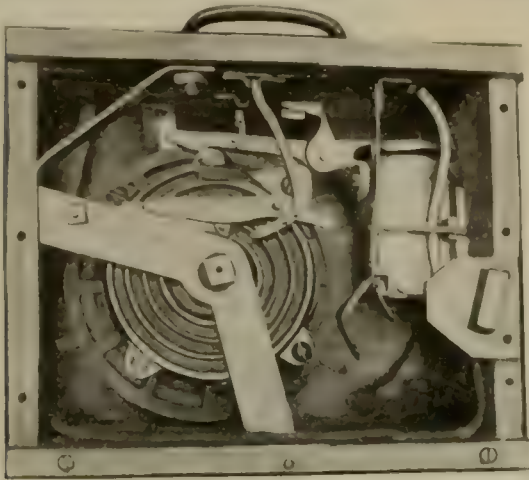


FRESH EMERGENCY CAR BRAKE.

bit, P, which rests close to the rail and is used to remove ice or sleet from the surface of the rail. It is claimed that this brake is especially adapted to street railway service on heavy grades and that it combines safety and efficiency in a high degree. It is independent of the motive power of the car and is always ready for an emergency. The brake is under easy control of the motorman at all times by the application of the lever and the weight of the car upon the wheels gives the necessary pressure on the rail without straining the car body. The brake shoes are provided with a flange near the wheel bearing on the rail which allows it to pass through curves without binding, or liability to derailment. The brake shoes

NEW TROLLEY RETRACTOR.

The accompanying engraving illustrates a trolley retractor which has been patented recently and is known as the Hoffman-Powers trolley protector, which will be of interest to our readers. The device is contained in a small wooden box placed at the rear of the car, within which is a drum on which the trolley rope is wound. Within this drum is a motor spring of sufficient strength to just keep all the slack out of the rope, in order that the retractive effort of the protector may be quickly applied in case the trolley leaves the wire. On the same spindle, but independent of the drum, is a spring barrel, containing a spring of sufficient strength to draw down the trolley pole. This barrel carries a pawl which engages a ratchet on the drum; under ordinary running conditions the pawl is disengaged, being held by a hook on a lever, on the opposite end



HOFFMAN-POWERS TROLLEY PROTECTOR.

of which is the armature of an electromagnet. This hook not only prevents the engagement of the pawl with the drum, but it prevents the spring barrel from rotating.

From each side of the trolley head flexibly poised wire connectors project laterally; these are insulated from the trolley pole, but are connected to the ground through the electromagnet in the protector box and a switch. These projecting wires are located so that they can not touch the trolley wire while the wheel is in place, but they make contact as soon as the wheel leaves the wire. The electromagnet attracts the armature, which in turn raises the releasing hook, allowing the pawl to drop and the spring barrel to come into action. The latter now engages with the drum and both springs unite in drawing the pole downward, where it is held out of reach of the cross wires and overhead work.

Tests extending over a considerable period show that the trolley wheel does not get even a few inches above the wire, and that it is drawn down four feet in an instant. A projecting lug on the spring barrel opens the switch, so that the operator can reset the trolley with no danger of a ground, allowing him to strike the projecting wires against the trolley in so doing.

To reset the trolley and the protector, it is only necessary to exert a slight pull upward on the rope, in which the trolley assists, this rewinds the barrel spring and the retaining hook catches hold of the pawl automatically. The switch is then closed, and the apparatus is ready to proceed. In order to assure the motorman that the device is set, or to warn him when the trolley has left the wire, the opening of the switch also closes a circuit through a battery and signal bell, which will continue ringing until the trolley is re-set.

It is claimed for this device that it will not be tripped by jarring of the car; that it operates whether the motors are taking current or not; that it is impossible for a circuit to be made unless the trolley wheel leaves the wire, and that it requires the minimum of effort to reset it. The device has been tested for some time on the lines of the LaFayette Street railway and has worked satisfactorily.

The maker is the Hoffman-Powers Co., LaFayette, Ind.

STRIKES OF THE MONTH.

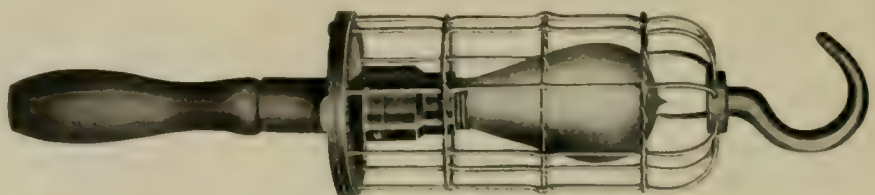
January 12th a strike of the motormen and conductors on the Waterbury division of the Connecticut Railway & Lighting Co. was declared. About 100 men were involved and the strike was caused on account of the discharge of a motorman who was president of the motorman's union. The man was discharged for repeatedly leaving his car at the suburban terminal and entering a saloon. For several weeks the service was badly crippled and no attempts were made to run cars at night. Later, men were secured to take the strikers' places and it was endeavored to resume the regular schedules. This increased the activity of the strikers and their sympathizers, and on the night of January 31st serious rioting occurred. Cars were stoned and non-union crews were severely handled; about 20 men were injured. February 1st 14 companies of militia were ordered to Waterbury after which the cars were run for some time with military protection. The company is now operating its cars on regular schedules by non-union men and the militia has gradually been withdrawn. Early in the strike the union started omnibus lines in opposition to some of the car lines.

On January 25th the conductors and motormen of the Indiana Railway Co. inaugurated a strike which left the cities of South Bend, Mishawaka, Elkhart and Goshen without street car service. The strike was brought about by the discharge of 10 men who were officers of the local street car men's union. The strikers demanded a nine-hour schedule, the adjustment of grievances by arbitration, reinstatement of 10 discharged conductors and motormen, recognition of the union by the company, and an increase in wages. On February 3d a committee of the prominent citizens of the cities affected endeavored to adjust the conditions between the company and the men but no settlement of the trouble could be made.

A strike of the conductors and motormen of the Montreal Street Railway Co. was commenced on February 1st for the recognition of the motormen and conductor's union, an increase of salary and the reinstatement of a number of employees. Within two hours after the strike was declared a car was wrecked by a mob and the motorman roughly handled. Another man was assaulted and probably fatally injured. The strike was terminated on the night of the same day, the company conceding most of the demands made by the employees including 10 per cent advance in wages, recognition of the union, and reinstatement of recently discharged men.

PORTABLE LAMP GUARD AND HOLDER.

The portable lamp guard and holder shown in the accompanying illustration is manufactured and marketed by Porter & Berg, dealers in electric railway supplies, Chicago. It is made after their own design and is something that can be used to great advantage by electric railway companies. It is made in two sizes, suitable to take either 16 or 32 candle power lamps. The guard is very strong and compact, yet not too heavy to be handled conveniently. There are a good many places in and around car barns, pits, store rooms, shops,



PORTABLE LAMP HOLDER.

etc., where a portable light would be very convenient and for this purpose the portable holder is especially adapted. The hook at the upper end of the guard is made of a size suitable to be attached to almost any form of support and by this means a man using it can readily find a temporary place for it. This device is particularly recommended for 500-volt work for the reason that the socket is thoroughly insulated from the guard, thus obviating any trouble from "grounds" on railway circuits. The outfit is furnished complete with the exception of the incandescent lamp and in addition a soft rubber socket protector is supplied, the latter serving as a protection to the socket when used in exceptionally moist places.

ACCIDENTS.

A head-on collision occurred between two cars of the Wilkes Barre & Wyoming Traction Co. on the night of February 1st, which is attributed to a dense fog which prevailed. The collision occurred near Pittston Junction and 10 persons were more or less seriously injured.

Two head-on collisions between electric cars occurred within 70 minutes, on January 28th, on the Clayton division of the St. Louis Transit Co.'s line. The first wrecked a car near the bridge over the River des Peres on the single track line and three men were injured, one seriously. The other collision was between a mail car and a passenger car which came together with such force that the front ends of both cars were demolished.

A car of the Philadelphia Rapid Transit Co. was wrecked by a locomotive on Jan. 31st and six persons were injured, but none seriously. A locomotive of the Reading railroad ran out of the station at Third and Burke Sts. with no one aboard, but with its throttle wide open, and ran at high speed along a single track which was but seldom used and where no watchman was stationed. When the motorman saw the locomotive he had no time to act, or even to jump. The car was struck near one end, turned at right angles to its former direction and was thrown over on its side. It is thought that the engine was started by some mischievous boy who had become frightened and jumped from the cab.

A collision occurred on January 21st between an Archer Ave. car of the Union Traction Co. of Chicago, and a train on the Chicago & Western Indiana Ry. The accident was due to the breaking in two of a freight train north of Archer Ave. When the engine and several cars had passed the crew of the electric car believed the track to be clear and the car was started forward. When it reached the center of the tracks the rear part of the broken train came into collision with the car. The motorman was fatally injured and several of the passengers were hurt, but none seriously.

On January 19th a collision occurred in Columbus, O., between a train on the Toledo & Ohio Central Ry. and a Leonard Ave. trolley car. Just as the motorman started to make the crossing it is claimed the gateman started to lower the gates and to ring the danger signal. The gates struck on top of the car near the rear vestibule, and as the car approached the tracks an engine backed down and struck the car, forcing it off the tracks and breaking both of the sills. It was claimed that the watchman did not attempt to lower the gates until after the car had passed onto the tracks and the marks of the gate on the roof of the car about 3 ft. from the rear end substantiate this claim. It is also said that the engine carried no lights and the conductor of the car was unable to see it approaching.

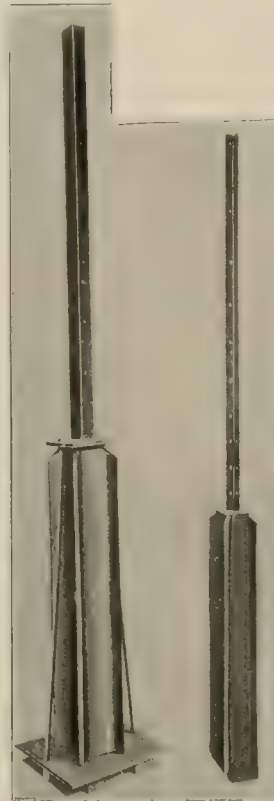
A motorman on a car of the Eddy & Fulton St. line, of San Francisco, Cal., lost control of his car while descending a steep grade and as the car entered a curve it jumped the tracks and threw several passengers to the street, seven of whom were painfully but not seriously hurt. The conductor of the derailed car claims that the motorman ran his car down the grade at an unnecessarily high rate of speed. The brakes of the car were found to be in perfect order.

The Congo State Railway authorities, whose headquarters are in Brussels, are about to invite estimates for supplying 30 electric locomotives and a large electrical installation.

The Berkshire Street Railway Co., of Pittsfield, Mass., recently started a through car schedule from Great Barrington and Pittsfield to North Adams. It is reported that the road is to be extended to Canaan, Conn. The company recently received several new combination passenger and baggage cars.

CLIMAX FENCE POSTS.

The use of wire fences for enclosing private rights of way for suburban electric lines and other railways is now very general and the accompanying illustrations show some new styles of fence posts which have been put on the market by the Climax Fence Post Co. These posts are particularly suited for railroad right of way fences, farm land fences, railroad signal posts, city sign posts, etc., and are made in several styles for corner, end, line and ornamental posts. They are made in any height required, of steel angles which are cemented in the base. The base is made of vitrified shale clay. The angles above the base are punched for any kind of fence wire desired. Fences of this construction present an extremely neat and attractive appearance and are rapidly coming into general use for interurban and suburban electric railways operating upon private rights of way.

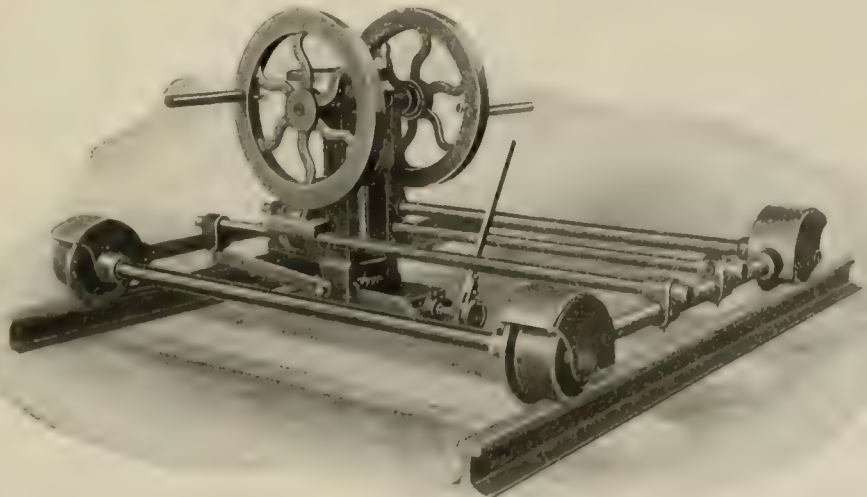


CLIMAX POSTS.

In view of the fact that the power house of the new Muncie (Ind.), Hartford City & Fort Wayne Railway Co. is located at Eaton, it is now proposed to run a branch line from the latter town to Albany, Selma, Parker City and Winchester. A part of the right-of-way to Albany has already been secured. Work on the Muncie-Hartford City company's line, connecting Muncie, Hartford City and Montpelier, was well under way the latter part of January, and it was expected that the road would be put in operation some time during the present month.

GORE TRACK DRILL.

The Ludlow Supply Co., of Cleveland, O., which has for some time been handling the Gore track drill mounted upon a carriage of its own manufacture, has now made arrangements whereby it will in future manufacture these drills. The company has made



GORE TRACK DRILL, ON CARRIAGE.

several improvements in them recently which will be seen by reference to the accompanying illustration. The driving wheels have

been found to be bringing them to a more natural position for cutting, and the small crank on the raising and lowering shaft has been replaced with a 12-in. wheel, making it much easier to raise and lower. A ratchet wheel and clamps for holding the rail while drilling have also been added. In recent tests, using a new bit, a hole was drilled in 26 seconds and each of the first 10 holes in less than one minute, with two men turning and one man feeding. By inserting a new bit frequently this average can be maintained. The carriage rides on the rails, allowing the drill to be moved rapidly. The company recently equipped one of its drills with a $\frac{3}{4}$ -h. p. electric motor connected by belt to one of the driving wheels. This arrangement gave entire satisfaction, the motor maintaining a speed equal to that when operated by two men, and but one man is required to operate the drill.

THE MARTIN ROCKING GRATE.

The accompanying illustrations show the fire grate manufactured by the Martin Grate Co., No. 28 Plymouth Court, Chicago. Fig. 1 is one of the bars in detail and Fig. 2 shows the appearance of the assembled grate. It will be noted that the bar extends lengthwise of the firebox, an arrangement which, in connection with the design of the bar itself, is intended to facilitate the use of slice bar and hoe. The bar is $1\frac{1}{2}$ in. in width and $5\frac{1}{2}$ in. in depth. There are interlocking

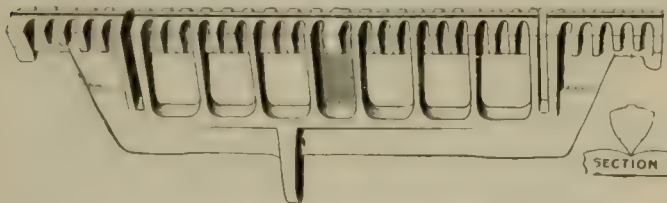


FIG. 1. DETAIL OF GRATE BAR.

fingers on the bars, the spaces between them are small and the bars all rock in the same direction at the same time. With these conditions, the act of shaking does not allow clinker to drop down and clog the grate.

This grate bar may be classed among the heaviest on the market, though the heavy part is a considerable distance below the fire line, with a free circulation of air between; thus providing against overheating. It will be noticed that the top of the bar is slotted near each end to allow for expansion and contraction. To this slot, it is said to be due, the long life of the bar.

The bars rest with a wedge-shaped bearing on the supporting bars, making the operation of the grate extremely easy. It is said

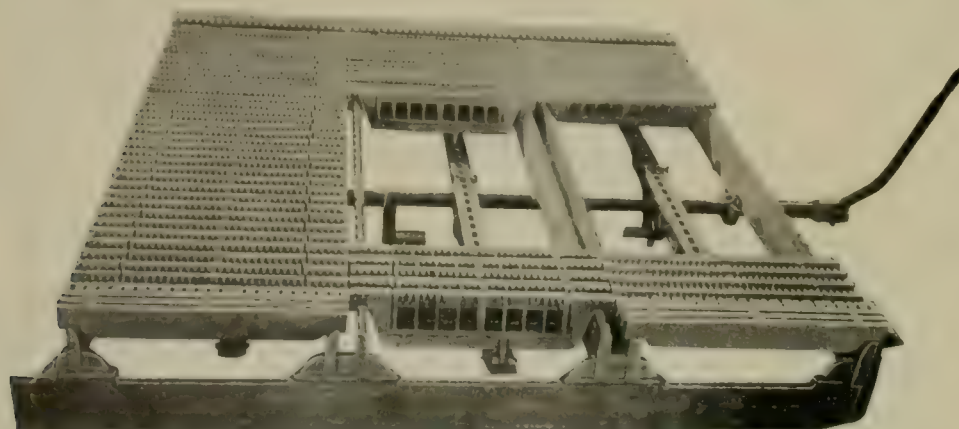


FIG. 2. ASSEMBLED GRATE.

that very little effort is required to shake a grate of 60 sq. ft. in area.

Ordinarily the air space for draft is about fifty per cent of the grate area, but it can be changed in a few minutes by changing the position of the bars.

While the grate would seem to be very satisfactory with any kind of fuel, it is especially adapted to use where screenings or slack is burned.

Some of the claims made by the manufacturers for this grate are: very reasonable first cost, remarkable durability, fuel economy, and great ease of installation, operation and repair. And these claims are substantiated by testimony from a great many of the largest steam plants in the west.

BARRETT JACKS AT PITTSBURG.

The Pittsburgh Railways Co. controlling all the street railway lines in Pittsburgh, Allegheny and the adjacent towns has placed an order with the Duff Manufacturing Co., of Pittsburgh, Pa., to equip each of its cars with a No. 2 Barrett jack. About a year ago the company tried the experiment of equipping every third or fourth car with a jack and the result has been so satisfactory that the cars are all to be so equipped. Several prominent street railway companies in this country are considering the adoption of this plan as there seems to be many advantages in providing each car with a jack to be used in case of emergency. They are frequently of service in removing wagons that are broken down on the tracks, thereby avoiding much annoyance and delay. In some places the law requires that a jack should be carried on each car. Such a law is in force in Cape Town, South Africa, and the equipment for this road was furnished by the Duff Manufacturing Co. about a year and a half ago.

PITTSBURG, McKEESPORT & CONNELLSVILLE RAILWAY CO.

The Pittsburgh, McKeesport & Connellsville Railway Co. announces that its main offices, and the offices of all its affiliated lighting companies, will be located in the Title & Trust Bldg., Connellsville, Pa. The new plant of the railway company, which cost in the neighborhood of \$1,000,000, will be put into operation within the next 30 days, and power from this plant will be delivered to all parts of the system as soon as the high tension lines are completed. The remaining links in the railway system are being rapidly closed up and the last of the bridges are being erected so that the entire road, with the exception of the extensions which are to be built this summer, will be in operation in the near future. The company has recently completed a new system of shops at Connellsville and is in the market for the equipment of machinery for these shops.

NOTICE OF REMOVAL.

The Standard Pole & Tie Co. has removed its offices to the Venezuela Building, numbers 133-5-7 Front St., New York City, a change rendered necessary by the increased business of the company and the consequent enlargement of its office force. The company is doing a large pole and tie business, and with its enlarged Southern yards, and its increased facilities in all departments, is covering a wide field throughout the Middle West.

At Brooksville, Fla., the company owns extensive tracts of Florida heart pine timber land on which it has erected and is now operating a sawmill and two large crossarm mills. The crossarms turned out at this point are of the best quality of long leaf yellow pine, and it is the company's policy to subject them to severe tests before shipment, so the arms will stand the most rigid examination and give entire satisfaction. The aim of the company is to please its customers at all times, and all orders sent to the New York office will receive attention and be satisfactorily filled.

The Urbana (Ohio) Bellefontaine & Northern Traction Co. recently received the first consignment of rails for the road in Champaign County, O.

A NEW STREET CAR FENDER.

For several weeks the Cleveland City Railway Co. has been making a practical test of the "Eclipse" fender which is the invention of Mr. Benjamin Lev, of Cleveland. It is claimed for the "Eclipse" that it will pick up a person absolutely without injury even when the car is moving rapidly, and the confidence of the inventor in the perfection of the device has resulted in a number of tests that to the onlookers must have been extremely startling. One such object lesson is thus described by an eye-witness: "Mr. Lev stepped out on the track as the car came down grade at a speed of about 12 miles per hour, and was struck by the fender which operates per-



ECLIPSE CAR FENDER.

fectly. The hollow rubber cylinder which extends across the front of the fender struck him about the ankles, the force of the impact causing him to fall backwards into the fender which held him securely. The car was stopped as quickly as possible and Mr. Lev released from the fender and was found to be entirely uninjured and none the worse for the experience. He had taken no precautions whatever in way of protecting his person by padding or otherwise, but was dressed in ordinary street clothes. The street railway people present were apparently well pleased with the result of the test."

The fender is made by the Eclipse Car Fender Co. of Cleveland. The construction is very simple; a platform or fender of band iron latticed together stands at an angle of about 45 degrees, and is pivoted near the front. At the lower end of the fender is a hollow rubber cylinder, which strikes about the ankles of any person standing on the track, taking the force of the blow; the force of the fall is taken up by the body striking the inclined fender, which at once tips back with the weight and holds the person as if caught in a basket. A flexible screen at the back prevents any injury from striking the front of the car.

AIR BRAKES FOR NEW YORK SUBWAY.

The Interborough Rapid Transit Co., of New York, has recently awarded contracts to the Westinghouse Air Brake Co., of Pittsburgh, for the air brake apparatus proper, such as engine valves, triple valves, brake cylinders, piping, etc., for all the 500 cars constituting the first installment of rolling stock for use in the subway. The Christensen Engineering Co., of Milwaukee, will supply the compressors, governors, etc., for the equipments.

WESTERN PENNSYLVANIA INTERURBAN.

Plans are under consideration for an interurban electric railway system which shall serve the coke region between the Allegheny and Monongahela Rivers, the territory being tributary to Pittsburgh. The Pittsburgh, McKeesport & Connellsville and Greenburg, Jeanette & Pittsburgh, together with the line now building from Connellsville to Greenburg will form the main part of the system, branches being laid to other towns as the condition may require.

One of the Manchester (N. H.) Street Railway Co.'s waiting station was destroyed by fire on January 23d.

FOND DU LAC-OSHKOSH ROAD OPENED.

The Fond du Lac & Oshkosh Electric Ry. was formally opened on January 28th, the ceremonies being participated in by the officials of the railway and of the Columbia Construction Co., and a number of invited guests from the cities along the line. The guests were taken to Fond du Lac on the interurban car "Oshkosh" where a luncheon was served. After the luncheon the guests again embarked on the two interurban cars, "Oshkosh" and "Fond du Lac," which reached Oshkosh about six o'clock. After making a tour of the city and inspecting the public buildings the party was taken to Athern Hotel where a dinner was served. Congratulatory speeches were made by the mayors of Fond du Lac and of Oshkosh and other prominent visitors.

The new road is 19 $\frac{1}{4}$ miles long and runs through a private right of way 50 ft. wide. The track is laid with 70-lb. T-rails in 60-ft. lengths and is to be ballasted with 18 in. of gravel. The overhead work is of span construction and there are two figures-8 trolley wires. The rolling stock comprises four passenger cars and one McGuire rotary snow plow. The cars are double truck, with vestibules, and contain modern facilities such as lavatories with hot and cold water, smoking compartments, etc. The power for the road is supplied by the Fond du Lac Street Railway & Light Co.

HOW TO CLEAN TRACK.

The importance of maintaining clean track and clean streets in which street railways operate has now become very generally understood by street railway managers, not only on account of the saving in current which is accomplished by keeping dirt and sand from the rails, but also on account of the additional comfort to passengers and the consequent increase in the traffic which follows. For cleaning streets and tracks both pneumatic sprinklers and snow sweepers have been found very effective, and the McGuire Manufacturing Co., of Chicago, states that the inquiries for pneumatic sprinklers which have been received during the winter months is significant of the preparations which are being made by street railway companies to clean the streets.

The company manufactures pneumatic sprinklers mounted on both single and double truck cars, the former being made in three sizes, 25,000, 30,000 and 35,000 gallons, and the double truck sprinkler being made in capacities of 40,000 and 50,000 gallons. The greatest demand now is for sprinklers which will cover the entire width of the street, and these machines are made to spread over a maximum width of 50 ft. on each side, or 100 ft. over all.

These pneumatic sprinklers are made with a heavy steel tank which contains a partition, on one side of which is the water storage and on the other side the compressed air storage for maintaining the pressure on the water. The air reservoir is maintained at the proper pressure by means of an independent motor-driven air compressor, and, if desired, motor driven centrifugal pumps are installed on the sprinkler for filling the tanks where there is no city water supply. In addition to the regular sprinkling head this company provides an auxiliary nozzle called a track flusher, which throws a separate stream of water directly upon the track rails so as to thoroughly clean them. The amount of water to be used is regulated by a lever controlled by the motorman, and in order to avoid wetting passing vehicles and pedestrians a device is provided for cutting off the water instantly by means of a spring actuated switch operated by the motorman's foot.

The company has received a number of orders for this machine from the Richmond Railway & Electric Co., of Staten Island; the Norfolk Railway & Light Co., of Norfolk, Va.; the Cleveland City Railway Co., Cleveland, O., and other companies. The sales of snow sweepers in localities where there is little or no snow have also been numerous recently and point to the increasing use of sweepers for cleaning tracks of dirt and sand.

The litigation between the city of Montreal and the Montreal Street Railway Co., in regard to whether the company shall pay to the city a percentage of the earnings of that portion of its track not included in the city limits, has been decided in favor of the company by the Court of Appeal, this court affirming the judgment of the Superior Court.

FINANCIAL.

SOUTH SIDE ELEVATED, CHICAGO.

The financial statement submitted at the annual meeting of the South Side Elevated Railroad showed a continuation of the steady heavy growth which the road has enjoyed for several years. The surplus for the year 1902 was \$178,031 against a surplus of \$125,500 in 1901. There was an increase of 8.95 per cent in the number of passengers carried over that of the previous year and the cost of conducting transportation amounted to nearly 1.27 cents per passenger carried, against 1.37 cents for the year before. The figures for last year, with comparison with those of 1901, are as follows:

| Earnings | 1902 | 1901 |
|-----------------------------------|-------------|-------------|
| Passenger | \$1,433,828 | \$1,310,000 |
| Other earnings | 48,470 | 45,000 |
| Miscellaneous | 1,537 | 570 |
| Gross earnings | \$1,483,835 | \$1,355,570 |
| Expenses | | |
| Maintenance of way and structure | \$ 57,442 | \$ 74,498 |
| Maintenance of equipment | 107,145 | 105,270 |
| Conducting transportation | 394,730 | 361,610 |
| General expenses | 149,950 | 141,201 |
| Loop rental and expenses | 183,057 | 162,300 |
| Total expenses | \$ 872,324 | \$ 844,879 |
| Net earnings | 611,511 | 510,691 |
| Deduct interest on bonds | 33,750 | 33,750 |
| Deduct dividends on capital stock | 409,124 | 357,955 |
| Surplus | \$ 178,031 | \$ 125,500 |

LAKE STREET ELEVATED, CHICAGO.

The financial report of the Lake Street Elevated for the year 1902 showed a deficit of \$26,915 for the year as against a surplus of \$6,204 in 1901. This was due to the increase in the items of labor, costs and taxes, and an increase of \$33,943 in labor alone more than equalled the deficit. The comparative statement of the earnings, operating expenses and net earnings for the past two years are as follows:

| | 1902. | 1901. |
|--------------------------|------------|------------|
| Total earnings | \$815,284 | \$780,402 |
| Operating expenses | 430,291 | 388,700 |
| Net earnings | \$384,992 | \$391,702 |
| Operating ratio | 52.78 | 49.43 |
| Total passengers carried | 15,849,411 | 15,394,038 |
| Daily average | 43,423 | 42,175 |

The following are the profit and loss accounts of the last two years compared:

| | 1902 | 1901 |
|--|-----------|-----------|
| To cost of operation | \$430,291 | \$388,700 |
| To taxes reserved | 24,235 | 14,856 |
| To interest on floating debt and trust notes | 64,793 | 56,248 |
| To interest on first-mortgage bonds outstanding (including interest accruing Jan. 1, 1903) | 236,726 | 17,261 |
| To interest on debenture bonds outstanding | | 218,355 |
| To rental of leased roads | 84,384 | 82,970 |
| To mileage tax, reserved | 1,767 | 1,767 |
| To surplus for year | | 6,204 |
| Totals | \$842,190 | \$786,402 |
| By passenger earnings | \$796,621 | \$767,795 |
| By miscellaneous income | | |
| Advertising and news privileges, etc | 18,002 | 18,000 |
| Deficit | 26,915 | |
| Totals | \$842,190 | \$786,402 |

At the annual meeting an organization committee was appointed consisting of David R. Forgan, H. N. Ilginbotham, H. A. Haugan, Cory E. Robinson and Thomas Templeton, which is to devise a plan of reorganization and report to the stockholders on March 2d.

NORTHWESTERN ELEVATED, CHICAGO.

The report of the Northwestern Elevated Railroad for the year 1902 showed 3¼ per cent earned on the preferred stock after \$36,000 in cash had been set aside out of earnings for the maintenance reserve, after heavy charges had been made against earnings for maintenance of equipment and after the cost of important improvements for the loop division had been deducted from the year's in-

come. These extraordinary items amounted to over 1 per cent on the preferred stock. The gross earnings of the Northwestern Elevated proper, for the year increased 15 per cent and the earnings of the Union Elevated, now owned by the Northwestern, increased nearly 12 per cent. The Northwestern now has \$51,000 in a cash reserve fund for maintenance of way and structures. The figures for the year with a comparison for those of 1901 are as follows:

| Earnings | 1902 | 1901. | Increase |
|---------------------------|-------------|-------------|------------|
| From passengers | \$1,107,329 | \$1,040,187 | \$ 151,342 |
| Other, including Loop net | 243,400 | 84,076 | 158,793 |
| Total | \$1,410,068 | \$1,100,863 | \$ 310,135 |
| Expenses | | | |
| Maintenance way | 58,063 | 29,748 | 31,315 |
| Maintenance equipment | 51,261 | 28,093 | 22,268 |
| Conducting transportation | 306,143 | 297,578 | 38,565 |
| General | 48,934 | 52,821 | 3,887 |
| Total | \$ 494,401 | \$ 379,140 | \$ 88,261 |
| Net earnings | 946,597 | 744,723 | 221,874 |
| Charges | | | |
| Loop rent | 110,774 | 101,635 | 15,139 |
| Taxes | 80,300 | 78,580 | 7,720 |
| Bond interest | 554,001 | 385,220 | 168,871 |
| Total | \$ 745,075 | \$ 565,435 | \$ 191,730 |
| Surplus | 189,423 | 159,287 | 30,136 |

aIncludes \$36,000 set aside in monthly installments in cash for maintenance reserve.

bIncludes \$15,000 set aside in monthly installments in cash for maintenance reserve.

cDecrease.

BROOKLYN RAPID TRANSIT CO.

The comparative statement for the months of December, 1902, and 1901, for all the underlying companies of the Brooklyn Rapid Transit system was as follows:

| | 1902. | 1901. | Increase. |
|--------------------------------|-------------|-------------|-----------|
| *Miles operated (single track) | 488.1 | 489.3 | |
| Gross earnings | \$1,076,192 | \$1,038,158 | \$ 38,034 |
| Operating expenses | 655,896 | 686,622 | *30,726 |
| Net earnings from operation | 420,296 | 351,535 | 68,760 |

While this showing is not equal to that of the previous months, it shows substantial gains in both the gross and net earnings and a fair reduction in operating expenses. The figures for the last six months of 1902 are as follows:

| | 1902 | 1901 | Increase |
|-----------------------------|-------------|-------------|------------|
| Gross earnings | \$9,832,300 | \$9,513,230 | \$ 323,130 |
| Operating expenses | 3,785,175 | 4,083,729 | **298,553 |
| Net earnings from operation | 3,051,194 | 2,429,510 | 621,684 |

* Includes leased railroad of New York & Brooklyn Bridge 2.6 miles and trackage rights over Coney Island & Brooklyn Bridge Railroad 2.4 miles.

** Decrease.

INTERNATIONAL RAILWAY CO., BUFFALO, N. Y.

The income account for the International Railway Co. for the month of December, 1902, with a comparison for December, 1901, is as follows:

| | 1901. | 1902. | Increase. |
|--------------------------------------|--------------|--------------|--------------|
| Gross earnings | \$732,370.73 | \$904,171.31 | \$171,794.58 |
| Operating expenses (excluding taxes) | 378,044.40 | 492,990.62 | 114,946.22 |
| Net earnings | 354,326.33 | 411,180.69 | 56,854.36 |
| Fixed charges | 386,489.25 | 390,134.40 | 3,645.15 |
| Net income | 32,156.92 | 21,046.29 | 53,203.21 |
| Net income, July 1st to date | 60,839.35 | 149,480.19 | 79,640.84 |
| Operating ratio (exclusive of taxes) | 51.6 | 54.5 | |

The figures for the quarter ending December 31st, with comparison of previous years are as follows:

| | 1901. | 1902. | Increase. |
|--------------------------------------|--------------|--------------|-------------|
| Gross earnings | \$270,650.97 | \$309,871.35 | \$39,229.38 |
| Operating expenses (excluding taxes) | 174,823.91 | 169,957.32 | 4,866.59 |
| Net earnings | 95,827.06 | 139,914.03 | 44,086.97 |
| Fixed charges | 128,241.23 | 132,822.20 | 4,581.03 |
| Net income | 32,414.17 | 73,091.77 | 40,505.00 |
| Net income, July 1st to date | 74,729.93 | 149,480.19 | 74,750.26 |
| Operating ratio (exclusive of taxes) | 64.6 | 54.8 | |

THE TWIN CITY RAPID TRANSIT CO.

The financial statement of the Twin City Rapid Transit Co. for December and for the year 1902 shows a remarkable increase in the operating expenses for December which was over 32 per cent, as against an increase in the company's traffic of about 12½ per cent. The figures are as follows:

For December, 1902—

| | 1902. | 1901. | Increase. |
|-------------------------------|-----------|-----------|-----------|
| Gross earnings | \$331,331 | \$204,341 | \$30,000 |
| Operating expenses | 151,450 | 114,100 | 37,350 |
| Net earnings | 179,875 | 180,235 | 300 |
| Interest, dividends and taxes | 78,018 | 94,450 | 13,068 |
| Surplus | 101,857 | 115,885 | 14,028 |

For the year 1902—

| | 1902 | 1901. | Increase. |
|-------------------------------|-------------|-------------|-----------|
| Gross earnings | \$3,012,211 | \$3,173,970 | \$438,235 |
| Operating expenses | 1,639,170 | 1,415,452 | 214,718 |
| Net earnings | 1,982,041 | 1,758,524 | 223,517 |
| Interest, dividends and taxes | 921,718 | 876,638 | 45,080 |
| Surplus | 1,060,323 | 881,886 | 178,477 |

* Decrease.

TORONTO RAILWAY CO.

The financial report of the Toronto Railway Co. for the year ending Dec. 31, 1902, with comparisons with the previous year has been issued as follows:

| | 1902 | 1901. |
|--------------------|----------------|----------------|
| Gross earnings | \$1,834,908.37 | \$1,661,017.50 |
| Operating expenses | 1,015,361.32 | 857,612.10 |
| Net earnings | 819,547.05 | 803,405.40 |
| Passengers carried | 44,437,678 | 39,848,087 |
| Operating ratio | 55.3 | 51.6 |

That the statement does not show a higher net revenue is explained by the higher prices paid for materials for maintenance and repairs, by the abnormally high price of coal, a large increase in employees' wages and a large expense in detecting and punishing systematic thieving which was depriving the company of a portion of its revenue. The directors have set aside \$75,000 from the surplus to the credit of a contingent account to provide against heavy or special renewals, etc.

MONTREAL STREET RY.

The earnings for the month of December, 1902, and for the last three months of the year 1902 with the increase over the same periods for the previous year are shown in the following tables:

| | Dec. 1902. | Increase. |
|------------------------|--------------|-------------|
| Passenger earnings | \$173,041.83 | \$16,330.78 |
| Miscellaneous earnings | 4,325.47 | 2,840.78 |
| Total earnings | 177,367.30 | 19,171.56 |
| Operating expenses | 113,917.48 | 8,310.63 |
| Net earnings | 63,449.82 | 10,860.93 |
| Fixed charges | 17,405.56 | 2,220.43 |
| Surplus | 4,044.26 | 8,640.50 |
| Operating ratio | 65.83 | |

For the quarter ending December, 1902—

| | 1902. | Increase. |
|------------------------|--------------|-------------|
| Passenger earnings | \$523,308.32 | \$48,885.66 |
| Miscellaneous earnings | 8,336.95 | 3,621.05 |
| Total earnings | 531,645.27 | 52,476.11 |
| Operating expenses | 313,994.85 | 26,657.74 |
| Net earnings | 217,650.42 | 25,818.37 |
| Fixed charges | 49,473.77 | 4,937.71 |
| Surplus | 168,206.65 | 20,880.66 |
| Operating ratio | 60.00 | |

CINCINNATI, DAYTON & TOLEDO TRACTION CO.

The statement of earnings of the Cincinnati, Dayton & Toledo Traction Co. for the month of December, 1902, compared with December, 1901, and for the seven months ending December 31, 1902, are shown in the following tables. The operating expenses include an accident appropriation equal to 2 per cent of the gross receipts and an charge for taxes and interest.

For month ending Dec. 31, 1902—

| | 1902. | 1901. |
|------------------------|-------------|-------------|
| Total gross earnings | \$30,452.32 | \$31,117.11 |
| Operating expenses | 21,376.93 | 17,025.70 |
| Net earnings | 15,075.30 | 13,191.32 |
| Deductions from income | 15,952.24 | 16,455.40 |
| Deficit | 876.85 | 3,264.14 |

For the seven months ending December 31, 1902.

| | |
|------------------------|--------------|
| Total gross earnings | \$302,668.46 |
| Operating expenses | 155,951.18 |
| Net earnings | 146,717.28 |
| Deductions from income | 113,850.85 |
| Net income | 32,857.43 |

PUEBLO & SUBURBAN TRACTION & LIGHTING CO.

The comparative statement of earnings of the Pueblo & Suburban Traction & Lighting Co. for the months of December, 1902, and 1901, is as follows:

| | 1902. | 1901. |
|--------------------|----------|----------|
| Gross earnings | \$40,583 | \$26,780 |
| Operating expenses | 20,249 | 13,501 |
| Interest, etc. | 11,249 | 4,059 |
| Net earnings | 9,085 | 9,229 |

PHILADELPHIA CO., PITTSBURG, PA.

The Philadelphia Traction Co. has completed its first calendar year since the Consolidated Traction Co. was taken over and the results are entirely satisfactory. The gross earnings of the property increased \$1,605,929, or nearly 14 per cent. There is \$28,953,000 common stock outstanding so that the \$2,450,564 earned over the previous dividend is equal to nearly 8½ per cent on its stock. The figures for the months ending Dec. 31, 1901, and 1902, are as follows:

| | 1902. | 1901. |
|---|-------------|-------------|
| Gross earnings from operations | \$1,375,132 | \$1,206,282 |
| Operating expenses and taxes | 710,967 | 646,483 |
| Net earnings from operations | 664,165 | 559,798 |
| Total earnings and other income | 781,743 | 577,942 |
| Deductions from income | 120,121 | 36,028 |
| Total income | 661,622 | 541,913 |
| Fixed charges | 327,014 | 265,721 |
| Net income | 334,607 | 276,192 |
| Less proportion of same to credit of owners of capital stock of affiliated corporations other than the Philadelphia Co. | 427 | 28,537 |
| Balance, represents Philadelphia Co's interest in the total net income | 334,180 | 247,654 |

The statement for the 12 months of the calendar years 1901 and 1902 is as follows:

| | 1902. | 1901. |
|---|--------------|--------------|
| Gross earnings from operations | \$13,795,053 | \$12,189,124 |
| Operating expenses and taxes | 7,759,029 | 6,655,849 |
| Net earnings from operations | 6,036,024 | 5,533,275 |
| Total earnings and other income | 7,643,673 | 6,005,095 |
| Deductions from income | 6,477,160 | 5,560,521 |
| Fixed charges | 4,020,632 | 3,180,094 |
| Net income | 2,450,528 | 2,380,420 |
| Less proportion of same to credit of owners of capital stock of affiliated corporations other than the Philadelphia Co. | 5,963 | 495,865 |
| Balance, represents Philadelphia Co's interest in the total net income | 2,450,504 | 1,884,560 |

The financial statement of the Chicago & Milwaukee Electric Ry. for the year ending Dec. 31, 1902, shows gross receipts \$190,110, operating expenses \$70,340 and a net income of \$110,770.

NEW PUBLICATIONS.

THE REQUIREMENTS OF MACHINE TOOL OPERATION WITH SPECIAL REFERENCE TO THE MOTOR DRIVE, by Charles Day. This is a reprint of the paper presented before the New York Electrical Society, Dec. 17, 1902.

EIGHTH ANNUAL REPORT of the Boston Rapid Transit Commission, covering the period from Aug. 18, 1901, to June 30,

1902 has just been published and contains an interesting description of the progress of the work on the East Boston tunnel.

PROCEEDINGS of the international congress of the Tramway & Light Railway Union, held in London, July 1-4, 1902, has been published in book form by the Union. The volume contains 270 pages, 8 x 13 in., and includes complete reports of the papers and discussions read before the congress.

"THE STEAM TURBINE, ITS COMMERCIAL ASPECT" which was read by Mr. E. H. Sniffen at the meeting of the American Street Railway Association held at Detroit in October last has been reprinted by the Westinghouse Company in pamphlet form. This paper was printed in the "Daily Street Railway Review" for Oct. 12, 1902, but the present publication is in very convenient form for reference and may be had by addressing the nearest office of Westinghouse, Church, Kerr & Co.

STEAM POWER PLANTS: THEIR DESIGN AND CONSTRUCTION. By Henry C. Meyer, Jr., M. E. 160 pages. Cloth. Illustrated. McGraw Publishing Co., New York City. Price \$2.00.

This book constitutes a number of "The Engineering Record Series" and much of the text has originally appeared in that paper. The book was written to give information to owners or managers of manufacturing plants or buildings requiring power installations who make no claims to expert knowledge in power plant engineering. The contents are divided into 11 chapters treating of all the various machinery contained in the power plant, and the illustrations give general and detailed information concerning a large number of modern plants. The latter feature alone makes the book a valuable treatise upon the subject of steam power plant engineering and the information given is both suggestive and valuable.

ELECTRICAL PROBLEMS. By William L. Hooper and Roy T. Wells. 8vo. Cloth. 170 pages with diagrams. Ginn & Co., publishers. List price \$1.25, mailing price \$1.35. This book contains several sets of electrical problems typical of those met with in electrical engineering practice and in laboratory work, and a brief treatment of the method of solution is given. The problems are all of a numerical character and most of them have already been presented by Professor Hooper to the electrical engineering classes at Tufts College. The problems include calculation on combination of electromotive forces and resistances in different groups, distribution and fall of potential in various circuits, inductance of coils, capacities of condensers and various problems in electro-chemistry and calculations of the output and efficiency of generators, motors, batteries, etc. The book also contains solutions of various problems in alternating electromotive forces and others on the calculation of armatures, field windings, and on the winding of transformers, rotary converters and other classes of electrical machinery. The answers to all the problems are given in the appendix, some of which are in the form of graphical reproductions. The problems included are all of a practical character many of which are constantly met with in the work of the electrical engineer and will be useful to the student in showing the practical application of mathematical formulae.

ADVERTISING LITERATURE.

THE FALKENAU-SINCLAIR MACHINE CO., Philadelphia, has issued an attractive booklet executed in six colors telling in a terse way about the "Combination of Two Old Concerns Pulling Together."

MARIS BROTHERS, Philadelphia, Pa., have published a very unique and artistically designed illustrated piece of advertising literature in a book entitled, "Cranes of Different Kinds." The book describes the Maris hand and electric traveling cranes, and will be sent to those interested upon application.

THE WESTINGHOUSE ELECTRO-PNEUMATIC SYSTEM FOR CONTROLLING RAILWAY AND OTHER MOTORS. This is a 20-page pamphlet fully describing and illustrating this system of train control. The Westinghouse company has also issued a separate publication "Instruction Book W. A. B. 5,000," giving instructions for the operation and inspection of the Westinghouse

multiple train control system for electric railways; this has particular reference to number 131 controller.

THE FOUR TRACK NEWS published by the New York Central & Hudson River R. R. has appeared for January and contains several interesting descriptive sketches by well known writers. It is well edited, and illustrated with a great many excellent half-tones. It is, in fact, a good type of what its title page claims it to be: "An illustrated magazine of travel and education."

PURDUE UNIVERSITY has recently issued its twenty-eighth annual report, it being for the year ending June 30, 1902. It contains reports of the president and other officers, a list of officers and instructors, and a short history and description of the institution. The year's work is reviewed and improvements and gifts noted. There is a short discussion on the agricultural department and, finally, some of the needs of the university are noted.

THE CROCKER-WHEELER CO., of Ampere, N. J., has recently issued the following flyers: No. 31, on type "D" machines rated at from 10 to 240 h. p.; No. 32, on motor driven linotype machines; No. 33, motors for elevator duty; No. 34, motor driven rotary planer; No. 50, on increased cutting speeds of machine tools; No. 51, motor driven printing presses; No. 52, motor driven grinders; No. 53, motor driven compressors; No. 54, countershaft motors.

"THE KEYSTONE TRAVELER" is the title of an artistically printed pamphlet of 26 pages which bears date January, 1903, Vol. 1, No. 1. This is issued by the Mayer & Englund Co., 1020 to 1024 Filbert St., Philadelphia, and it is announced that about once a month copies of this paper will break into the offices of street railway men. The contents include illustrated descriptions of the specialties handled by the company together with interesting notes on things of interest to the trade.

THE GENERAL ELECTRIC CO. has issued three pamphlets concerning transformers which cannot fail to prove of value to those interested in this apparatus. No. 9114 supersedes No. 9106 and is entitled "Some Facts Regarding Type H. Transformers." It comprises a description with illustrations clearly showing the different parts of the apparatus and includes tables and other data concerning the apparatus. No. 9115 is entitled "Transformer Economy" and presents tables and curves exhibiting core losses, copper losses and regulation. No. 9116 is a short treatise on sheet steel for transformers illustrated with half tone engravings of microscopic views of different metals.

THE WEIR FROG CO., of Cincinnati, O., has published a new catalog, No. 6, illustrating its well-known frogs, switches, crossings and other special track work. The catalog is 5 x 8½ in. in size and contains 335 pages. It is substantially bound in red cloth covers and presents a very handsome typographical appearance. This company makes a very complete line of special work for steam and electric roads and several hundred designs are described and illustrated in its new catalog, the number of these being far too great to mention in detail. In addition to these, however, the company is prepared to submit plans for any style of special work not listed. The catalog contains a very complete table of contents and in addition there are 21 tables in the back of the book which relate to the design of special work and which will be found very useful for railroad men. Many of these tables are original with this company and all of them will be found thoroughly up-to-date. The company carries 40 different sections of T-rail in stock from which track work is made and any other sections can be obtained by giving the mill and section number of the rail.

TRADE NOTES.

THE OHIMER CAR REGISTER CO. has appointed Clyde B. Funk to represent it in the southern territory with headquarters at Richmond, Va.

AT A MEETING of the board of directors of the Allis-Chalmers Co. held Jan. 15, 1903, the regular quarterly dividend on preferred stock was declared.

STREET RAILWAY REVIEW

Vol. XIII

MARCH 20, 1903

No. 3

Electric Haulage on the Miami & Erie Canal.

Equipment of the Miami & Erie Canal Transportation Co. — First Three-Phase Traction System in the United States

A system of electric haulage for canal boats is being installed on the Miami & Erie Canal which is not only unique in the history of transportation but involves the use of a three-phase system of electric traction, being the first electrical installation of its kind in this country and the most extensive application of mechanical canal boat haulage in the world.

The Miami & Erie Canal runs from the Ohio River at Cincinnati in a general northerly direction and connects with Lake Erie at

railroad systems of the state existed, it constituted one of the busiest arteries of trade in the state of Ohio. The territory through which it passes and that immediately contiguous to it contains about 5,315,000 people, or nearly one-third of the entire population of the state and it passes through 18 cities and towns whose population aggregates 656,500, and penetrates the richest and most fertile sections of the state. For thirty years practically no attention has been paid to the canal and its business, which had paid large receipts to the



VIEW ALONG LINE OF MIAMI & ERIE CANAL.

Toledo. The route of the canal and the principal cities through which it passes are shown on the accompanying map. The electric system which is being installed, and which is now practically completed between Cincinnati and Dayton, a distance of 68 miles, comprises a standard gage single track road built along the tow path of the canal on which electric locomotives are used to tow fleets of from five to seven canal boats.

The construction of the Miami & Erie Canal was commenced about 1825 and in its early years, before the competition of the

state, has been gradually diverted to the railroads, so that for the last 20 years the appropriations for the maintenance of the canal not only included all of its receipts but often considerable amounts in excess taken direct from the state treasury. The receipts for the 20 years previous to 1900 amounted to \$1,604,408, and the expenditures for maintenance and operation for the same period were \$1,792,384, leaving the canal a debtor to the state treasury for this period in the sum of \$97,976. For many years, however, after the canal was built it earned very large receipts, and the gross earn-

Ohio. In 1900 Mr. Fordyce entered into an agreement with the State Board of Public Works of Ohio to undertake a series of experiments whose success proved the feasibility of this system, and a contract was entered into between the state of Ohio and Mr. Fordyce in March, 1901, granting him the right to construct and operate along the Miami & Erie Canal and upon the land adjacent belonging to the state all necessary facilities for propelling boats by means of an overhead trolley system built upon the tow path. The franchise is for a period of 30 years from the time the system is put in operation, and it specifies among other provisions that the construction of that portion of the route between Cincinnati and Dayton shall be completed within 2½ years from the date of the contract and that the entire length of the canal must be completed within four years thereafter. Failure to comply with these provisions forfeits the franchise.

To the Miami & Erie Canal Transportation Co. was assigned the

the roadbed shall be filled over the top of the ties so as to give a smooth surface for the present method of towing by mules and horses; that the dimensions of the banks built by the company shall not be of a smaller cross section than as originally built. The company is authorized to build and operate as many swing bridges as will be necessary for the operation of the road, subject, however, to the use of the state of Ohio for canal purposes, and which shall be free of charge to the state for such purposes.

According to the terms of the franchise the entire track between Cincinnati and Toledo, a distance of 244 miles, is to be finished and in operation by the year 1907. The part of the work between Cincinnati and Dayton and through the latter city, a distance of 68 miles, which was to be completed in 2½ years from March, 1901, is already practically finished. The roadbed which is laid with 70-lb. rails on oak ties follows the bank of the canal. It is very substantially constructed and where the locks occur trestles are



VIEW OF CANAL AT RAILROAD CROSSING, SHOWING CONCRETE RETAINING WALL.

contract between the state of Ohio and Mr. Fordyce. According to this franchise, the company, if obliged to abandon its project for any reason, shall have the right to remove all of its poles, wires, tracks and buildings from along the canal; the state of Ohio, out of its appropriations, maintains the canal.

The company is prohibited from interfering with the ordinary use, control and management of the canal and the franchise does not limit the power of the Board of Public Works as fixed by law. The company is compelled to transport all boats along the canal when the owner of them shall so desire, and in case of disagreement as to the price for propelling boats the company shall be subject to such regulations in regard to charges as may be prescribed from time to time by the Board. The speed of all boats transported by the company is limited to four miles per hour.

The specifications of the State Board of Public Works under which the construction of the electric plant was carried out provide, among other things, that all roadbed construction shall, wherever practicable, be 2 ft. above the standard level of the canal in each of its levels, and that the company shall build retaining walls or pile construction where necessary to receive the inner rail of the track for the purpose of minimizing space, and that the ballast of

built from the high level down to the low level so that the grades have been maintained within a maximum of 1½ per cent.

Furnouts are provided at suitable points for passing locomotives, the switches and frogs being furnished by the American Switch & Frog Co. The rails are bonded with United States Steel & Wire Co's. bonds, one to each joint, and there are no cross bonds. In a number of places where the road passes under bridges the roadbed dips down below the surface of the water in the canal and at these places concrete retaining walls have been built of the style shown in one of the accompanying illustrations. There have been 5,019 ft. of these concrete walls built up to the present time. In places where the banks are narrow and the track approaches close to the water it was necessary to build retaining walls to support the weight of the locomotives on the banks. These walls were built of piling driven close together, along which 3-in. oak planks were bolted. There have been 11,488 ft. of piling built up to the present time.

A general view of the pole line and overhead construction will be seen in one of the illustrations giving a general view along the line of the canal. The high tension feeders are run in the form of a triangle, two phases being carried upon the lower cross arm and one on the upper cross arm centrally above the other two. These

are carried on Locke porcelain insulators of the Victor type without gutters. The feeders are stranded aluminum wire equivalent to No. 6 copper. The three-phase circuit for the locomotives is carried on two overhead trolley wires and the track. On account of the numerous bridges under which the trolley wires have to pass the height of these wires above the track is very variable, being 22 ft. high in some places and as low as 7 ft. under some of the bridges in the city of Cincinnati. The minimum height of the trolley wires outside of the city is 9 ft.

The trolley wires consist of two No. 0000 G. E. groove wires carried for the principal part of the way on Christy flexible brackets, with special double insulated fittings made by the Ohio Brass Co. At swing bridges and places where it has been necessary to run the high tension feeders on the side of the canal opposite to the tracks, to avoid buildings and other obstructions, span wire construction has been used. The part of the work already completed has been by far the most difficult owing to the number of buildings and other obstructions which have been put up close upon the banks of the canal for the past few years when the operation of the canal was practically suspended. The remaining portion of the roadbed and overhead construction through to Toledo offers comparatively few difficulties and it is expected to push this part of the work to completion very rapidly.

of these sub-stations will be provided with Westinghouse low equivalent lightning arresters and static interrupters. The transformer buildings are all of the same design and are 25 x 60 ft., inside dimensions, the main story being 18 ft. high with a basement 7 ft. high. The walls are of brick laid on concrete foundations and the floors and roofs are built of concrete and expanded metal, making the buildings absolutely fire proof.

The Spring Grove station consists of a standard sub-station building with an addition 30 x 34 ft. in which the motor generator set is contained.

The company has at the present time seven locomotives contracted for, four of which have been already delivered. These are each 20-ton locomotives, the frames of which were built by the Baldwin Locomotive Works and the equipment was furnished by the Westinghouse Electric & Manufacturing Co. The cabs of six of the locomotives are built so as to clear the trolley wires at a height of 9 ft., and one locomotive, which is to be used entirely for switching purposes in the city of Cincinnati, is built to pass under trolley wires 7 ft. high. The frames, which are 14 ft. in length, are mounted on Baldwin trucks having 30-in. wheels and a 7-ft. wheel base. The weight complete is about 24 tons each and the motors are connected to the axles through double reduction gearing. The draw-bar pull with three-phase current at 3,000 alternations and



CINCINNATI WAREHOUSE OF THE MIAMI & ERIE CANAL TRANSPORTATION CO.

The company has no generating station of its own, but takes current from the Cincinnati Gas & Electric Co., which has a plant on the bank of the canal near the Cincinnati terminus. This company furnishes three-phase current of 60 cycles at 4,000 volts pressure to the Spring Grove converter station shown in the accompanying illustration. This current is stepped down to 400 volts at the Spring Grove station and is two-phased by the Scott method of connection of transformers. This two-phase current is led to a 450-h. p. two-phase synchronous motor, which is direct connected to a three-phase, 25-cycle, 300-kw. generator, giving a pressure of 390 volts. Thence the current is led to 250-kw. transformers and stepped up to 33,000 volts for the transmission line.

At points about 12 miles apart there are static transformer sub-stations, each of which is to be equipped with three 150-kw. transformers permanently connected in delta. These transformers will step the three-phase current down from 33,000 to 1,090 volts, which is the voltage of the trolley circuit.

The Rialto sub-station, shown in an accompanying illustration, is situated about 12 miles from the Spring Grove station and is the first of these sub-stations to be equipped with transformers. All

1,100 volts and with an efficiency of 95 per cent for each pair of gears is as follows:

| Coefficient of Adhesion. | Draw Bar Pull. |
|--------------------------|---------------------|
| 25 per cent | 9,600 lb. starting. |
| 20 per cent | 7,600 lb. starting. |
| 16 per cent | 6,350 lb. starting. |

The equipment of each locomotive includes two induction motors connected in concatenation and provided with rheostatic control. The variable resistance is in the rotors or in the rotor of either motor. The motors are rated at 80 h. p. each and are wound for 200 volts. This voltage is secured by means of transformers on the locomotives which step the trolley current down from 1,090 to 200 volts. The maximum speed of the locomotives using one motor is six miles per hour, and the operating speed with two motors in tandem is between three and four miles per hour. The motors are guaranteed to run for 10 hours at full load with a maximum rise of temperature of 75° C.

That part of the trolley circuit inside the city of Cincinnati will be operated at a pressure of 390 volts, as a precaution of safety,

instead of 1,000 volts, and the locomotive transformers are provided with auxiliary connections to utilize this voltage inside the city. Changes in the transformer connections will be made by means of switches in crossing the city line.

The electrical apparatus of the entire equipment is of the Westinghouse type and the engineering and construction work has been done by the Cleveland Construction Co., of Akron, O.

In the practical operation of the system a string or fleet of canal boats from five to seven in number will be towed by a single locomotive. Owing to the narrowness of the channel and the surging or piling up of the water in front of the boats, it has been found necessary to use tow lines of about 200 ft. in length between each of the boats and between the forward boat and the locomotive. This length of tow line behind the locomotive is also required in order that the boats may be steered, so as to avoid being dragged against the banks. The tow line is fastened to the locomotive by means of a swivel draw bar.

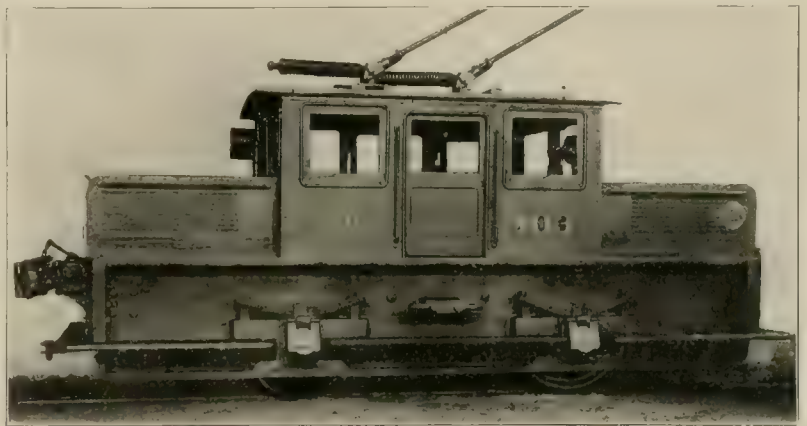
At the points where the road crosses from one side of the canal to the other swing bridges have been constructed over which the locomotives pass. After the locomotives have passed, the bridge will be opened, permitting the boats to pass through. Three of these swing bridges have been built on that part of the road already constructed, one being at 12th St. in Cincinnati, one at Hartwell, 10 miles from Cincinnati, and one at Flockton, five miles south of Hamilton. It may be stated also that the question of bridges has proved a troublesome one on this part of the line, as 135 highway bridges have had to be redesigned or reconstructed to provide sufficient clearance for the overhead system.

When two fleets of boats pass on level parts of the canal switches are provided so that one locomotive may take the switch and drop its tow line while the other one passes over on the straight track. The schedules are arranged, however, so far as possible, that the crossing of the boats will take place at the locks. The locks are 90 ft. in length, providing room for only one boat to pass at a time. In running into a lock and floating a boat up or down to the next level about eight minutes per boat is allowed, although under favorable conditions a boat may be put through the lock in about four minutes. When two lines of boats are passing at the locks considerable time is saved, as instead of allowing the lock to fill up when emptied after the down-stream boat has passed, one of the boats in the opposite direction is put into the lock and floated up to the next level, thus requiring no more time for the passage of two boats in opposite directions than for a single boat in one direction. While the operation of putting the boats through the locks is at best a slow one it must be remembered that the question of high speed does not enter as a feature of this method of transportation, and the company both by the terms of its charter and from the nature of its service, is precluded from undertaking passenger or other high speed service. It has been found from experiment that freight may be hauled in canal boats by this system at a cheaper rate than it can be towed by mules, the power required being only about 10 h. p. per boat when towed at a speed of four miles per hour.

The boats used in this service are 70 ft. long, 10 ft. wide and have a capacity of about 70 tons each, which is equal to three average car-loads. The company is building its own boats at Lockland, O., where it is turning out about two boats per month. The company expects to be able to operate its boats during the entire season, in order to do which provisions have been made for breaking the ice during the winter. Within the city limits of Cincinnati no ice is found in the canal at any season for the reason that the Cincinnati Gas & Electric Co. and a number of other manufacturing plants in which steam power is used make use of the canal for condensing purposes and the water is comparatively warm at all times of the year. Outside of the city, ice breakers are used which consist of flat boats with steel protection, which are heavily loaded. These are pulled up on top of the ice, which is constantly broken through by the weight of the boat. In addition to this a protection from ice is applied on the front of each boat which consists of strips of beading flexibly connected which are wrapped around the prows of the boats.

The operating expenses of the system are extremely small as in addition to the small amount of power required per boat only one man, called a pilot, is required on each boat for steering, and one man on the locomotive. The company is establishing large warehouses and depots at various points along the route. One of these is located on the canal at Cincinnati, between Walnut and Main Sts., extending the entire length of the block. This is shown in an accompanying illustration.

The traffic department of the Miami & Erie Canal Transportation Co. is thoroughly organized on a system practically similar to that of the railroads, and is in charge of a traffic manager. Local agents are stationed at all of the principal shipping points along the canal and the company has installed a private telephone, called the business telephone, which connects all of the agencies with the office of the traffic manager so as to enable the latter to keep in constant touch with the business being carried on at all points along the canal. The traffic department also has a set of uniform bills of lading, way bills, way bill corrections, "over," "short" and "damaged" reports and vouchers used in cases of loss or damage. The uniform bill of lading contains the agent's receipt for the goods shipped, name of consignee, destination of goods, route over which they are to be shipped and description of the articles with the weight. Beneath these are two blank spaces, one of which is filled in by the agent, giving the rate for each class of freight shipped,



THREE-PHASE ELECTRIC LOCOMOTIVE.

and the other is a form for the receipt for any prepayment which has been made. On the back of the bill are given the conditions of shipment, which are the same as usually found on bills of lading. The way bill of freight contains blanks to be filled in showing the gross and net weight of shipment, where weighed, the route, giving junction with connecting railways if any, boat number, pilot, date and time of shipment, with space for the description of the articles, the weight, rate, freight, advances, amount prepaid and total charges, to be filled in wherever transshipments are made. It also contains a space for the receiving agents' receipt. The other forms used are same as are used by all transportation companies and need no special description.

During the past winter the company has carried on considerable shipping business which came to it entirely unsolicited and for which special provision had to be made. As its regular locomotives and the three-phase distributing plant were not sufficiently near completion to be put into operation the company constructed a number of flat cars equipped with ordinary street railway motors and rented current for this temporary work from the Cincinnati Traction Co. By means of this temporary equipment a considerable amount of business was done on the canal.

The largest individual industry among the numerous factories located along the canal is the manufacture of paper. In the towns of Carrollton, Miamisburg, Franklin, Middletown and Amanda are established 17 paper mills, some of which are among the largest in the world, and in addition to the shipment of the finished product of these factories the transportation of the incoming raw materials of manufacture constitutes a very large item of the canal company's business.

CONVENTION ANNOUNCEMENTS.

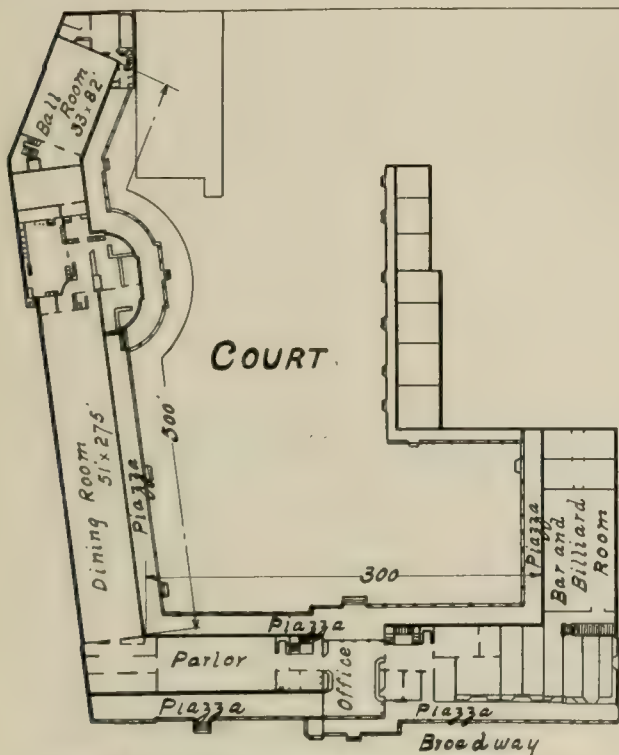
It has been decided to hold the 22d annual meeting of the American Street Railway Association at the Grand Union Hotel, Saratoga, N. Y., on Wednesday, Thursday and Friday, Sept. 2, 3 and 4, 1903. The executive committee of the association met at the Worden Hotel, Saratoga, February 23d, those present being J. C. Hutchins, of Detroit, president; W. Caryl Ely, of Buffalo; Richard T. Laffin, of Worcester, Mass.; Andrew Radel, of Bridgeport, Conn.; Walter P. Read, of Salt Lake City; T. C. Penington, of Chicago, secretary, and T. J. Nicholl, of Rochester. Mr. Nicholl was chosen by the committee to fill the vacancy caused by the resignation of W. J. Hield, of Minneapolis, who found that the demands on his time would not permit him to give the association business the attention it deserved, and rather than slight these latter duties preferred to withdraw from the committee.

The subjects chosen for convention papers have been assigned and are as follows:

"Steam Turbines."

"Electric Welded Joints."

"The evils of Maintenance and Champerty in Personal Injury Cases."



GROUND PLAN, GRAND UNION HOTEL, SARATOGA, N. Y.

"The Manufacture and Distribution of Alternating Current for City Systems."

"Comparative Merits of Single and Double Truck Cars for City Service."

"The Right of Way."

"Train Orders and Train Signals on Interurban Roads."

"Freight and Express on Electric Railways."

As soon as the committee was called to order Mr. A. P. Knapp, president of the Village of Saratoga, and Mr. C. B. Thomas, president of the Business Men's Association, invited the Street Railway Association to hold the 1903 convention at Saratoga. Mr. C. A. Douglass, representing the Grand Union Hotel, Saratoga, explained what it could offer in the way of hotel accommodations, meeting room and exhibit space.

An invitation was also received from the street railway manufacturers and suppliers of Chicago and the West, who offered to rent the Coliseum Building, and furnish it to the association free of cost and without conditions.

The secretary announced that a letter had been received from a private party in New York proposing to hold the convention ex-

hibit at the Grand Central Palace, under certain conditions in regard to charges for space.

In the afternoon the committee inspected the Grand Union Hotel and a number of buildings which had been suggested as being suitable for exhibit halls, and on again meeting decided to have the convention at the Grand Union Hotel on the dates already an-



VIEW ON PIAZZAS.

nounced. The hotel building is around three sides of a court, and on two sides and part of the third facing the court are 14-ft. piazzas where the smaller exhibits could be located, there being perhaps 8,000 sq. ft. of piazza space available for this purpose. Larger exhibits can be placed in the court, it being the intention of the hotel to provide a suitable protection for the exhibits in the court.

The ballroom of the hotel which is large enough to seat 600 persons will serve for the meetings of the A. S. R. A., and two smaller halls seating 60 to 90 people are available for the Accountants' Association and the Mechanical and Electrical Association.

A local committee on exhibits has been appointed and applications for exhibit space should be addressed to Mr. Frank M. Cozzens, Saratoga Springs, N. Y. The charge for exhibit space will be 10 cents per sq. ft. as heretofore. Secretary Penington will make further announcements as to the details as arrangements are perfected. No rooms will be assigned at the hotel prior to April 15th, but assignments will be made in the order that applications are received.

The other principal hotels in Saratoga are the United States, the Americanadelpia, Congress Hall, the Worden and the Kensington.



COURT YARD OF GRAND UNION.

The entertainments will be arranged by Mr. A. B. Colvin, president of the Hudson Valley Railway Co., and Mr. C. B. Thomas, of the local committee, and it is understood that the program will include a trip to the plant of the General Electric Co. at Schenectady, to the water power plant at Mechanicsville and an excursion over the Hudson Valley road. The banquet will be held the even-

ing on Friday, September 4th. The association will probably hold only one business session each day, the afternoons being set apart for excursions and the inspection of exhibits.

A very pleasant feature of the committee's visit to Saratoga was the dinner given on the evening of February 23d by representatives of Saratoga. The party was taken in sleighs to the Arrowhead Hotel on Lake Saratoga, which is about four miles from the center of the village. Besides the executive committee there were present: A. P. Knapp, C. B. Thomas, C. A. Douglass, H. L. Waterbury, Dr. B. M. Varney and Capt. J. K. Walbridge, of Saratoga; H. W. Blake, of New York, and Daniel Royse, of the "Street Railway Review," Chicago.

The Street Railway Accountants' Association will hold its seventh annual meeting on the same dates as the A. S. R. A., and it is provided in the by-laws of the recently organized American Railway Mechanical and Electrical Association that it shall convene the day before the A. S. R. A. meeting. Announcements regarding the details of these meetings have not been made as yet.

THE MULTIPLE SYSTEM OF STREET CAR WIRING.

Without referring particularly to trolley cars, the fathers of our country dispensed good sound doctrine when they declared that "mankind are disposed to suffer, while evils are sufferable, rather than to right themselves by abolishing the forms to which they are accustomed."

This fact still holds good, and is applicable to series street car lighting—as well as to matters of government.

When 500 volts was adopted for street car work, it was taken for granted that operating five 100 volt lamps in series was the proper method of lighting the car, and this was correct so long as five 16-c. p. lamps and an oil headlight provided ample illumination for the car; but as time ran on, the conditions changed.

Single trucks gave way to double trucks; 16-ft. car bodies were increased to over 40 ft.; oil headlights were superseded by electric arc or incandescent lights, and several circuits of five lamps each were found necessary to properly light the interior of the car.

It was still stoutly maintained that cars must be wired in multiples of five, viz., in several circuits of five lights in each circuit.

The disadvantages of series lighting have long been apparent, and it is to be hoped, for the convenience of the operating department, that steps will soon be taken to adopt a better and more up-to-date system of wiring, especially when the process is so simple.

Below is given a diagram of the wiring adopted by the Los An-

gence shown on the diagram is to take the place of the headlight, so that the headlight can be cut out at the end of the trip and have the lights inside the car continue to burn.

In order to give a better distribution of light, 3-light clusters are used in preference to 6-light, and ordinarily twenty-two 16-c. p. lights are burned (with one extra 16-c. p. light available on the front platform) and four 8-c. p. lights in the illuminated signs, making the equivalent of twenty-four 16-c. p. lights in series with an arc headlight of 3.5 ampere capacity.

Under the old system of series lighting, including a headlight re-

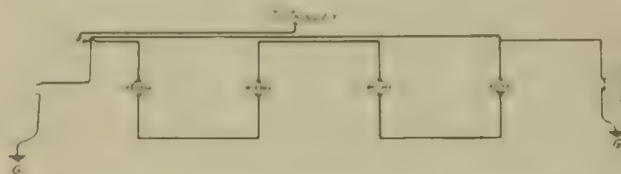


FIG. 2 SIMPLIFIED DIAGRAM OF CAR WIRING.

sistance, 6.5 amperes would be required for the same illumination obtained under this system with 3.5 amperes.

The advantage of cutting the cost of car lighting in half is a matter worth considering; besides this system is more flexible and the extinguishment of one light has no effect on the others. The faulty globe can be readily located and replaced, or if not renewed at once it does not matter, as only one light is out instead of five.

Another innovation adopted on the cars of this company is the method of running the lighting wires in conduits, so they can be readily removed and others drawn in, without disturbing the headlighting or other woodwork of the car.

L. B. PEMBERTON.

Electrical Engineer Los Angeles & Redondo Ry.

INCREASE IN NEW YORK "L" TRAFFIC.

The Manhattan Railway Co., of New York City, carried 2,500,000 more passengers in January of this year than in January, 1902, an increase of over 90,000 each business day, or of 1,300 car loads a day. To meet this immense increase the carrying capacity of the road was augmented by 2,500 cars a day and the total number of round trips made during the month, taking the single car as the unit, was increased 68,018 in January, 1903, over January, 1902. To operate the additional cars 461 extra guards were employed, and at

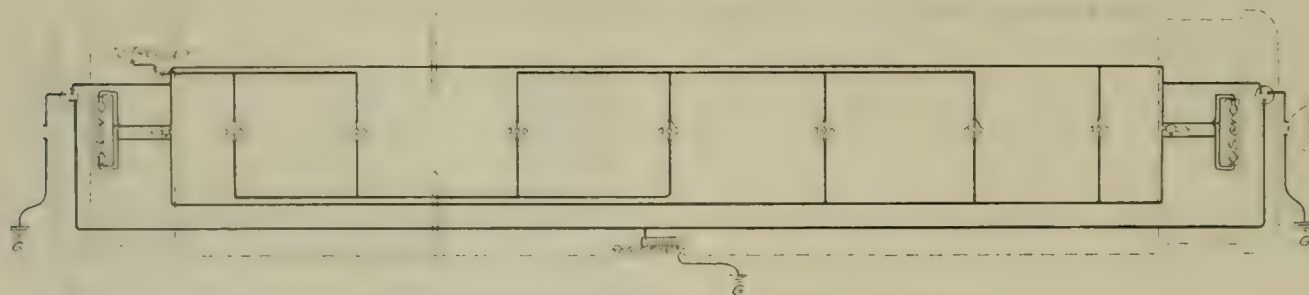


FIG. 1 DIAGRAM OF CAR WIRING, LOS ANGELES & REDONDO RY.

geles & Redondo Railway Co. on its interurban cars. These cars are 40 ft. long, vestibuled and built in three styles, viz., open at both ends; open at one end, and entirely closed. To meet these varied conditions the following lighting equipment was selected:

Seven 3-light clusters with 16-in. porcelain reflectors; one key socket in each vestibule; two revolvable illuminated signs with two 8-c. p. lamps in each sign, and an arc headlight.

By means of the key sockets, the motorman can have the front vestibule light or dark, to suit his convenience and without affecting the other lights in the car.

Fig. 2 shows the general plan of the wiring in a simpler form. Four groups, of six lights each connected in multiple, are run in series with the headlight, thus dispensing with the wasteful resistance commonly used in connection with the headlight. The resist-

least 300 more will be required when the new cars that have been ordered are placed in operation. Twenty of the first hundred cars ordered have been delivered.

Judge Cochran, of the United States Circuit Court, sitting at Detroit, has dismissed the bill of complaint of Benson Bidwell against the Consolidated Street Railway Co., of Grand Rapids, of which the Grand Rapids Railway Co. is the successor. This was one of a large number of suits commenced by Mr. Bidwell against street railway and electrical construction companies all over the country. Mr. Bidwell claims to have the original patents for the transmission of electrical energy by trolley and for lighting street cars from the same current. The case passed upon was pending more than a year.

Track Construction of the International Railway Co. in Buffalo, N. Y.—1.

BY T. W. WILSON.*

The International Railway Co. to-day has perhaps as large a percentage of good track as any system in America, comprising as it does, 105½ miles of electrically welded track out of a total of 200 miles within the city limits of Buffalo. A study of the following rail table is interesting in this connection:

Track owned and controlled by International Ry:

| | |
|-------------------------------|------------------------|
| 9-in. Girder..... | 120 miles single track |
| 7-in. "..... | 37 " " " |
| 6½-in. "..... | 45 " " " |
| 6-in. "..... | 34 " " " |
| 4½-in. "..... | 8 " " " |
| 5 3-16-in. A. S. C. E. T..... | .36 " " " |
| 6-in. Shanghai T..... | 0.34 " " " |
| 4½-in. T..... | 53.8 " " " |
| 3½-in. T..... | 19. " " " |
| "Richards" rail..... | 1.81 " " " |

Total, 354.95 miles of single track.

Geographically, the 9-in., 6½-in. and 6-in. girder is confined almost entirely to Buffalo, the 7-in. girder to the Niagara Falls sub-

electrically welded during the last three years, and all of the Buffalo & Lockport and Lockport & Olcott main line have been relaid with 85-lb. T-rails of the A. S. C. E. standard section in 60-ft. lengths. Of the 72 miles of concrete track, 45 miles were built from 1899 to 1903, inclusive, under the direct supervision of the writer, 17 miles in 1897 by the Traction company (then under a different management), and 12 miles previous to 1898. The 16 miles of 6½-in. concrete track were also built during the period from 1899 to 1903 and under the same supervision.

The city of Buffalo is unique in the fact that it has more asphalt paving than any other city in the world, not excepting Washington, London or Paris. It is this fact that rendered the use of a permanent roadbed of concrete advisable and introduced such an element of uncertainty into the life of an old track which is tamped with sand and paved with asphalt up to the rail as made it difficult in the past to foresee reconstruction and provide for it. We have been obliged to relay a number of streets in which the rails and joints were in a very good shape, simply because the asphalt paving had broken away from the rail and rutted out badly, caused by the



FIG. 1. WELDING EQUIPMENT OF LORAIN STEEL CO.

urban and Lockport, the 4½-in. girder to the city of Niagara Falls and the different sizes of T-rail to the suburban lines.

About 72 miles of the 9-in. girder and 16 miles of the 6-in. girder are laid on concrete both of the "beam" and "solid type" (see Figs. 2 to 7). About 106½ miles of track (30,260 joints) have been

*Chief Engineer International Railway Co., associate member American Society of Civil Engineers, member American Railway Engineering and Maintenance of Way Association, member Engineering Society of Western New York.

resiliency of the roadbed. Nearly all track of this character has been relaid, however, in the last three years, eliminating a great source of expense in the maintenance of track and roadway.

Of late years a pavement of No. 1 Medina sandstone, with the joints filled with portland cement grout, has been gradually substituted for asphalt, and in this we have been greatly assisted by the approval of the city authorities, who have come to know by heart the street railway axiom that asphalt will not stand against a steel

and subject to excessive vibration. With these conditions of paving to contend with, the company has adopted the following standards:

Rail.

The rail used is a 9-in. girder semi-grooved type, rolled by the Lorain Steel Co., and known as its section 94-313 (see Fig. 6). Observe that the base is 6 in. wide, making a magnificent support when superimposed upon beam concrete and lessening the tendency of wide gage due to tipping. Too little attention is paid to this point by street railway engineers. When a track is new and all its fittings in first-class shape the width of base does not matter so much, but

measurement showed that this rail had worn down $\frac{1}{2}$ in. in four years or 1-32 in. in one year (Fig. 6). As the deepest flange operating over this track is $\frac{3}{4}$ in., this would indicate the life to be about 16 years. It is probable that this rate of wear will not be maintained, however, and the life of the track will be somewhat longer than 16 years, the Pan-American travel being heavier than anything we are liable to have for some years. Of course the track of similar construction in the outlying parts of the city not subjected to such frequent service (2 minutes regular) will have a much longer life. In this connection it will appear strange to the old trackman to speak of the life of a track being dependent upon

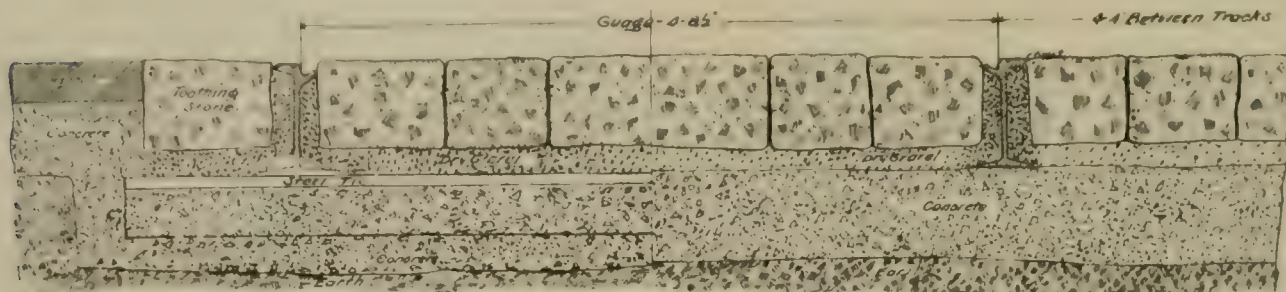


FIG. 2 CROSS SECTION OF 9-IN. TRACK IN ASPHALT STREET, BLOCK PAVING IN TRACK AND DEVIL STRIP.

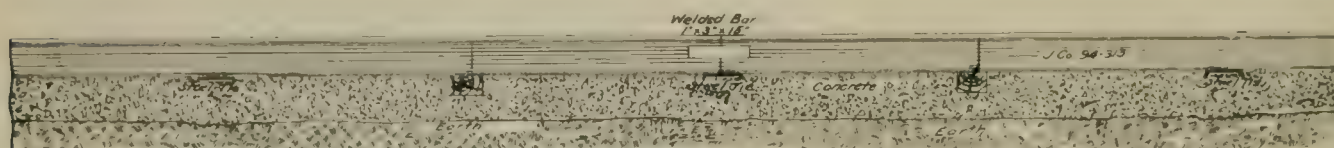


FIG. 3 LONGITUDINAL SECTION BEFORE PAVING.

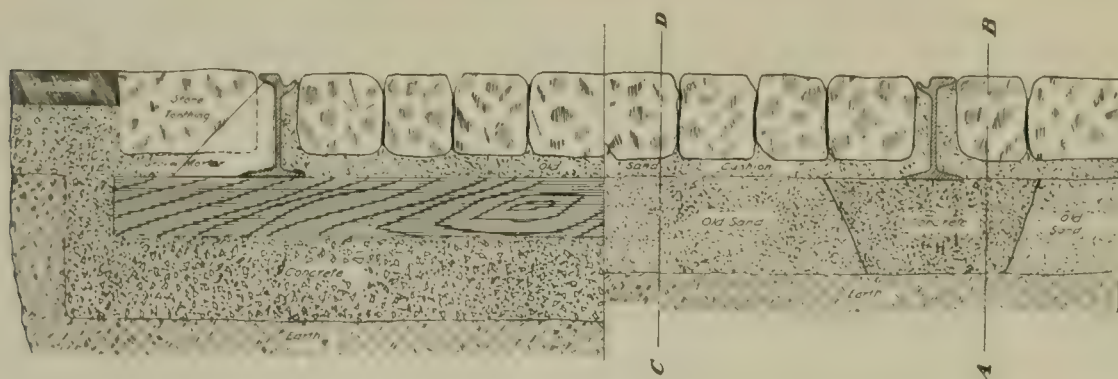


FIG. 4 CROSS SECTION OF 9-IN. TRACK, BEAM CONSTRUCTION, STONE PAVING.



SECTION THROUGH A B. FIG. 5 SECTION THROUGH C D.

after 8 or 10 years of continuous service, when the ties are rotting and the pavement has become loose, the 6-in. base, assisted by a tie plate which fits snug under the head, does its work well.

The depth of throat, $1\frac{1}{4}$ in., is another and the greatest point in favor of this rail section. With a concrete base the wear upon the head of the rail is no doubt greater than with a flexible roadbed, so that every 1-32 of an inch gained in depth means a year, more or less, in the life of the rail, depending of course upon conditions of operations and depth of wheel flange. Within a month a section of rail has been taken from a concrete track in Main St., Buffalo, which was laid in 1899, over which there was an average of one-half minute service during the Pan-American Exposition. A careful

the wear of the head instead of upon the joint, as the life of the greater portion of track in the past has been determined by poor joints rather than by wear upon the head.

This is one of the wonderful results which the electrically welded joint has achieved. To be paradoxical, after the joint is welded, it ceases to be a joint, and we forget it is there.

Finally, the semi-grooved portion of the section lends itself very nicely to the vehicular travel and besides is self-cleaning, the flange of the wheel crowding out the dirt over the lip of rail. The groove may be termed a compromise between the narrow 1-in. wide full grooved section used in Washington and the Crimmons or Trilby type used in New York city. The Washington rail is the least de-

sirable which could be installed from a car operation standpoint, while on the other hand, it is the best for vehicles. The Trilby rail is good from both the railroad and city standpoint, but is heavy and expensive. Probably the best rail rolled to-day is Lorain Co. Sec. 137-371.

Ties.

During the large amount of construction carried on in 1899 very careful inspection was made of the old ties taken out. These were of all kinds of wood from hemlock to yellow pine and oak. It was found that the yellow pine ties, in nearly all cases, were in

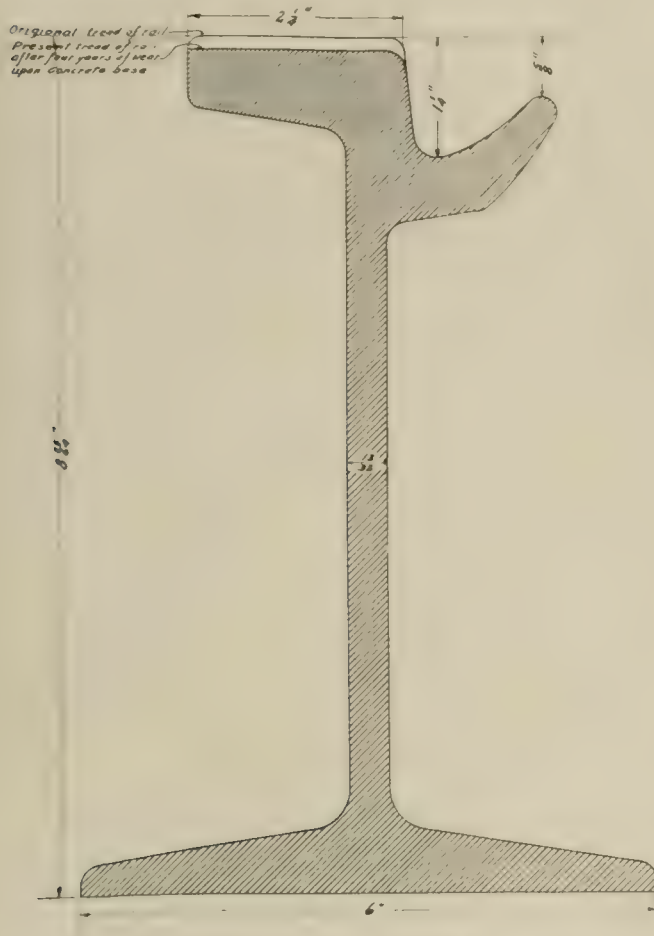


FIG. 6 JOHNSON RAIL, SECTION 94-313.

very good condition, even better than the white cedar. A long leaf southern pine 5 x 7 in. 7 ft. long has therefore been adopted for use between the steel ties which are spaced at 10 ft. The latter are of a channel section 6 ft. long, and are secured to the rail by brackets which come well up under the head of the rail.

Joints.

The electrically welded joint was adopted as a standard in 1899 and since that time, 30,216 joints (representing 106 1/2 miles of track) have been welded. Numerous descriptions of the process

have been published, so all that is necessary here is to give a statement of results obtained and the number and cause of breakages. In this connection the question is still asked as to "what we do



FIG. 7 TOOTHED ASPHALT LAID IN 1899.

with expansion." Probably the best answer is that we "forget it" the same as we do the joint after it is welded.

Scientifically it may be said that the rail is held in every infinitesimal part of its length by the concrete base, which covers about one inch of the base of the rail, and by the paving, and the track cannot



FIG. 8 NO. 1 BLOCK STONE LAID IN 1899.

expand or contract. The force is taken up in internal strain in the metal of the rail. When this strain becomes greater than the ultimate tensile strength, the rail breaks.

A tabulated statement follows which explains itself:

| KIND OF RAIL. | FIRST YEAR. | | SECOND YEAR. | | | | THIRD YEAR. | | |
|-----------------------|------------------|---------|--------------|-----------|-------------------|---------|------------------|----|-----|
| | Joints welded in | | No. | | Joints welded in | | No. | | No. |
| | 1899 | Broken. | 1900 | 1899-1900 | | Broken. | Joints welded in | | |
| | | | | 1901 | 1899-1900 1901 | | Broken. | | |
| Old, 6 in. | 4787 | 18 | 11973 | 16760 | 127 | 482 | 17242 | 8 | |
| Old, 7 in. | 8 | 0 | 566 | 874 | 7 | 0 | 874 | 1 | |
| Old, J. Co., 9 in. | 2658 | 49 | 1894 | 4552 | 25 | 356 | 4908 | 7 | |
| Old, P. S. Co., 9 in. | 74 | 3 | 146 | 220 | 6 | 0 | 220 | 1 | |
| New, 6 in. | 0 | 0 | 619 | 619 | 2 | 0 | 619 | 0 | |
| New, 9 in. | 3822 | 45 | 2234 | 6056 | 16 | 597 | 6053 | 3 | |
| Totals | 11349 | 115 | 17432 | 28781 | 183 | 1435 | 30216 | 20 | |

Of the 183 broken joints, winter of 1900-01, 23 were on welding done in 1899 and 160 were on welding done in 1900 (17,432 joints were welded in 1900).

The joints which broke have all been carefully inspected and in no case did the break occur through the weld, nor did the weld pull off. The break almost invariably occurred at the end of a welding bar, the rail breaking usually through old bolt or bond holes beyond the bar.

By welding with bars long enough to cover and reach over all such holes, this source of breakage has been eliminated since 1900. The 49 breaks in 1899 and the 25 in 1900 in old Johnson Co. 9-in. as shown above, were directly due to this cause. The large number of breaks in 1900 in Old 6-in. (127) we could only account for by



FIG. 9—6-IN. TRACK RELAID, CONCRETE BEAM CONSTRUCTION.

attributing them to some quality in the chemical composition of the rail which did not lend itself readily to the weld. They nearly all occurred in the same street, viz; East Ferry St., and this would seem to help that hypothesis.

Referring again to the table, we note 183 broken joints at the end of 1901 winter. These were all rewelded in the summer of 1901, so that to-day the number of broken joints is 20. These have been cut out and a piece of rail 10 ft. long inserted, full bolted and bonded. Next summer these plates will be taken off and the rails rewelded.

(To be continued.)

PENNSYLVANIA STATE REPORT.

The annual report of the Pennsylvania Bureau of Railways, for the year ending June 30, 1902, covers the reports of operation and financial condition of 97 street railway corporations operating street railways, and 96 street railway corporations whose lines are operated by other street railway corporations; also reports from 445 street railway corporations whose lines have not yet been constructed.

The cost of road for the operating street railway companies is given as \$61,647,864; the cost of equipment, \$12,015,828; stocks owned, \$21,932,440; bonds owned, \$433,932; cash and current assets, \$13,160,552; other assets, \$7,013,805, or a total cost of road and equipment amounting to \$116,204,481.

The gross earnings from operations for the year covered by the report were \$29,001,741. The companies having over a million dollars income from operation were the Consolidated Traction Co., Pittsburgh, \$1,614,102; Pittsburgh Railways Co., \$3,711,003; United Traction Co., of Philadelphia, \$14,006,915, and the United Traction Co., of Pittsburgh, \$1,065,122. Since the first of January, 1902, the Consolidated Traction Co. has been operated by the Pittsburgh Railways Co., and, therefore, the receipts attributed to it are for a fraction of the year only, and the receipts of the Pittsburgh Railways Co. are for the six months ending June 30, 1902; also, the amount credited to the United Traction Co., of Pittsburgh, represents the receipts prior to the operation of this road by the Pittsburgh Railways Co. In addition to the income from operation, the receipts from

other sources amounted to \$1,105,693, making a grand total of \$30,107,434.

The entire length of street railways in the state, as disclosed by the report, is 2,175.47 miles; the total length of all tracks operated, including sidings, etc., 2,464.60 miles. The companies operating the larger systems were: Conestoga-Traction Co., 83.66 miles; Lehigh Valley Traction Co., 130.26 miles; Pittsburgh Railways Co., 318.18 miles; Scranton Railway Co., 76.69 miles; United Traction Co., of Philadelphia, 334.77 miles; United Traction Co., of Reading, 58.21 miles; Wilkes Barre & Wyoming Valley Traction Co., 51.21 miles; Harrisburg Traction Co., 43 miles.

The total number of cars in use was 7,017, of which the Pittsburgh Railways Co. had 1,541 and the United Traction Co., of Philadelphia, 3,205.

The number of employes of operating companies was 17,788, and the compensation paid them amounted to \$10,394,401, or \$584 per capita. The United Traction Co., of Philadelphia, alone paid \$4,466,848 in wages. The number of employes the year previous was 15,828, and the total compensation paid, \$8,745,024.

The number of passengers carried during the year covered by the report was 640,076,370, as against 580,654,629 the preceding year. The number of passengers killed by accident was 34; the year before, 33. The number of passengers injured, 1,466; the year before, 1,050.

Among street railway employes 11 were killed during the year covered by the report and 234 injured; the year before 14 were killed and 129 injured.

From the reports of the 96 street railway corporations whose lines are leased and controlled by other corporations it appears that they have an aggregate capital stock outstanding of \$119,801,319, and funded and unfunded indebtedness amounting to \$62,921,719. The cost of road and equipment, which is reported exclusive of the amount reported as cost of road and equipment of lessee company and other assets, amounts to \$189,306,806. The income of these subsidiary companies consists mainly of rentals from the lessee companies and is reported at \$7,555,102. The amount of dividends paid by these companies is reported as \$4,893,020. Other disbursements than dividends amount to \$2,611,066. The amount paid as dividends by the operating companies was \$1,086,440.

AN OHIO CONSOLIDATION.

Feb. 14, 1903, the Cleveland, Elyria & Western Railway Co., which operates 90 miles of road, and the Cleveland & Southern Railroad Co. with 40 miles of track, were consolidated under the name of the Cleveland & Southwestern Traction Co. These lines comprise a road connecting Cleveland with Elyria, Oberlin and Norwalk with extensions north from Elyria to Lorain and North Amherst, and south from Elyria to Grafton and from Oberlin to Wellington. Also a line from Cleveland to Berea, Medina and Wooster. The officers of the Cleveland & Southwestern Traction Co. are: President, A. E. Akins; first-vice-president, A. H. Pomeroy; second vice-president, S. C. Smith; secretary, E. F. Schneider; treasurer and general manager, F. T. Pomeroy; general passenger agent, J. O. Wilson; general superintendent, W. J. Hillier; assistant superintendent, E. W. Coe; consulting engineer, W. H. Abbott; chief electrical engineer, A. G. Hindert; chief mechanical engineer, A. McManerry; master mechanic, M. D. Patingale.

Other Mandlebaum-Pomeroy interests comprise the Ohio Central Traction Co. with a line between Mansfield and Bucyrus via Galion and Crestline; the Western Ohio now operating between Lima and St. Mary's and building from Lima to Findlay and south to Piqua; and the Cincinnati, Dayton & Toledo, in operation between Cincinnati and Dayton. The Widener-Elkins syndicate is financially interested in the Cincinnati, Dayton & Toledo company.

There are various rumors in circulation as to the plans for closing the gaps between Findlay and Toledo and between Dayton and Piqua.

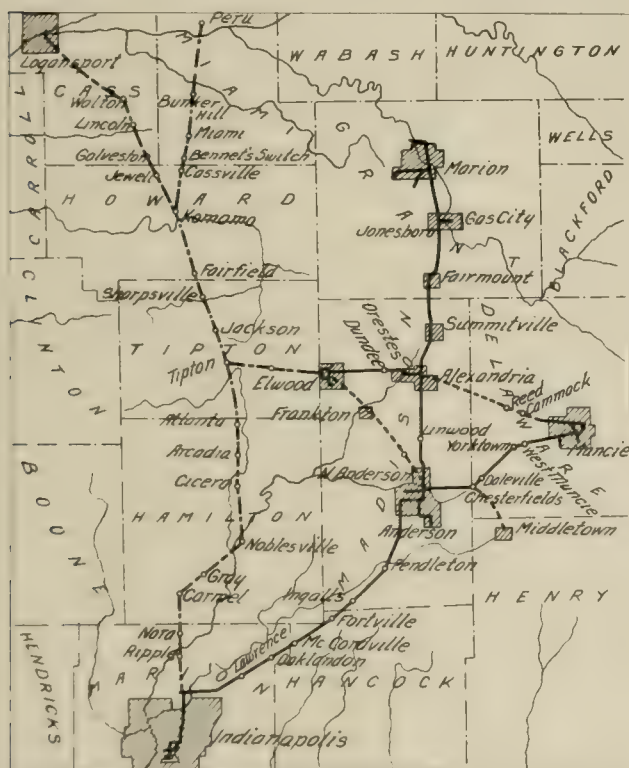
The Toledo (O.) Railway & Light Co. recently contracted with the G. C. Kuhlman Co. of Cleveland, for 30 new double-truck cars, and with the J. G. Brill Co., of Philadelphia, for 10 double-truck cars and 40 sets of trucks. The General Electric Co. will supply the motors.

INTERURBAN EXTENSIONS IN NORTHERN INDIANA.

One of the most important electric interurban projects now under construction is that of the Indianapolis Northern Traction Co., whose route is shown on the accompanying map. The new line starts from the northern boundary of Indianapolis, where it forms a junction with the Union Traction Co. of Indiana, and runs in a general northerly direction, passing through Carmel, Noblesville, Tipton, Kokomo and a number of intermediate towns. At Kokomo the line branches, one line running nearly due north to Peru and the other branch running northwest to Logansport. A short branch also runs from Tipton to Elwood, making connection with the lines of the Union Traction Co. of Indiana at the latter city.

The new system is nearly all graded and the rails, poles and ties have been delivered for the section between Indianapolis and Tipton. The rest of the construction material is being delivered over the remainder of the route and all machinery and other supplies have been ordered for early spring delivery.

The Indianapolis Northern Traction Co. is being built by the same interests which own the Union Traction Co. of Indiana, and



SYSTEMS OF THE UNION TRACTION CO. OF INDIANA AND THE INDIANAPOLIS NORTHERN TRACTION CO.

Union Traction Co. of Indiana
 Union Traction Co. of Indiana Extensions
 Indianapolis Northern Traction Co. — — —

the new road will be leased and operated by the latter company. Its power house will be located at Anderson, and will comprise practically an extension of the present plant of the Union Traction Co. The construction of the addition to this plant is now under way, and the new road will be operated by means of a 30,000-volt current, which is the highest voltage thus far attempted for electric railway transmission. The roadbed of the Indianapolis Northern is being constructed in the most substantial manner and all sharp curves and grades of over 1½ per cent have been avoided, this construction being adopted with a view to high speed service.

The Union Traction Co. of Indiana is also building several additions to this net work of tracks which practically covers the northern section of the state of Indiana. One of these extensions is from Alexandria to Muncie, another is from Elwood, passing through Fullerton to Anderson, and the third extends from Chesterfields to Middletown. All of these extensions are expected to be in operation during the coming summer. The company is also

building extensive new repair shops adjacent to the power house at Anderson in which all repairs of the interurban systems as well as those of the local systems owned by the Union Traction Co. will be made. Work on the new shops was recently commenced.

In addition to its regular schedule this company has recently added four limited trains to its service on which an extra rate of fare is charged. These trains start from Muncie at 8:00 and 11:00 a. m. and at 2:00 and 5:00 p. m., running through to Indianapolis in two hours and making but one stop, which is at Anderson. Limited trains also leave Indianapolis at the same hours, stopping only at Anderson and Muncie. The cars used on the limited service are handsomely decorated and upholstered and are provided with smoking compartments furnished with easy chairs. The limited cars have proved very popular and have been well patronized notwithstanding the increased rate of fare charged.

EXTENSION OF NEW YORK TRANSIT FACILITIES.

The plans submitted to the Rapid Transit Commission by its chief engineer, Mr. William Barclay Parsons, for increased transportation facilities in New York City call for an additional outlay of about \$50,000,000. His proposed changes are in brief as follows: A new subway from the Battery to 42d St. by way of Church and Wooster Sts., University Place and Broadway; an east-side subway from 40th St. and Park Ave. to Mott Haven, by way of Lexington Ave., parallel to the New York Central & Hudson River R. R.; a branch line from Lexington Ave. to Lenox Ave., under 110th St.; an elevated extension on the Southern Boulevard in the Bronx, running toward Westchester; a triangular branch of the Manhattan Railway Co. from Ninth Ave. through 53d St., 10th and Amsterdam Aves. to 72d St.; two additional tracks on the Second Ave. elevated to be carried over the Chatham Square junction and over the Park Row line to City Hall; connections between the elevated and subway at 149th St. and Third Ave. and at various other points; a third track for express trains on the Sixth Ave. elevated line; a third track on the Eighth Ave. elevated road from 116th St. to 125th St.; a branch elevated road from Second Ave. to the new Blackwell's Island bridge; periodic junctions between the tracks of the New York Central and the subway and elevated systems, and removal of the New York Central's surface tracks on the west side below 50th St. to an elevated structure.

THROUGH SYSTEM FROM CINCINNATI TO TOLEDO.

Mr. H. C. Lang, of Cleveland, O., secretary of the Cincinnati, Dayton & Toledo Traction Co., and a leading factor in the Mandelbaum-Pomeroy Traction Syndicate, states that it is not improbable that the plans for a continuous electric system from Cincinnati to Toledo will be consummated by Jan. 1, 1904. The Cincinnati, Dayton & Toledo line now extends from Cincinnati to Dayton. Between Dayton and Piqua, O., are two separate through lines. With both of these lines the syndicate is on friendly terms and either will probably be willing to co-operate with it. Between Piqua and Lima the Western Ohio Traction Co., one of the syndicate's properties, has completed a line from Piqua to Sidney and by May 1st will be in operation to Lima, thus completing a continuous system to within 70 miles from Toledo. The Western Ohio Traction Co. has projected a road from Lima to Findlay and some work has been done upon it. The Lima-Findlay branch can be completed by this year. At Findlay the road would be met by the Toledo, Bowling Green & Southern Traction Co., now operating, or, if it seems preferable, it will be possible to reach Toledo from Findlay by way of the Toledo, Fostoria & Findlay Traction Co., which has a line in operation between Findlay and Fostoria and proposes to push construction on its line from Fostoria to Toledo this season. No overtures have been made by the syndicate in this connection as yet.

The Louisville, Anchorage & Pewee Valley Electric Railroad Co., Louisville, Ky., is building some very attractive stations along its interurban line. One at Beard was opened on March 4th. Construction of another at Pewee Valley will be begun shortly.



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NO. 3

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CHICAGO FRANCHISES.

The Chicago franchise question is in the state that was, all negotiations having been suspended on February 16, with no prospect of resuming conferences between the council committee and the street railway companies until after the municipal election which is to be held April 7. The indications are that the traction question will be made the principal issue in the coming campaign, a thing much to be deplored since any agreement with the street railways must be on a business and not a political basis.

In effect the suggestion of the street railways offered at the last conference was to make an arrangement similar to that agreed upon in 1883, that is, fix the terms for a 10 or 20-year extension without prejudice to existing rights under the 99-year act. The companies desire that the valuation of their rights under the 99-year act should be deferred until the validity of that law, which is questioned by the city, shall be determined in court. After such an adjudication the companies would be willing to dispose of all their rights to the city at the end of such extended term as might be agreed upon.

The position of the council committee on transportation has been that a waiver of the companies' as yet undetermined rights should be made as part of the compensation to be given for a short extension of all franchises. It is obviously not practicable for the railways to consider such a proposition.

REPORTING POWER HOUSE DATA.

Intelligent comparison of two or more matters, however similar in general nature, yet involving numerous varying factors, can be made only by reduction to a common basis or by reference to an accepted unit of measurement, and the universality of this fact has resulted in the establishment of many standards, more or less properly suited to the purposes for which they have been devised and adopted. When such bases of reference are once established by competent authority, recognized by good practice and understood by all concerned, it would seem unnecessary to urge their use in all measurements where exactness and, more especially, general availability are concerned. While a notched rod or a knotted cord may serve with ample certainty in the purchase of a pane of window glass, these methods of measurement could hardly be regarded as of material value in direct computations of relative sizes or of total extents for two or more transactions. The dollar and the ton are recognized standard units of value and weight for the measurement of fuel, yet costs of power generation, so readily expressed in terms of fuel-consumption per unit of time or output, and so definite in meaning to the operator of an individual plant under given conditions, are frequently, if not usually, of little value for purposes of general comparison of the performances of plants using different fuels, varying each from the other in cost per ton and in effective value for steam production. On the contrary, the evaporation of a pound of water into steam under given conditions of temperature and pressure involves the effective expenditure of a definite amount of heat, and naturally constitutes a proper basis of reference for computations. The production of steam is the specific duty of the boiler plant, and its cost should be found and used in all investigations of the expense and efficiency of steam power installations, regardless of the use to which the steam is put after leaving the boilers.

In this connection we would direct attention to the letter, elsewhere in this number, from Mr. Jos. E. Lockwood, of Detroit, Mich. Mr. Lockwood refers to the inconvenience experienced in recent endeavors to arrive at intelligible results by comparison of data derived from tests conducted at various power generating stations, and deploring the fact that the cost of evaporation had not been derived and stated independently of the ultimate station output. From the information available when such tests are worked up, the cost of evaporation is readily obtainable and may be stated in any of three different ways, equal in accuracy and varying only in convenience of subsequent use: (a) cost per pound of water evaporated under the conditions of feed water temperature and steam pressure (and temperature also, where superheating is used) under which the boilers are operated; (b) cost per pound of equivalent evaporation from and at 212° F.; and (c) cost per standard boiler horse power, the evaporation of 30 lbs. of water per hour from feed water at 100° F. into steam at 70-lb. gage pressure, or the equivalent evaporation of 34½ lbs. of water per hour from and at 212° F.

The use of either of these three in statements of power-plant op-

erating expenses will afford an entirely definite basis for comparison of results and economy attained, not only at a given station under various conditions, but also at different plants among which costs and qualities of fuel may vary widely and where tests are made and reported by different men. Having this convenient and definite standard of reference for boiler practice, its use in all cases should require no recommendation at our hands. Since, however, power costs are, in many reports of tests, stated in terms of the consumption of fuel of a stated quality and price, making them utterly unavailable for purposes of general comparative usefulness, we would urge that, in addition to these statements, the rate and cost of evaporation be calculated and included in the reported data.

THE 1903 CONVENTION.

It has been determined that the conventions of the American Street Railway Association and the two allied organizations—the Street Railway Accountants' Association and the American Railway Mechanical and Electrical Association—shall be held this year at Saratoga, N. Y. Although Saratoga has for years been a popular convention city, its choice for the meeting place of the street railway associations is a radical departure from established precedent, our conventions heretofore having been held only in the larger cities, the proximity of Niagara Falls to Buffalo making the 1897 convention scarcely an exception.

The meeting place of the A. S. R. A. has heretofore been determined largely by the fact that certain of the members of the association wished to act as host. The growing need for hotel accommodations and a larger exhibit hall, as well as the cost to the local street railways for entertainment (which in recent years has amounted to between \$10,000 and \$15,000), have resulted however in very much limiting the choice of cities. It was apparent at Detroit in 1902 that future meetings would have to be arranged on a slightly different basis and the action of the A. S. R. A. executive committee in selecting Saratoga was taken after giving consideration to the various points involved. There is no question as to the sufficiency of the hotel accommodations, which are no doubt greater than in any of the larger cities, and the matter of arranging attractive excursions and other entertainments is in capable hands. The one question considered doubtful by the committee was whether a suitable exhibit hall was available; and after careful inspection of the headquarters hotel and the undertaking of the management to erect over a portion of the court a roof covering the area needed for the more bulky exhibits, this was decided in the affirmative. The advantage of having the exhibits at the hotel itself is apparent and is doubtless the reason for not setting apart a day for the inspection of exhibits as has been done for several years past.

The date chosen, which is about five weeks earlier than usual, was arranged with the view of securing the best hotel accommodations, and with the idea that the weather is more likely to be pleasant in September than in October. The "season," including the races, is over at Saratoga on August 31st, but all the hotels postpone closing until after the annual flower festival, which is held the week of Labor Day. Labor Day this year is September 7th, and the choice of the convention date for the week intervening between the racing season and the flower festival is a happy one—the hotels will not be crowded, neither will any of them have closed.

THE NEW ASSOCIATION.

The organization at Cleveland last month of the American Railway Mechanical and Electrical Association is the second step by electric railway men towards the development of a family of electric railway associations, and will result, we believe, in a marked change in the scope and character of the work of the American Street Railway Association. We predict for the A. R. M. & E. A. a growth fully as rapid and a success quite as marked as have attended the Accountants' Association. The development of the new organization will result in the relegation to it of all questions pertaining to power plants, shops and rolling stock, just as accounting subjects are now considered entirely by the Accountants' Association instead of by the A. S. R. A.

There is a wide field that can be properly covered by the mechanics and engineers, among the most important being, track and rolling stock standards, shop design and methods, interchange rules for adoption where cars are operated over the tracks of different com-

panies, and the investigation of the merits of various types of power house equipment and of systems of current distribution. But in connection with this work there is also opportunity for co-operation on the part of the A. S. R. A. which could as an association exert its influence for the adoption by its members of the recommendations of the "specialists," so to speak. The point we wish to make is that the association as a body could properly act to promote the general use of standards adopted by the Accountants' and the Mechanical and Electrical associations, where now such recognition by companies is secured through the personal arguments presented by the individual accountant, master mechanic, or engineer, to the general manager of his company.

If development proceeds along these lines, the A. S. R. A. will become more strictly a managers' association for the discussion of the broader problems of operation, and simultaneously we should have organizations of the men in other departments of the roads as for instance the claim department, the maintenance of way department, etc.

If the A. R. M. & E. A. were in need of encouragement, which we do not for an instant intimate, it need only refer to the work of the Accountants' Association, which has had its work officially approved by the association of state railroad commissioners, adopted as standard by several state commissions, and used by the United States Census Bureau in collecting and recording street railway statistics.

ELECTRIC RAILWAY CONSTRUCTION IN 1903.

At this season active preparations for carrying out the railway construction to be done during the year are well under way. The operating companies have made their decisions in regard to extensions of lines and the purchase of new equipment, and those engaged in new enterprises have completed their plans for the summer and fall work in the field. For this issue we have collected authentic reports covering the new construction, track rebuilding, proposed additions to power plants, shops and car houses, and new machinery and rolling stock, the information being furnished by railway officials during the current month. It is very gratifying to find that so many railways now in operation have decided to carry out extensions of their lines and other improvements of various kinds, and when the work already under contract for completing lines begun in 1902, and the newly organized enterprises that have made arrangements for construction, are taken into consideration there is apparently no doubt but 1903 will be the banner year for electric railways.

In the "Review" for January last, page 42, was published a summary of the progress made in completing those roads that last year were reported as under construction, and in this number, besides the confirmed reports already mentioned, we have added a list of the corporations organized within the last eight or nine months for the purpose of building electric railways. It can not be hoped that all of these latter will progress as far as track building this year, but the surprising number of new companies is an excellent index of the activity in the electric railway field, and taken in connection with the work in sight, indicates that no backward tendency is to be apprehended in the immediate future.

ELECTRIC CANAL PROPULSION.

A number of attempts have been made upon various canals to substitute mechanical for animal power for the propulsion of boats, but the most ambitious attempt in this direction is that of the Miami & Erie Canal Transportation Co., whose project is described on another page. At first sight the plan of building a complete and substantial roadway and overhead system as an auxiliary to a waterway seems somewhat anomalous, as the question naturally arises why the roadbed itself should not be used for transportation instead of using boats. The whole subject, however, resolves itself into a question of the cost of transportation and it is believed from somewhat extensive experiments which have been undertaken in several places that a large volume of bulky freight can be carried on canal boats, towed by electric locomotives, not only cheaper than upon freight cars but even considerably cheaper than upon boats propelled by animal power.

One reason for the economy of the present system of haulage is the low speed at which the boats are operated and the entire absence

on grades, making an absolutely uniform load on the locomotives which, though running at a speed of about four miles an hour, nevertheless operate about three times as fast as boats propelled by horses or mules. In any case the existing conditions on this canal entirely preclude the use of the track for freight cars, as aside from the question of the banks being able to stand the weight of heavily loaded trains the curves and irregular profile of the tracks and the overhead clearance at bridges, which in some places is as small as 7 ft., is sufficient to prevent the use of the track for any other than the purpose of canal boat towing.

For a number of years the trolley has been considered a feasible method of furnishing power for canal boat propulsion and the first canal boat ever propelled by electricity was the Frank W. Hawley, which was operated experimentally on the Erie Canal at Pittsford, N. Y., in November, 1893. The experiment was carried on over a stretch of two miles where an overhead trolley was suspended from span wires between pole lines on either bank of the canal. Upon the trolley wire was a traveler which connected with the motor on board the canal boat by a flexible cable and the motor on the boat was attached to a propeller which provided the motive power. Considerable difficulty was experienced with this system however, and no further extension of it was made.

Oct. 26, 1895, a cable-way system of electrical canal boat propulsion was tested experimentally upon the same canal, which, however was abandoned on account of the very large cost of construction which it involved. This system comprised a motor suspended over the tow path from a cable which furnished current to the motor. The propelling power was furnished by a second cable which was wound three times around a driving wheel operated by the motor. The test of this system proved it to be an economical method of propulsion, but as stated its initial cost prevented its adoption. Ex-Governor Flower, of New York, who was present on the occasion of the tests of both of these systems, quoted in an address some figures furnished by the state electrician showing that it cost \$43.24 to propel a 240 ton boat from Buffalo to Albany by hore power, \$17.80 by steam power and \$7.97 by electricity.

On Apr. 26, 1900, a trial was made on the Delaware & Raritan Canal of a traction engine consisting of an automobile mounted upon four steel wheels traveling upon the tow path. This traction engine was furnished with storage batteries and was operated during a large part of the season of 1900. The engineers in charge of the work reported that freight could be moved by this means at a cost somewhat less than one mill per ton mile, which is about one-fourth of the cost of the movement of the same traffic by the Pennsylvania Railroad, which owns and operates the Raritan canal. The successful operation of this machine has led to the construction of an improved traction engine mounted upon three wheels, two of which operate upon a single line of track and the third one rests upon the tow path, its function being merely to balance the engine.

In all of these experiments, however, the application of electricity was made in a very crude manner for the reason that the canal banks were not in suitable condition to permit of electrical haulage under the most effective conditions.

The application of mechanical haulage to canals has been far more extensively carried out in Europe than in this country. In Germany a system controlled by Siemens & Halske is in operation on the Finow Canal, which makes use of a narrow gage railway upon the canal bank. Another system has been installed experimentally upon the Dortmund-Ems Canal, but the most complete system of this kind is that on the Charleroi Canal at Brussels, Belgium. This canal is very narrow and about 50 miles long, and connects the Charleroi coal district with the port of Antwerp, passing through Brussels. The system comprises a number of small electric automobiles rated at about 5 h. p. capacity which take the place of the horses previously used. These automobiles are connected with an overhead system which consists of feeder wires carrying current at 6,000 volts, and trolley wires carrying the operating current at 600 volts. The main current is supplied by two power stations which are 29 miles apart, and this current is reduced to 600 volts at sub-stations located three miles apart along the entire distance of 50 miles. The automobiles operate over sections of varying lengths, each motor towing one boat until it meets another one in the opposite direction, when the two change tow lines and retrace their routes. The banks of the canal are so narrow that the two motors cannot pass at any point and they are in such poor condition that occasionally electrically driven tug

boats have to be employed instead of the motors. The tug boats are operated from the overhead lines by means of a flexible cable connected to a trolley carriage.

From these descriptions it will be apparent that the system installed on the Miami & Erie Canal is mechanically far in advance of anything which has yet been undertaken in this direction, and it is confidently expected that this substantial construction, which will enable large fleets of boats to be operated by one locomotive, will decrease the expense of transportation per ton-mile considerably below any figures which have heretofore been attained.

SEEKING POWER TO CONDEMN PROPERTY.

A bill is before the Wisconsin legislature by which, if passed, the electric railway companies will have the same right of eminent domain now enjoyed by the steam railway companies. It provides that they can not only exercise this right in the condemnation of rights of way for interurban roads, but also in cities to secure tracts on which to build terminal stations and power plants. The only limitation is that wherever public property is involved the consent of the legislative body of the municipality in question must be obtained. The managers of the electric power companies have endorsed the bill without exception, as an absolute necessity if interurban lines are to be continued around the state on lines now planned. There is considerable opposition. This is the third attempt to have such a law passed.

INTERURBAN CARS ENTER CINCINNATI.

The Interurban Railway & Terminal Co., of Cincinnati, which owns and operates the interurban terminal, the Rapid Ry., the Suburban Traction Co. and the Cincinnati & Eastern Electric Railway Co. placed his first interurban car in operation within the city of Cincinnati February 24th. A car of the Cincinnati & Eastern line, which runs to New Richmond, was run into the new interurban terminal station, which is now nearing completion. The cars used on this line are 45 ft. in length, which is 7 ft. longer than the largest cars used by the Cincinnati Traction Co. The length of these cars necessitated some slight changes in one or two of the curves in the city. Mr. G. R. Scrugham, president of the Interurban company, states that the cars on this line have been put into regular operation within the city and that the cars of the other interurban lines will be operating to the terminal depot on or before April 1st.

MUNICIPAL OWNERSHIP AND PUBLIC FRANCHISES.

The national convention of Municipal Ownership and Public Franchises was held under the auspices of the New York Reform Club, February 25, 26, 27, 1903, at the assembly room of the club, in New York City. The sessions were opened by an address of welcome by Mayor Low, of New York, and by John G. Agar, chairman of the association. A number of papers and discussions of unusual interest were presented at the meeting, the full proceedings of which will be published in the winter number of "Municipal Affairs," which will probably be issued during this month.

The Milwaukee Electric Railway & Light Co. will insure itself against loss by fire and has set aside \$300,000 for a fire reserve fund. The company's property is insured for \$2,000,000, calling for about \$30,000 per annum in premiums. In lieu of this the reserve fund will be invested in 5 per cent bonds, netting \$15,000 annually, to which will be added 1 per cent of the year's gross receipts, by which means the reserve fund will increase at the rate of \$45,000 annually, provided there are no losses. High insurance rates caused the innovation.

For a few days in the middle of February snowdrifts crippled the interurban service of the New Castle (Pa.) Traction Co., especially the New Castle-Sharon line. Some of the drifts were five feet deep. The electric lines suffered no more than, if as much as, the steam roads, however, and the cars on the local traction lines, as well as on the Mahoning Valley road, made schedule time as a rule.

COMPARATIVE STATEMENTS.

BY HENRY W. BROOKS, JR.

One of the most marked features of recent years is the determined effort in every line—commerce, industry and transportation—to reduce the cost of production. During the lean years of railroad-ing, managers were forced to resort to every possible means of economy to reduce operating expenses. The question was, how to make both ends meet without a further outlay of capital? When

comparative statements, to be valuable, must be for similar periods and that great care must be exercised when comparing one set of figures with another to know the exact conditions at each period.

In respect to periods, these figures may be tabulated by a series of days, weeks, months or years, as occasion demands, but the longer the period the better, as daily or weekly fluctuations have little real value, as a rule. Statements may also be made irrespective of calendar periods but from the commencement of a certain cause, or policy.

Beginning first with more general statements we have in Form 1 the comparison for a series of years of the gross earnings from various sources of a small suburban road, also doing a lighting and power business. The first year the company did a cash fare business; the second year earnings were considerably increased by the sale of excursion tickets to a picnic ground and by the installation (at comparatively small additional fixed investment or operating expense) of a lighting plant; the third year the policy was continued by furnishing power to near-by factories. The table is very simple, quite elementary, but it speaks for itself and tells the story plainly.

Some statistics that will prove useful are set forth in Form 2. It is a comparative statement for a period of years of gross earnings, operating expenses and net earnings, by totals and by the following operating units; per mile of track, per car mile run and per passenger carried. Already having the gross earnings, operating expenses, car mileage and other data, it requires but little labor to tabulate this statement.

From this table we can see our traffic conditions in general, the earnings per mile in comparison with the investment, efficiency of car service, whether we are getting more profit out of each five cent fare collected; and the more we study this table the more food for thought we find.

Looking more closely into traffic conditions we find the necessity for comparative statements which will show the decline or increase, whether a temporary matter or a permanent tendency, whether

FORM I.
Comparative Statement of Gross Earnings for Period of Three Years.

| | 1899 | 1900 | 1901 |
|-----------------------------------|---------------|---------------|---------------|
| Cash fares | 25,000 | 28,000 | 33,000 |
| Sale of tickets | | 3,000 | 8,000 |
| Mail and express | 200 | 325 | 400 |
| Electric lighting | | 800 | 1,500 |
| Sale of power | | | 1,200 |
| Total gross earnings | 25,200 | 32,125 | 44,100 |

FORM II.
Comparative Statement of Gross Earnings, Expenses and Net Earnings, by Totals and Operating Units.

| | Total. | | | Per Mile of Track Operated. | | | Per Car Mile Run. | | | Per Passenger Carried. | | |
|--------------------------|----------------|----------------|----------------|-----------------------------|--------------|--------------|-------------------|------------|------------|------------------------|-------------|-------------|
| | 1900 | 1901 | 1902 | 1900 | 1901 | 1902 | 1900 | 1901 | 1902 | 1900 | 1901 | 1902 |
| Gross Earnings* | 1,197,200 | 1,212,700 | 1,162,700 | 11,972 | 12,127 | 11,627 | 30 2 | 30 3 | 27 6 | 5 04 | 5 07 | 5 08 |
| Operating Expenses | 1,832,100 | 835,900 | 827,400 | 8,321 | 8,359 | 8,274 | 21 0 | 20 9 | 19 7 | 3 50 | 3 50 | 3 61 |
| Net Earnings... | 365,100 | 376,800 | 335,300 | 3,651 | 3,768 | 3,353 | 9 2 | 9 4 | 7 9 | 1 54 | 1 57 | 1 47 |

more prosperous times came the good work was still kept up and abundant funds were then at the disposal of railway managers for extensive improvements, particularly for bettering the roadway and for heavier equipment. The result of this intelligent and determined policy as shown in reports of net earnings of railways, has been extremely gratifying to manager and capitalist.

It is self-evident that the results of any policy should be accurately and clearly known and this can only be accomplished by intelligent accounting. No important departure should be inaugurated without starting simultaneously an accurate, comprehensive record, so that at any time we can know definitely the results of our action. If we have spent money for improvements or extensions to the line, we want to know that our policy has been justified by reduced operating expenses or increased earnings.

For this statistical information the manager must rely on the accountant, who should be a man practically informed on street railway operation. The nice work of the statistician requires an ability to discriminate, to separate the elements of causes, and to measure the effects of certain causes.

Perhaps one of the principal ways in which the accountant can thus assist the manager is by providing comparative statements. Comparative statements are a convenient, readily understood form

of showing the trend of the business, the results of any policy of management, or the abandonment of a procedure or methods, and are a valuable test of the efficiency of the management.

Let us look more closely into this matter of comparative statements, omitting more particularly those relating to capitalization and fixed investment and paying more attention to those relating to traffic and operating expenses. A point to be emphasized is that

FORM III.
Comparative Statement Showing Volume and Density of Traffic.

| | 1900 | 1901 | 1902 |
|--|-----------|-----------|-----------|
| Total passengers carried | 2,503,000 | 2,700,500 | 3,000,100 |
| Average per mile of track operated | 46,580 | 6,500 | 365,700 |
| Average per car mile | 5.45 | .80 | 5.81 |

FORM IV.
Comparative Statement—Railway Mileage as Related to Volume of Traffic and Earnings.

| Year. | R. R. Mileage. | Per Cent. Increase. | Passengers Carried. | Per Cent. Increase. | Cost of Road. | Per Cent. Increase. | Gross Earnings. | Per Cent. Increase. | Per Cent. Earnings to Cost of Road. |
|-------|----------------|---------------------|---------------------|---------------------|---------------|---------------------|-----------------|---------------------|-------------------------------------|
| 1895 | | | | | | | | | |
| 1896 | | | | | | | | | |
| 1897 | | | | | | | | | |
| 1898 | | | | | | | | | |
| 1899 | | | | | | | | | |
| 1900 | | | | | | | | | |
| 1901 | | | | | | | | | |
| 1902 | | | | | | | | | |

growing proportionately with the increase in population and general condition, whether we are getting all the traffic we might claim that a to competitive, excursion, regular, the result of improved service, better schedules, construction of new lines, establishment of a railway park, and, etc., or other point, the management will be to know.

In regard to street railway passenger traffic control to team,

road, we have got the idea too firmly fixed that a certain volume of traffic is there, no more, no less and we have to take what comes. Possibly we pay more attention proportionately to decreasing expenses than to increasing traffic. Our statistics should point out how far the decline or increase has been caused by general conditions and how far within the power of the management to regulate, that we may know the conditions and determine what course to pursue.

Our track and equipment are not worked to full capacity. Each

tion between the property investment and the returns on that investment. The table is self explanatory.

Turning now from comparative statements of traffic conditions to those of operating expenses we enter a most interesting and prolific field for careful and minute statistical work and research. Beginning with the more general view, we must first bear in mind the general finances of the company and know what funds we will have at our disposal for the operation and maintenance of the property,

then disburse them in those directions where they will do the most good. We can set aside a more or less variable amount for maintenance of roadway and equipment, but a certain amount, of the nature of a fixed expense, must be set aside for conducting transportation. The power houses with their demands for fuel, labor and supplies must be provided for, and a certain car service maintained, together with light, car and roadway repairs. General statements for a period of years may be gotten up to show operating expenses from this viewpoint of distribution or allotment of operating funds, between maintenance of roadway and buildings, main-

FORM V.

Comparative Statement of Operating Expenses in Detail for Two Years.

| 1901 | | ITEM. | 1902 | | Increase. | Decrease | Per Cent. Change |
|---------|-----------|---|---------|-----------|-----------|----------|------------------|
| Amount. | Per Cent. | | Amount. | Per Cent. | | | |
| 100,000 | 12.50 | Maintenance of Railway and Building: | 120,000 | 13.33 | 20,000 | | .80 |
| 72,000 | 9.00 | Roadbed and track | 90,000 | 10.00 | 18,000 | | 1.00 |
| 15,000 | 1.62 | Overhead construction | 19,000 | 2.11 | 4,000 | | .49 |
| 5,000 | .62 | Repair and renewal of buildings | 3,000 | .33 | 2,000 | | .29 |
| 10,000 | 1.25 | Removal of snow and ice | 8,000 | .89 | 2,000 | | .36 |
| | | Maintenance of Equipment: | | | | | |
| | | Repairs of cars and vehicles | | | | | |
| | | Repairs of electrical equipment of cars | | | | | |
| | | Repairs of steam plant | | | | | |

additional fare is so much profit. How shall we increase the volume of traffic by better car service, or is that already too frequent considering the traffic; by the establishment of amusement resorts; by the construction of feeders from populous districts or to secure competitive traffic?

Comparative statements, based upon these traffic conditions will be invaluable to the management. Among such tables, we may mention (1) showing number of passengers carried for corresponding periods for several years; (2) number of passengers carried on different lines; (3) direction and volume of traffic (so that car service can be regulated accordingly); (4) traffic secured by the management (such as competitive, amusement, etc.).

tenance of equipment, conducting transportation and general expense.

A more detailed statement of operating expenses is shown in Form V, which gives a comparison for two years, both in dollars and percentage of total operating expenses, of each classification of expenditure. The columns for increase or decrease, add clearness and conciseness.

To show the detailed operating expenses for a period of years the same arrangement as that of Form VI may be used. The columns headed "Divisions" in this form (which will be considered later) may be substituted for monthly or yearly periods. In taking up this comparison we first consider the subject of maintenance of roadway

FORM VI.

Comparative Statement of Operating Expenses by Divisions.

| EXPENSE. | 2nd Ave. Div. | Lenox Ave. Div. | 10th St. Div. | 30th St. Div. | Fulton St. Div. | Total. |
|--|---------------|-----------------|---------------|---------------|-----------------|--------|
| MAINTENANCE OF WAY OF BUILDINGS: | | | | | | |
| Repairs of roadbed and track—labor | | | | | | |
| Repairs of roadbed and track—paving material | | | | | | |
| Repairs of roadbed and track—steel rails | | | | | | |
| Repairs of roadbed and track—switches, castings, track tools | | | | | | |
| Repairs of roadbed and track—ties and timber | | | | | | |
| Repairs overhead and underground construction | | | | | | |
| Repair and renewals of buildings | | | | | | |
| Removal of snow and ice | | | | | | |
| MAINTENANCE OF EQUIPMENT: | | | | | | |
| Repairs of cars and vehicles | | | | | | |
| Repairs of electric or cable equipment of cars | | | | | | |
| Repairs of steam plant | | | | | | |
| Repairs of electric or cable plant | | | | | | |
| Repairs of tools and machinery | | | | | | |
| Miscellaneous expense | | | | | | |
| TRANSPORTATION EXPENSES: | | | | | | |
| Car service | | | | | | |
| Car house expense | | | | | | |
| Operation of power station—labor | | | | | | |
| Operation of power station—light and supplies | | | | | | |
| Operation of power station—water supply | | | | | | |
| Operation of power station—fuel | | | | | | |
| Hired power | | | | | | |
| GENERAL EXPENSES: | | | | | | |
| Salaries of general officers and clerks | | | | | | |
| Miscellaneous expenses of general office | | | | | | |
| Insurance | | | | | | |
| Law expense | | | | | | |
| Injuries and damages | | | | | | |
| Contingent expense | | | | | | |
| TOTAL OPERATING EXPENSE | | | | | | |

Two tables regarding the volume of traffic are herewith given. The first (Form 3) gives concisely for a period of years the total passengers carried, average number per mile of track operated and number per car mile, from which we get a clear idea of the density of traffic and efficiency of the service.

Form 4, a comparative statement of the increase of railway mileage and traffic, is of value as a measure of the sagacity or judgment in extending the mileage to secure traffic. It shows plainly the rela-

and buildings. It is the theory of maintenance to keep the property up to a certain standard—a standard equal to the original condition and investment. The actual condition will rise above or fall below this standard from time to time, but it is the aim to keep the property up to this original condition. Reducing maintenance charges is but borrowing from the future, simply deferring payments. It has got to be met some time.

Comparison of this item from month to month is of little value,

as it varies with the seasons; nor is it to be compared with the month to month volume of traffic.

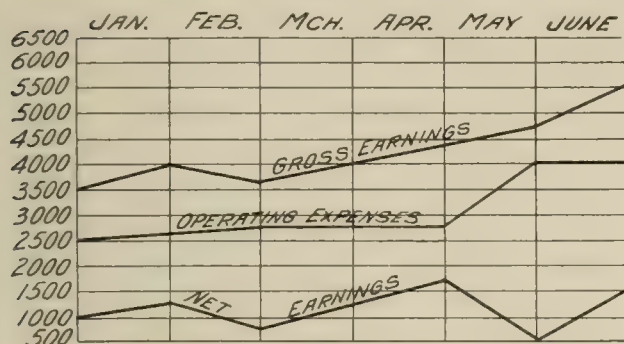
In making a comparison of this item of expense from year to year, we can conclude, if the expenditure is heavy (based on the operating unit of amount per mile of track) that the property is being improved, the standard raised, unless we know this increase is caused by inefficient management, unusually severe weather, effects of accidents or washouts, or the increased cost of labor and materials (steel rails for instance). The demands of the service—speed, frequency of car service, type of car, together with the type of roadway construction, will regulate the maintenance of way expenses. For high service heavy traffic, the prevention of accidents, the roadway must be kept in better condition. All these facts and many others must be kept in mind when making comparisons of roadway expenses.

The item of line repairs and renewals is liable to erratic fluctuations, owing to extraordinary expenses due to storms. It bears little relation to other accounts.

Repair and renewal of buildings is a difficult item to compare, as the repairs are of such a miscellaneous character, are so infrequently made, and it being unnecessary to keep up a fixed standard.

In making comparison of car repairs and renewals, we find this item will fluctuate violently according to the policy of the company, as the standard is raised or lowered, as the company has funds to

FORM VII.



devote to this department, shop economy and speed, age and type of equipment. Our comparison should be based on the number of cars repaired and the cost per car mile run. In these statements the renewals should be separated from the repairs for certain purposes of comparison. There is no doubt, it is a difficult account to judge.

The same remarks to a certain extent apply in considering the expenditures for repairs of electric equipment, although this is a more fixed account, as such equipment must of necessity be maintained to get proper car service. The introduction of improved motors, necessitating less repairs, tends to lessen the account.

The comparison of repairs to steam plant and repairs to electric plant must rest on longer periods of time, as the charges for accidents, and repair parts are infrequent, but heavy when they do occur.

There is a certain regularity of expense for maintenance of shop tools and machinery, although it depends on age and type used, but is often allowed to run much less than it should, until new tools are introduced.

Car service expenditures to be compared from year to year must at the same time be compared with the volume of traffic during these periods. The rate of wages must be borne in mind.

The expenses of power house operation will also reflect the volume of business, but this item becomes complex with the introduction of the item of fuel cost. To determine the economy of power house operation, we must also base our deductions on the amount of power produced.

The transportation expenses per car mile for a series of years will not a good idea of the economy of the car service management.

Among the general expenses, there is but one item I would call the manager's attention to, at this time, that being the comparison of the injuries and damages account. It is one very easily reflected by the management. Compare your record with your predecessor—your own record from year to year. Has it increased? Trace it down to its source, whether in deficient discipline, careless employees,

defective equipment, or faulty construction. Later records are not always just to the manager, owing to the growing disposition of juries to make large awards in all street railway accident cases.

Form VI is a comparative statement of detailed operating expenses by divisions, as used on a large railway system. In many of our large cities the various car lines have come under the control of one company, either by purchase or lease and thus form one unified system. Aside from statistical value, it is often necessary that the operating accounts should be kept separate, therefore it is an easy matter to put them in such shape that they will be valuable comparative records of the efficiency and economy of the several division superintendents and of the cost of operating under different traffic conditions, under different systems of traction, and under the different standards of maintenance. In one instance a company operated horse, cable, trolley and conduit electric lines. The expediency of changing from one form of traction to another was better calculated upon having the above statement of operating costs.

In these division comparisons, due consideration must be made in judging the superintendent's efficiency for the different conditions under which each operates—the traffic may be heavier or more severe on one line; another may be better built and of recent construction; while another may have been poorly built and run down.

Referring again to Form II we here have an excellent comparison for a period of three years of total operating expenses, and a comparison of operating units. From year to year can be noted the changes, and conclusions drawn therefrom of the expenditure per mile of track owned and operated, per car mile run and per passenger carried.

Another form of arranging these statistics, which attracts the eye and impresses the memory as to the trend of the business, is by charts, as per Form VII. I think it will be understood and appreciated, without further explanation.

It will be seen that the books of the company already contain the material from which these various groups of comparative statistics can be worked up, requiring the expenditure of but very little additional time. The trained railway accountant can set forth graphically the undercurrent of the railway operations in such a way as to be of practical value and appreciated by the practical, self-made manager, who might object to a waste of time in the compilation of voluminous, useless statistics that will be glanced at for a moment and then forgotten.

While the tables and suggestions set forth herewith will be of practical value as they are, they will also be highly suggestive of other groups and comparisons to the alert accountant and manager.

In the foregoing I have tried to point out how comparative statements can be of practical value in giving the manager a clear, definite knowledge of the exact condition and trend of the street railway property intrusted to his care and direction. Before leaving the subject, I wish to impress the importance of absolute statistical accuracy, of understanding all related conditions, of following up these comparisons periodically and thus keeping in close touch and absolute knowledge of the trend of your business. Make effective the findings of the figures.

SYSTEMATIC INCREASE IN WAGES BY THE MASSACHUSETTS ELECTRIC COMPANIES.

An entire rearrangement in classification of motormen and conductors and in wages paid has been placed in effect on all divisions of the Massachusetts Electric Companies, comprising 900 miles of electric railway tracks in eastern Massachusetts. Mr. E. C. Foster, vice-president and general manager of the companies, states the new classification and increase are made as a result of long and careful study, and the plan is believed to give one of the most scientific and most substantial advances in wages ever inaugurated in the history of electric railways. The total increase based upon pay rolls of conductors and motormen for the last fiscal year amounts to \$154,677.87, or 12.18 per cent. The actual increase for the present fiscal year, however, will be greater than this amount.

The classification and increase, which went into effect Mar. 1, 1903, will affect 2,522 conductors and motormen. By the plan the men are divided into six classes as follows:

Class No. 1 contains the employees who have been in the service

of the company less than one year. This class will include 26.85 per cent of all the car men employed on the system. Employees in Class No. 1 will hereafter receive 20 cents an hour, an increase of 18 per cent over the lowest wages paid to men of this class under the old schedule. Of this class Mr. Foster says: "Men in Class No. 1 at present receive rates ranging from 17 to 20 cents per hour. Of the total number in this class 23 per cent receive an increase varying from 11 to 18 per cent and 50 per cent of them will within two months be advanced to Class 2. Class No. 1 contains the new men who cause most anxiety to street railway managers. Cost of accidents, increase in cost of repairs due to new motormen and inattention to passengers and missing of fares by new conductors are greater than by the older and more experienced men."

Class No. 2 comprises the men who have been in the service of the company one year and less than two years. This class will include 15.42 per cent of the men, and Class 2 men hereafter will be paid 21 cents per hour, an increase of 5 per cent.

Class No. 3 comprises the men who have been in the service two years and less than four years. This class includes 18.36 per cent of the men and they will receive 22 cents per hour, an increase of 10 per cent.

Class No. 4 contains the men who have been in the service four years and less than seven years. This class includes 18.52 per cent of the men and they will receive 23 cents per hour, an increase of 15 per cent.

Class No. 5 contains the men who have been in the service seven years and less than ten years. This class includes 11.10 per cent of the men, and they will receive 24 cents per hour, an increase of 20 per cent.

Class No. 6 contains the men who have been in the service ten years and over. This class includes 9.75 per cent of the men and will receive 25 cents per hour, an increase of 25 per cent.

The basic principle in the new arrangement is recognition of faithful service and placing before each and every man an opportunity to improve his condition from year to year. The companies have many true and tried men—men who look upon the success of the companies as their own, who as a rule are married, have families and are settled permanently in their respective communities—and experience shows that such men take greater interest in the welfare of patrons of the companies, have fewer accidents and that repairs to their cars and machinery are the least.

The properties of the Massachusetts Electric Companies are operated in two main divisions, the Boston & Northern, north of Boston, and the Old Colony, south of Boston. The new schedule and classification applies to both divisions alike.

In this connection the views of Mr. H. C. Page, general superintendent of the Boston & Northern division, are of value. Mr. Page in his announcement to employees says: "In making this classification and increase of wages the company recognizes and establishes as a principle that skill, experience and faithful service should be appreciated, and in justice and fairness it must be admitted that the skill and experience which naturally follow length of service make men more valuable."

"Classification and increase of wages have been under consideration for some time and would have been established sooner were it not for the fact that the abnormal fuel conditions, which greatly increased cost of operation, were the most serious in the history of electric street railways; and while the immediate future of fuel is not perfectly clear, reduction in price from that of the preceding four months is substantial."

"If the situation were studied solely from the view point of whether the company can afford the increase in wages, no increase were possible at the present time, but we hope that with your earnest co-operation accident expenses will be reduced and by greater attention to the traveling public patronage will be increased. We expect this co-operation from you for it is only by such action on your part, and the beneficial results which we hope to obtain therefrom, that those who have taken all the financial risks involved may expect security and a fair return for their risk and investment."

"Each and every man can see that the increase is substantial and generous, amounting to an average increase of 12.18 per cent of the wages paid for the same classes of work for the last fiscal year. It will prove still greater when compared with increases made by employers other than street railway companies. While the percentage

of increase is as great, if not greater, than that made by merchants, manufacturers and railroads, and while the two former can and do increase the price of their wares and the railroads increase the rates of freight to compensate them for increase of wages, our company cannot increase its rates of fare—its only source of income—without legislative authority."

PROTECTION OF TRADE NAMES.

The protection which has been afforded in the use of trade names by merchants and manufacturers is afforded on one or both of two grounds, first, that the misuse of a trade name is a wrong done the public in leading purchasers to buy one article when they in fact asked for and wished to get another, and second, that it is an injury to the owner of the trade name that is infringed. Of recent years the courts have become much broader and more liberal in interpreting the law regarding infringements of trade names, and in a late English case (*Worcester Royal Porcelain Co. vs. Locke & Co.*) the court held that the Worcester company was entitled to a monopoly of the use of the word "Worcester" in connection with china, although geographical names as a matter of principle cannot be appropriated as trade marks.

One of the late decisions in this country on trade names was rendered Dec. 23, 1902, in the United States Circuit Court, in the case of *Babcock & Wilcox Co. against the Aultman & Taylor Machinery Co. and Thayer & Co.* The perpetual injunction issued in pursuance of the decree directs that the defendants "absolutely and entirely desist and refrain from using the name 'Babcock & Wilcox' or the initials 'B. & W.,' or any substantial part or imitation of the same, or either of them, either alone or combined with other word or words upon, or in connection with the sale or offering for sale or advertisement for sale, of any boiler or other steam apparatus not manufactured by the complainant, and from employing any phrase hereinbefore set forth, containing said name or initials, except in connection with or reference to boilers or steam apparatus manufactured by the complainant (the Babcock & Wilcox Co.) and from stating or representing any boiler or other steam apparatus manufactured, sold or dealt in by them, or either of them, and not manufactured by the complainant, as a 'Babcock & Wilcox' or 'B. & W.' boiler, and from selling or offering for sale, or passing off, any such boiler or other steam apparatus as and for a boiler or steam apparatus manufactured or sold by the complainant and from using said name or initials or any substantial part or imitation thereof, for the description or designation of the type, design, or construction, of any steam apparatus manufactured or sold by the defendants, or either of them, or similar thereto."

TO PREVENT VIBRATION FROM MACHINERY.

The Architects' and Builders' Magazine for February quotes a speaker at a recent American Institute meeting, who gives a successful expedient adopted in insulating dynamos on sand. Beds of dry sand about 6 in. thick, placed under and in corresponding upright enclosures on all sides, were found to be nearly complete safeguards against the building partaking of any tremulous motion from the rapidly whirling machinery.

The San Bernardino Valley Traction Co. recently received the rails for its new line between San Bernardino and Redlands, Cal. The company expects to have this line in operation before April 1st.

The St. Joseph & Elkhart Power Co., of Mishawaka, Ind., is installing a large hydraulic plant on the St. Joseph River for the generation of electric power for transmission to South Bend and Mishawaka and the adjacent territory. Messrs. Sanderson & Porter, of New York City, are the consulting engineers and contractors for the company and the equipment will consist of four Westinghouse 1,000-kw. revolving field alternators and two direct current exciters, all of which will be direct coupled to horizontal shaft water wheels. A complete high tension Westinghouse switchboard with electrically operated oil switches for use on the 13,200-volt circuit will also be installed.

Street Railway Park Development.—IV.

The Most Profitable Attractions for Parks—Descriptions of Street Railway Parks at Various Places—Illustrations of Attractive Park Scenery and Amusement Resorts.

PARK ATTRACTIONS.

BY C. W. WADDELL.

The love of amusement is inherent. It is firmly implanted in every race and people, and has been in all ages. A history of the diversions of mankind would be a history of man. The earliest unfoldings of human intelligence display this trait. Before we understood or uttered a syllable, we were amused, diverted and entertained. Even some of the lower animals manifest a love for entertainment. We recognize this when we say "As playful as a kitten." A trait so deeply implanted in our nature must be important and necessary to our well-being. These facts are too plain to need the support of an argument.

The demand for public entertainment is founded on this inherent love for amusement and a business created to supply the demand has a sure foundation. If it fails, the creator or his materials are at fault.

Every business or calling is based upon the necessities of the mind or of the body. Those of the body are primary and demand first consideration. Consequently a large part of the world's wealth is employed, directly or indirectly, in supplying our physical wants. Almost the entire science of business, as commonly taught or understood, relates to the production and sale of the necessities of life. That there could be circumstances requiring the application of different ideas in the production and sale of entertainment, is, perhaps overlooked by some who are engaged in the amusement business. In this case we do not deal so much with men's necessities as with their inclinations. We do not supply a material want. We appeal to the mental man. We stimulate his imagination, excite his curiosity, tickle his sense of the ludicrous, please his ear with melody, astound him with the marvelous and in numerous other ways divert and entertain him.

Having briefly considered the origin, importance and nature of the propensity, on which the amusement business is founded, we will now undertake to discuss in limited detail the production of amusements for the public.

Generally speaking this business requires as much knowledge and experience as any other. One must study it if he would comprehend it. He must understand the peculiarities of the public in the locality in which he proposes to do business and take into account the size of his field, otherwise he will not know what kind of material to buy, or how much of it he needs. The average outsider is not impressed with an amusement proposition. He calls it a show, and shows, in his mind, are only associated with pleasure. He thinks of it as something too trivial to involve serious business problems. If chance makes him the proprietor or manager of such an enterprise he is puzzled and annoyed by its peculiarities and uncertainties, but he is slow to relinquish the idea that it is just a show.

Some men surround the show-business with a glamour of romance. It seems to give them a near view of another world. It will never do for a manager to entertain such impressions. He is engaged in a serious calling, one that demands a large amount of common sense, careful thought and close attention. The romance is for the public. The man who thinks he can handle this business on the lines that are required for merchandizing or the operation of a railroad, should never undertake it.

If we are asked what kind of attraction are best for "Traction Parks," it is hard to make a satisfactory reply, because an answer can only be founded upon a knowledge of local conditions and the previous history of each park. Take a new park for example, located in a city that never had a park before, in this case, almost anything might do the first year. The novelty of the park alone is an attraction. We remember an instance of this kind, which will serve to illustrate; the first park opened in a city of considerable size, drew immense crowds the first year. Driving horses were employed as an attraction. We know of another instance where driv-

ing horses were employed at an established park in a city of similar size, though extensively advertised, they were a failure. There is nothing strange about this. In the first place the people were not used to either parks or outdoor attractions, in the second place they were familiar with both. A few cities have parks located adjacent to large lakes, as at Council Bluffs, Iowa; St. Joseph, Mo., and Toledo, Ohio. These parks have a great natural attraction in their lakes, one that lasts from year to year without diminution of value. At such places attractions of all kinds can be handled to better advantage.

The size of a city in which a park is located, also makes a difference as to the kind of attractions that may be employed. It also makes some difference if a small city is located near a large one.

For some years vaudeville shows have been extensively employed for park purposes, but generally speaking they do not now produce as good results as formerly. Most cities have good shows of this kind all winter. This affects the summer business. It grows harder all the time to procure material for new acts. A large percentage of the acts now on the road are old ones revamped. Seven or eight years ago one good aerial act was sufficient to draw a good crowd, but since the novelty has worn off, a bill of six good turns will seldom do as much. In resorts where beer is sold and at some of the lake parks vaudeville can yet be used to good advantage, but in other places it cannot be depended upon to produce enough travel to warrant its presentation as a free show. If an admission is charged the reduced car revenue equalizes the door receipts.

Spectacular attractions, such as high diving, balloon ascensions, etc., have lost most of their value as independent crowd producers, and are good only in localities where they have not been seen.

Park theaters are also a frequent cause of disappointment. They may be all right when used in conjunction with other inducements, but they are not suitable for the chief attraction of a park. With capacity to entertain hundreds they should not be expected to draw thousands.

High grade bands when properly handled usually produce good results. The love of music is almost universal. No form of entertainment permits of greater variety. A good band makes a good advertising proposition. The intrinsic merit of a band, the history of its achievements, its leader, and distinguished members, and its daily programs make legitimate material for interesting press stories. Ten thousand persons can hear and enjoy a band concert as perfectly as five hundred, in fact there is scarcely a limit to the number of persons who may be entertained if an adequate number of good seats are provided.

Good band music gives standing and credit to a park and permits the establishment of a reputation that can be built upon. This form of entertainment not only pleases but educates the public. By an intelligent handling of programs one may witness the growing appreciation of his patrons for good music. The writer has observed this growth with great satisfaction. Beginning three or four years ago with a mixture of an occasional classic number with popular ones, the demand for high grade music has increased until "Classic Night" can be depended upon to bring out eight or ten thousand appreciative visitors. The hardest thing to accomplish is to get the band one wants when he wants it. Transportation is a large item in the expense of a big band.

Long engagements or short jumps are the only alternatives for a band on the road. Touring a band is a risky proposition. For that reason there are only a limited number of desirable organizations to be had.

Bands combining novelty and merit are the best. Uniforms are very important. The men must look and act a distinguished part. The leader should be magnetic and resourceful. A local band, however good, will not compare, so far as results are concerned, with one that comes from a remote place, the farther away the better, provided it makes a good appearance and does creditable work.

While speaking of attractions it may not be out of place to comment upon street railway amusement in their relation to the amuse-

ment world. Before the street cars became an important factor in urban life there were few summer entertainments of consequence, riding, driving, fishing and kindred sports were the only diversions possible during the summer months (drinking places excepted). The majority of persons living in cities were not able to enjoy these pleasures. When the era of rapid transit came and it was made possible for people to go where they pleased at small cost, the great bar to summer amusement was removed, and all were able to find a cool place for out-door enjoyment without physical exertion. A desire to increase their earnings prompted the street-car companies to provide shady resorts to induce the public to ride on their cars. They afterward added various attractions to increase the inducement. This, as everyone knows, was the origin of street railway parks, and the beginning of a new business. The new field is a great one—full of possibilities. Many experiments have been made, and there have been some failures. The task of the pioneer was ever arduous and full of trouble, but the lessons of his experience are invaluable to those who follow. There are now two amusement seasons—winter and summer. The summer should excel the winter season, because it is naturally the best. It is the time of the year when every one wants to relax and recreate. It is also the season of least expensive living when the common people have the most money.

On account of the peculiar relation of the street railways to the parks, outsiders have not been able to do much in this field, and consequently have not given it much thought or study, and it would not be far from the truth to say that the companies have not given it the kind of attention it should have.

copy the plans of some acquaintance, or he may accept the scheme of some amusement promoter.

Whatever he does, he wishes he had not done it. After he has settled upon a policy to be pursued and the expense to be incurred, he leaves the details of execution to a subordinate and drifts along until his duty challenges him again.

It is quite probable that a majority of street railway managers would admit that they treat the park question somewhat as we have described, but there are some who devote much time and effort to the solution of the problems of street railway amusements, to them all credit is due for the progress already made, and upon them rests the burden of our hope for the future.

NORUMBEGA PARK, NEWTON, MASS.

Norumbega Park in its present form is one of the recently established railway parks in New England. It was started as a private enterprise of several of the directors in the Commonwealth Avenue Electric Ry., and after the merger of the Commonwealth with the Boston & Suburban Electric Companies, the Norumbega Park Co., which is the park owning company, passed into the control of the Boston & Suburban. The park property is still run as a distinct enterprise apart from the railway company, although the owners are practically all financially interested in both properties.

The park includes a fine tract of wooded land on the banks of the Charles River in Auburndale, which is a part of the city of Newton, Mass. The park is laid out in broad walks, flower beds, decorative shrubbery and grass plots. There are no "keep off the grass" signs



PLAN OF NORUMBEGA PARK, NEWTON, MASS.

Frequently the directors, the president, or some other officer have entire control of park affairs. In most cases they are in the hands of a busy man, who thinks of the park only when duty compels him. The press of other matters often causes him to procrastinate until the time arrives when he must decide upon a season's program, then he gets in a hurry and does the best he can. He may think that the short way out is to do what he did last year or to

in any part of the grounds, and the lawns and terraces are free and open to all. The walks and paths are swept and cleaned every day. A force of special uniformed policemen are on duty in the park during the day and night, and the management pride themselves on the good order maintained. No intoxicating liquors are sold or permitted on the grounds. The total number of park attaches on the pay roll during the summer season, including police, zoo attend-

ants, sweepers, and other employes, amounts to about forty persons. The attractions include a rare and costly collection of animals, an open air theatre with rustic stage, electric fountain, excellent restaurant, Chalet or Palace of Electricity, swings, merry-go-rounds, boating, etc. The entire park property with the zoo and other attractions represents a large investment, on which the receipts from

pany encourages pedestrians, bicyclers and carriage riders to visit the park as this all means increased receipts from the various concessions within the grounds. An idea of the number of bicyclers who visit the park can be obtained from one of the accompanying views taken from a photograph showing the wheels checked on a pleasant afternoon. On this occasion 1,050 wheels were checked in



RESTAURANT AND CAR HOUSE AT NORUMBEGA PARK ENTRANCE.

the park itself pay a good return aside from the increase in fare collected on the cars during the park season.

The park is about ten miles from Boston, and a thorough service is given over the Boston & Suburban lines from Norumbega into the Boston subway. A charge of 10 cents is made for admission to the park to all who do not obtain park tickets on the cars. From points where fare on the electric lines is 10 cents for a single ride a round trip coupon ticket is sold for 25 cents, one of the coupons admitting the bearer to the park, thus making the charge of admission

a single day. A charge of 5 cents is made for checking wheels. The ordinary duplicate strap check is used and never since the park opened has a wheel been lost while in the company's care, and the total claims for damage to wheels amount to just \$1.

The Women's Cottage is a somewhat new feature. This building is exclusively for women, no man being allowed to enter under any pretext. The front part is an octagon pavilion provided with plenty of comfortable rocking chairs. The rear part is a large room fitted with the most approved toilet accommodations, as marble



BOAT HOUSE, NORUMBEGA PARK

5 cents to patrons of the car. Where the single fare is 5 cents a round trip ticket with park coupon attached is sold for 15 cents. The total attendance at the park last year was frequently 3,500 a day or about 400,000 for the entire year, of which number from 110,000 to 120,000 paid admission at the entrance gate. There has never been a serious accident due to this increased traffic. The com-

wash basins with open plumbing, looking glasses and rocking chairs and tables. There are also small iron cots or beds made up with mattress, sheets, pillows, etc., and any mother is at liberty to bring babies and small children here and put them to sleep. A woman attendant is in charge at all times, and if the mother chooses, she can leave her baby in charge of the matron, while she enjoys the theat-

medicinal purposes at the park. There is also kept at the cottage a supply of medicine in case of accident, sudden sickness or other emergency. This evidence of concern on the part of the company for the comfort and convenience of its



SMALL CASINO AND LUNCH ROOM.

patrons is fully appreciated by the public and has been the means of greatly increasing the popularity of the place.

The music court is a level circular piece of ground, 150 ft. in diameter. In the center is a well designed band stand of rustic work with accommodations for 25 musicians. Around the circle is a row of oak-slat settees that will accommodate 400 persons seated.

A number of free swings are provided and these are all gathered in one place known as the swing court and one man is detailed to look after them. It is believed a better plan to group all the swings in one place rather than scatter them through the park as this arrangement affords better protection to the women and children and enables the attendant to preserve order and decorum.

The casino is a small rustic building where soda in various forms is dispensed together with all kinds of soft drinks, cigars, confectionery, etc. At the front of the building is a broad semi-circular rustic veranda from which an excellent view is obtained of the Charles River and its canoes, steamers and other craft. The soda and other selling privileges at the casino are let to outside parties on a percentage basis.

The company keeps several hundred canoes on the Charles River

steamers which run regularly between the park and Waltham, Mass.

The electric fountain is built at the bottom of a natural ravine whose sloping sides present an excellent vantage point from which large crowds can view the display. The fountain is supplied by two small rotary engines and gives about 200 or more different combinations of geysers, cascades, single streams, fans, sprays, gold and silver rain, etc., illuminated by almost every possible combination of colors and tints thrown up from beneath by powerful electric lights directed through colored screens.

The park would not be complete without the ever popular merry-go-round. In this case the machine is one of the largest made, of the Dentzel type, and it is always the scene of the greatest activity.

The "Chalet" is a feature not often found in parks of this character. This building which is a one-story frame structure about 38x75 ft., was formerly given over to various electrical illusions but during the coming season the idea is to fill it full of various penny and nickel-in-the-slot machines, thus establishing a place of



SWING COURT, NORUMBEGA PARK.

novel entertainment which it is believed will be well patronized and should be a source of considerable revenue.

The Zoological Garden is a feature that appeals to everybody but largely to the children and the student. The object lessons taught by this department are invaluable and the thousands of children



RUSTIC THEATER, NORUMBEGA PARK.

for hire by the hour or day, and there are also row boats and steam launches, besides a number of private craft which pay a yearly rental. The boathouse is one of the largest and best equipped on the river. The landing here provides accommodation for two

that have embraced the opportunity of visiting the park for this purpose attest their appreciation of the efforts of the management in this direction. It is proposed to keep strictly American animals and under conditions that will make them seem as natural as possi-

ble. To this end, enclosures, not cages, have been built so the animal can have the earth to walk on and live among the trees with plenty of shelter and shade. Among the collection which is constantly increasing may be found mountain lions, timber wolves, lynx,



ENTRANCE BUILDING, SHOWING CAR TRACKS AND RESTAURANT ABOVE.

foxes, prairie dogs, porcupine, fishes, sable, raccoons, baby bears, full grown bears, badgers, squirrels, monkeys, eagles, owls, moose, elk, deer and one of the finest American bison in existence. This department is kept open 10 months in the year, so great is the demand of visitors to see the animals.

By special arrangement a full blooded Indian brings his squaw and children to the park every year and sets up a genuine birch bark tepee where Indian curiosities are made and sold.

Near the park entrance is an elevated water tank of 10,000 gal. capacity. Water from this tower is carried by a system of piping over the park to several points where, with the aid of lines of hose, nearly every square foot of the property is reached and can be watered. Part of the water is used for the fire sprinkler system in the restaurant and car house at the park entrance.

The rustic open air theatre is regarded by the management as superior in drawing power to any other feature. The rustic stage is set in the center of a natural auditorium and the seats are arranged in semi-circular rows on the side of the declivity. The theatre has 3,000 seats, 200 of which sell for 25 cents; 400 sell for 10 cents, and the remaining seats are unreserved and free. Clean and



1007 WHEELS CHECKED IN ONE DAY

the ground that is used for storing cars in anticipation

of extra large homeward bound crowds after special occasions. The second story is utilized as a restaurant which has come to be one of the leading inducements to park visitors. The building stands in the center of the terminal loop and the loading and unloading platforms are located in a covered addition adjoining one side of the main building. The roof of this addition forms a veranda for the second story and is used as an annex to the restaurant. Over 500 people can be accommodated at one time in the main dining hall and veranda service. The fittings of the kitchen, larder, bakery and dining hall are arranged with an eye to convenience and dispatch as well as absolute cleanliness and neatness in preparing and serving meals. The reputation gained for both menu and cuisine has extended to the most distant points of Boston and vicinity, and during the park season the capacity of the restaurant is taxed to the utmost during the afternoons and evenings.

The arrangement of the terminal loop gives facilities for discharging and receiving the largest crowds without confusion. The arriving cars circle the building and unload their passengers at the unloading platform, the passengers entering the park through turnstiles. The cars after unloading proceed to the loading platform which is virtually an extension of the other platform, the two being separated by a heavy division fence. To keep the people from going out onto the tracks and so around this partition from one platform to the other, a ditch or shallow canal about 8 or 10 ft. wide has been built across the tracks at the dividing line and this is kept full of water. This has proved an effectual barrier.

From the loop track several spur tracks branch off and run into the car storage house on the ground floor of the main building. Here the extra cars are accumulated and as they are under cover they are kept dry and clean until needed.

The manager of Norumbega Park is Mr. Carl Alberte, who is one of the best known park managers in New England.

STRATFORD, O.

The Columbus, Delaware & Marion Electric Railroad Co. operates two parks, one of which is called Stratford Park and is located 17 miles from Columbus and three miles from Delaware, O. This park is situated on both sides of the Olentangy River, and Olentangy Falls, which are within the park, add greatly to the beauty of the place and guarantee plenty of clear, running water, making admirable facilities for boating, fishing and other aquatic amusements. In connection with the park is a picnic grove furnished with benches, tables, swings, etc., and a cable ferry boat plies between the banks of the river, offering ample facilities for transporting park visitors



SUMMER AND WINTER PAVILION, STRATFORD, O.

between the picnic grove and the park. A summer and winter pavilion has been erected on the bank of the river, a general view of which is shown herewith. The building is 60x125 ft. in area and is equipped with a stage and suitable dressing rooms and con-

tains an auditorium seating 1,000 people, a fine dancing floor and an excellent restaurant. It is comfortably heated and well lighted, and designed to meet all requirements of organizations and special parties. It is for use exclusively by those patronizing the Columbus

located $2\frac{1}{2}$ miles north of Worthington and covers 54 acres of grove and woodland, forming an ideal spot for Sunday-school and family picnics. The park is provided with shelter houses, platforms for games or dancing, swings, tables, croquet grounds and other



WINTER VIEW OF OLENTANGY FALLS AND PAVILION AT STRATFORD, O.

Delaware & Marion Electric railroad and ordinarily no charge is made for its use. The general arrangement of the interior of the building is shown in the floor plan illustrated herewith. A special track leads to a covered entrance to the pavilion, so that guests are not exposed at all in inclement weather.

The restaurant is in charge of a competent caterer and arrangements can be made for serving any sort of meal from a simple luncheon to an elaborate course dinner.

attractions accessory to a day's outing in the woods. For excursion parties special low rates per car are made, including admission to the park and the use of the pavilion.

LAFAYETTE, IND.

The LaFayette Street Railway Co. owns a beautiful tract of land along the banks of the Wabash, $4\frac{1}{2}$ miles from LaFayette and $2\frac{1}{2}$ miles from Battle Ground, where was fought the battle of Tippecanoe, between the forces of General Harrison and of Tecumseh and his brother the Prophet. The name of the park, "Tecumseh Trail," is due to the fact that the old Indian trail along the river crosses this tract and is still plainly visible. On the higher bluffs back of the Trail is the Indiana Soldiers' Home, itself an attraction productive of much pleasure riding. At the Trail a band-stand, a shooting gallery and a dance hall and restaurant building have been erected. The park is under the management of Mr. George Malchus.

PORTLAND, ME.

The Portland Railroad Co. operates three pleasure resorts called Riverton, Underwood and Cape Cottage. Riverton is located $5\frac{3}{4}$ miles from Portland, Me., Underwood is $6\frac{1}{4}$ miles from Falmouth and Cape Cottage is $5\frac{1}{2}$ miles from Cape Elizabeth. The resorts are all operated by the company and Riverton is under the management of Mr. D. B. Smith. At Riverton a rustic theater with a capacity for 2,500 people is operated during the summer, and at Cape Cottage there is an enclosed theater seating 1,000 people. Vaudeville performances are given at the rustic theater, and drama at Cape Cottage. Both of these entertainments have proved very successful.

KEY WEST, FLA.

The Key West Electric Co. has purchased a site for a summer resort which is being improved and equipped for a pleasure park. The improvement of the park is still under way, and it is expected that it will be completed at an early date.

KNOXVILLE, TENN.

The Knoxville Traction Co. operates Chilhowee Park, located four miles from the center of Knoxville. The park is managed



During the coming season the company expects to provide high class theatrical entertainments in the pavilion as well as other outdoor attractions in the park, and it has provided a large number of steel row boats which are rented at very low rates.

Glenmary Park, the other resort operated by this company, is

by Mr. E. R. Roberts and contains a theater with a seating capacity for 1,200 people. Repertoire plays and specialty acts have been found the most remunerative entertainment, and in addition to the theater the park contains merry-go-rounds and a gravity railway, billiard hall, bowling alleys, shooting galleries, donkeys and a "zoo."

COLORADO SPRINGS, COL.

The Colorado Springs & Interurban Railway Co. operates a pleasure resort called Cheyenne Park which is located $4\frac{1}{2}$ miles from the end of the Cheyenne Canyon line. This park was built on personal property by Mr. W. S. Stratton, the president and general manager of the company, for the use of the road and was operated last summer and will continue to be operated during the coming season. The park comprises about 10 acres of land at one end of which the company has constructed a loop for the Cheyenne Canyon line. At this end of the park there are waiting rooms, constructed of steel, which contain refreshment counters for the accommodation of the public. The accompanying illustrations show several views in this park. It contains numerous small lakes stocked

feature. The company contemplates making some improvements to the park in the near future.

HOT SPRINGS, ARK.

The Hot Springs Street Railway Co. owns Whittington Park, located one mile from the city, which is operated by Messrs. H. O. and R. E. Price, lessees. The park contains a theater of 1,500 seating capacity, as well as ball grounds, electric merry-go-rounds and dancing pavilion. Base ball, a horse show and live and clay pigeon shooting have been found to be the most remunerative entertainments.

HAMILTON, O.

The Cincinnati, Dayton & Toledo Traction Co. owns a resort called Lindenwald Park, situated in the suburbs of Hamilton $2\frac{1}{2}$ miles from the court house. The park is leased to Mr. John W. Foster, manager. It contains a theater in which comic opera has been given with great success, and its other attractions include a



VIEWS OF STRATTON PARK, COLORADO SPRINGS, COL.

with native trout and gold fish, a refreshment pavilion, also a band stand where, during the summer and in fact for the greater part of the year, the company has been giving band concerts Sunday evenings, and three evenings during each week. Moving pictures are shown every evening during the summer and this style of entertainment, together with the band concerts, have been found very profitable as the company has frequently had to handle from 4,000 to 6,000 people at one of these entertainments. Some other attractions are to be added to the park this summer, the character of which has not yet been determined. The park contains no theater and is operated by the street railway company.

SAN DIEGO, CAL.

The San Diego Electric Railway Co. operates Mission Cliff Park, located $3\frac{3}{4}$ miles from the center of the city. The park contains a small theater with a capacity for about 300 people, in which the company has given free concerts Sunday afternoons, including both vocal and instrumental music. The management of the park considers the local population to be too small to support more than occasional attractions. The park has a mountain view of about 30 miles and most visitors to the city visit the park because of this

dancing floor, picnic grounds, swings, merry-go-rounds and refreshment stands.

PORTLAND, ORE.

The Oregon Water Power & Railway Co. owns a park called Canemah Park, situated 15 miles out of the city. The park is operated by the company and is under the management of Mr. G. C. Fields, superintendent. The park does not contain a theater, and the most attractive features have been found to be a pavilion and ball grounds.

KINGSTON, ONT.

The Kingston, Portsmouth & Cataraqui Electric Railway Co. operates Lake Ontario Park, which is owned by the company and is situated at the mouth of the St. Lawrence River $2\frac{1}{2}$ miles from the city of Kingston. The park is under the management of Mr. H. C. Nickle and contains a theater capable of seating 500 people. High-class vaudeville has been found the most remunerative attraction and the park is also used for various sports such as baseball, football, etc. The baseball grounds are considered among the finest

and they are provided with a grand stand having a seating capacity for 200 people.

INDIANAPOLIS, IND.

The Indianapolis Electric Co. owns Casino Park, located 2 1/4 miles east of the city, which it leases to Messrs. Breinig & Miller. Mr. H. L. Breinig is the manager of the park. It contains a casino with a seating capacity of 3,000, in which vaudeville and light opera have been given with success. The company also gives free band concerts at the public park owned by the city.

MUSCATINE, IA.

The Citizens Railway & Light Co. owns and operates what is known as the City Railway Park, located 1 1/4 miles from the city on the company's railway line. The park is managed by Mr. H. T. Fiske and contains a theater of 2,000 seating capacity, in which vaudeville and light opera are given during the summer. The other attractions are band concerts and fireworks. This park was opened for its first season last summer.

AMSTERDAM, N. Y.

The Amsterdam Street Railway Co. operates Akin Park which is a three-acre tract situated four miles west of the center of the city. During the summer the company draws pretty good crowds to picnics and sacred concerts on Sunday afternoons. It contains a pavilion which is open for dancing, but on account of the small size of the park the company has not made a special feature of park entertainments.

FITCHBURG, MASS.

The Fitchburg & Leominster Street Railway Co. operates Whalom Park, located 3 1/4 miles from the city. The park is under the management of Mr. W. W. Sargent, and it contains a theater with a seating capacity for 3,000 people in which comic opera and vaudeville are given. A detailed description of Whalom Park was published in the "Review" for March, 1901, page 165, and October 1901, page 760.

MARQUETTE, MICH.

The Marquette City & Presque Isle Railway Co. does not own any pleasure resort but its lines connect with the Presque Isle Park which is located three miles from the city and which is owned and operated by the city. The park is in charge of Mr. Robert Hume and boating and dancing are the principal amusements during the summer. No entertainments are given in the winter.

GREENSBURG, PA.

The Pittsburg, McKeesport & Greensburg Railway Co. owns and operates Oakford Park, 3 1/2 miles from Greensburg. The park contains a theater with a capacity for 900 people in which refined vaudeville has proved the most attractive entertainment.

SAVANNAH, GA.

The Savannah Electric Co. operates Casino Park located five miles from Savannah which is under the management of Mr. L. W. Nelson. The park contains a theater of 600 seating capacity in which vaudeville performances are given. This, and balloon ascensions have proved the most attractive class of entertainment, and other attractions such as yacht races, high wire performances, etc., are occasionally given.

ELMIRA, N. Y.

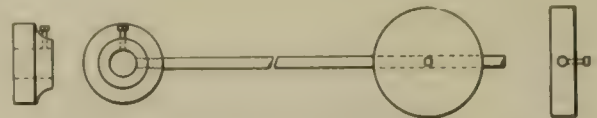
The Elmira Water, Light & Railroad Co. owns and operates Roricke Glen Park located on the Chemung River 2 1/2 miles from Elmira. The park is managed by Mr. Charles W. Smith and contains a theater with a seating capacity of 1,500. Light opera has proved the most remunerative entertainment and in addition to this, vaudeville, horse and animal shows have also been given.

CORRESPONDENCE.

Editor "Street Railway Review":

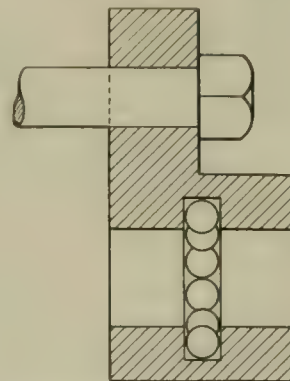
Taking it for granted that all engineers of street railway power houses are more or less troubled with "racing" engines, I will give my experience in remedying the defect, hoping it will be of some use to others confronted with the problem.

Upon taking charge of this station, which contains two cross compound engines, size 14 and 28 x 36 in., I found they were regulating



COUNTERWEIGHTED GOVERNOR ROD.

very badly, and after thoroughly overhauling all working parts and finding no serious defect, I started to experiment upon lines of my own. There is a 1 1/4-in. rod running between the high and low pressure guide frames, one end of which is connected to the governor mechanism and the other to the low pressure cut-off, as is customary in cross compound engines. Upon this I placed a counter balance in such a way that the governor should be assisted in its ascent



BALL BEARINGS FOR GOVERNOR ROD.

and also to steady it, which proved to be a great advantage. A short time after, I removed the bearings at each end of the rod, and turned a groove in them, introducing steel balls such as are used in bicycle ball bearings, practically making ball bearings of them, this completing the job. I have now two very satisfactorily working engines at least 50 per cent better than formerly.

Byfield, Mass.

J. W. Small, Chief Engineer,
Georgetown, Rowley & Ipswich Street Ry.

IDEA FOR SMALL ROADS.

There is a suggestion to the manager of the small road in the practice of the Chattanooga (Tenn.) Electric Railway Co. which trains all its motormen and conductors for work on either end of the car. After an applicant for the position of either motorman or conductor has been accepted he is first required to spend some time in the shops familiarizing himself with all the details of repair work; next he is sent out on the front platform of a car and is thoroughly instructed as to the duties of motorman; and he is then given a certain period of instruction as conductor. Each employee is therefore competent to do general repair work, to run a car as motorman or to perform the duties of conductor. This general utility of the men has been found of great service in times of emergency, as when, for instance, a motorman is needed when only conductors are available.

At the last meeting of the South Australian Parliament an act was passed to provide for the construction of a line of railway from Oodnadatta to Pine Creek which will require some 1,063 miles of single track which is to be built to 3 ft. 6 in. gage and laid with 60-lb. steel rails.

RECENT STREET RAILWAY DECISIONS.

EDITED BY J. L. ROSENBERGER, ATTORNEY AT LAW, CHICAGO.

RIGHT TO ERECT AND MAINTAIN POLES AND WIRES NOT TRANSFERABLE FROM ROAD

City of Carthage v. Carthage Light Co. (Mo. App.), 70 S. W. Rep. 930. Dec. 1, 1902.

The right, conferred by a franchise ordinance, to erect and maintain poles and wires in the streets and alleys of a city incidental to and in connection with the operation of an electric street railway, the court of appeals at Kansas City, Mo., holds, cannot be disconnected with the operation of said street railway and transferred to one who does not own the said street railway franchise nor operate the same under it.

ORDINANCE IMPOSING DUTIES ON MOTORMEN BIND- ING ON COMPANY.

Gulf, Colorado & Santa Fe Railway Co. and Rapid Transit Railway Co. v. Holt (Tex. Civ. App.), 70 S. W. Rep. 591. Nov. 8, 1902. Rehearing denied Nov. 29, 1902.

A city ordinance prescribing a course of conduct to be pursued by motormen in the operation of cars, as for example requiring them to stop their cars and ring their gongs at a distance of five feet from the intersection of any street railway or steam railway track, the civil court of appeals of Texas holds, is as binding on the company as though the ordinance specially named the company therein.

FOREIGN CORPORATION NOT COMPLYING WITH STATE LAW CANNOT MAINTAIN ACTION FOR CON- STRUCTION OF ROAD.

Delaware River Quarry & Construction Co. v. Bethlehem & Nazareth Passenger Railway Co. (Pa.), 53 Atl. Rep. 533. Oct. 13, 1902.

The supreme court of Pennsylvania says that the effect given by its decisions to the act of April 22, 1874, which provides that no foreign corporation shall do any business in that commonwealth until it has complied with certain requirements, is to prohibit a recovery by a foreign corporation on a contract made in violation of the provisions of the statute. And, while it says that isolated transactions between a foreign corporation and citizens of Pennsylvania have been held not to come within the prohibition of the act, it holds that a foreign corporation was within the prohibition when it came into the state with its agents and workmen, and for the period of six months was engaged in the continuous prosecution of its ordinary business, constructing 10 miles of electric railway, employing a large amount, if not all, of its capital, and creating new obligations day by day. Nor was registration two months after the work was completed sufficient to entitle it to maintain an action for labor and materials furnished by it in the construction of such railway.

FRANCHISE ACQUIRED PRIOR TO VESTING OF RIGHT OF ACTUAL CONSTRUCTION UNDER STATUTE.

Commonwealth v. Uchland Street Railway Co. (Pa.), 53 Atl. Rep. 513. Oct. 13, 1902.

The Pennsylvania railway act of June 7, 1901, gives to any company incorporated under it authority to adopt extensions, and, as requisite to the establishment of an extension, exacts no more of such company than that its resolution to extend over a route described shall be recorded in the appropriate recorder's office, and that an exemplification of this record shall be filed in the office of the secretary of the commonwealth, though "no right to actually construct the same [the extension] shall vest until after thirty days from the filing of said exemplification." A charter was granted to a company June 10, 1901. On June 26, 1901, an exemplification for an extension was filed in the office of the secretary of the common-

wealth. On July 10, 1901, another company took out a charter to construct its railway on a route including two of the same streets already taken by the first-mentioned company. The supreme court of Pennsylvania holds that the charter of the second company was invalid, the act further providing that whenever a charter should be granted to build a road, no other charter to build a road on the same streets, highways, bridges or property, should be granted to any other company. The view apparently taken is that it is only the "right to actually construct" the extension which is deferred for thirty days after the date of filing the exemplification, the company having done everything required of it to establish an extension being immediately invested with a franchise, with an exclusive privilege in the streets covered by the extension.

LIABILITY FOR INJURY TO PASSENGER JUMPING OR PULLED OFF CAR OR JUMPED UPON, A COLLISION OF CARS APPEARING IMMINENT.

Birmingham Railway & Electric Co. v. Butler (Ala.), 33 So. Rep. 33. Nov. 25, 1902.

One of the averments in this case being that the company's agent negligently caused or allowed another car "to appear to be in imminent danger of colliding with" the car on which the plaintiff was a passenger, it was contended that in order to constitute a good cause of action thereunder it should appear from the allegations—First, that the appearance of imminent danger was such as to convince a reasonable person of the imminence of such danger; and, second, that, as the result of such appearance, the plaintiff, in order to save herself, jumped from said car, as any reasonable person might have done under such circumstances, and thereby she was injured. The supreme court of Alabama holds the contention sound.

There was evidence tending to show that the plaintiff was pulled off of the car by the gentleman accompanying her, and also evidence tending to show that another passenger, after she had fallen or been pulled off, jumped or fell upon her. In either event, the supreme court says, if imminent danger and peril from collision of cars existed in fact, or if the appearance of such imminent danger was such as to reasonably impress an ordinarily prudent person of its presence, and the acts above stated followed in efforts of escape or safety, the question of the company's liability in law would be the same. In either case the negligent act of the company would be the proximate cause.

DUTY AS TO KEEPING TRACKS IN REPAIR—PAVING AND REPAVING—ORDINANCE REQUIRING REPAIR OF PAVEMENT CONFERS NO RIGHT OF ACTION ON INJURED TRAVELER—ORDINANCE NOT SUPPORTED UNDER POLICE POWERS.

Fielders v. North Jersey Street Railway Co. (N. J.), 53 Atl. Rep. 404. Nov. 17, 1902.

It is familiar law, the court of errors and appeals of New Jersey says, that a railway company, having the right to lay tracks in a public street, is bound, by the general principles of the common law, and without a specific statute or ordinance or a contractual obligation, to lay its tracks in a proper manner, and to keep them in a proper state of repair. But the question of the liability of such a company for failing to keep the surface of the street in repair is quite a different question. Such a liability does not result from the mere fact that the corporation has been vested with a franchise or license of using the public street. The liability to maintain the pavement as such, if it exists, must either be rested upon some valid statute or ordinance imposing such a duty, or must arise out of the obligations of a contract.

Where a city ordinance in terms requires all street railway companies to pave, repave, and keep in repair, under the direction and to the satisfaction of the proper municipal authorities, the space between the rails of their tracks, and between the tracks, and the space

for one foot outside of each outer track, at the same time providing that, if any company fail so to pave or repave or to keep the pavement in repair, the city authorities may cause the work to be done, and the company shall, on demand, pay the cost thereof, the court holds, as a matter of construction, that the ordinance does not confer a right of action upon any member of the traveling public who may sustain damage through the non-repair of the street.

Such an ordinance as that just described, the court further holds, is an assumption of the power of taxation, and cannot be supported under the police powers conferred upon the municipality by the legislature.

INJURY TO PASSENGER ON RUNNING BOARD BY BEING
STRUCK BY GIRDER OF BRIDGE—DUTY TO PAS-
SENGERS—DUTY TO PASSENGER AND EMPLOYEES
IN CONSTRUCTION OF TRACKS—INSPECTION
NOT REQUIRED OF PASSENGERS OR
EMPLOYEES.

San Antonio Traction Co. v. Bryant (Tex. Civ. App.), 70 S. W. Rep. 1015. Nov. 19, 1902. Rehearing denied Dec. 17, 1902.

A man 60 years of age was received as a passenger on a crowded car near a bridge. The car was put in motion before he could find and secure a seat. He was on the west side when he paid his fare by depositing in a box in front, and the only vacant seat was on that side, in the rear. Not wanting to disturb the lady passengers, whose dress skirts fell across the aisle, he stepped down on the running board, went along it until he reached the seat, and in his endeavor to reach it he was struck by an upright girder; the car having in the meantime attained a speed of from five to six miles an hour. He had for six months previously daily crossed the bridge on the company's cars and testified that he did not know, nor had he observed, the dangerous proximity of the track to the bridge. The court of civil appeals of Texas holds that it could not be said that he was guilty of contributory negligence as a matter of law.

Nothing is more firmly settled, the court says, than the proposition that railway companies are bound to exercise extraordinary diligence in protecting their passengers from injury. The track is just as essential a thing in the transportation of passengers by rail as is the car in which they ride. A railway car cannot be successfully or safely run except upon a track, and a railway company cannot lawfully, either as to car or track, be wanting in extraordinary diligence towards passengers without becoming responsible in law for the consequences. This duty of so constructing and maintaining its track as to not expose its passengers on its cars to danger the passenger above mentioned had the right to presume had been performed by the company in laying its track along said bridge, and, unless he knew that it had failed in such duty, he had the right to act upon such presumption. The degree of care that a common carrier by rail owes to its passengers in protecting them from defective construction of its railroad is higher than it owes to its servants. To the former it owes the utmost care, to the other ordinary care. Neither are required by law to inspect or ascertain whether this duty has been performed. Each may rest upon the assumption that it has been.

JUDGMENT IN ACTION AGAINST LESSOR FOR INJURIES
BAR TO ACTION AGAINST LESSEE—LESSOR
LIABLE FOR NEGLIGENCE OF LESSEE.

Anderson v. West Chicago Street Railroad Co. (Ill.), 65 N. E. Rep. 717. Dec. 16, 1902.

The only question argued by counsel before the supreme court of Illinois was the effect of a judgment in a suit by the plaintiff against the Cicero & Proviso Street Railway Company as an estoppel in this case. The facts, as found by the appellate court, were that the Cicero & Proviso Street Railway Company was the lessor, and the West Chicago Street Railroad Company, was the lessee, of the street railway on which the accident occurred, and that the injury and negligence charged were the same in both suits. The conclusion of the appellate court from these facts was that the lessor

and lessee sustained the relation of principal and agent to each other, and that the determination of the suit against the principal was res judicata in the suit against the agent, and a bar to its further prosecution, and that hence an instruction asked by the West Chicago Street Railroad Company to find for it should have been given. The judgment of the appellate court is affirmed by the supreme court.

It is the settled law of this state, the supreme court of Illinois says, that when injury results from the negligent or unlawful operation of a railroad, whether by the corporation to which the franchise is granted or by another corporation or other corporations which the proprietary company authorizes or permits to use its tracks, the company owning the railway tracks, and franchise will also be liable, and for this purpose the company whom it permits to use its tracks, and its servants and employees, will be regarded as the servants and agents of the owner company, and no other negligence than that of the lessee need be alleged or proved to fix the liability of the owner. In other words, in the case of a leasing of a railroad by one company to another company, the negligence or tort of the lessee company in operating its road is by the law of this state imputed to the lessor company, because it cannot absolve itself from the responsibility imposed by law upon it to operate its road so as to do no unnecessary damage to the person or property of others. The relation between them, so far as it has reference to such damage, is not that of landlord and tenant, but that of principal and agent, or master and servant. Both being liable to the party injured, such party could sue them both in the same action, or sue each one separately, but if one was not guilty of the tort the other one could not be.

RISK ASSUMED BY PASSENGER PASSING ALONG RUN-
NING BOARD ON SIDE NEXT TO PASSING CARS—
DUTY OF PASSENGER TO PLACE HIMSELF IN
POSITION OF SAFETY—EVIDENCE OF ACTS
ON PREVIOUS OCCASIONS, WIDTH OF
CARS AND USE OF RAIL ON INSIDE
OF NEW ONES EXCLUDED.

Moody v. Springfield Street Railway Co. (Mass.), 65 N. E. Rep. 29. Oct. 30, 1902.

The party suing boarded a car, with some friends, he walking towards the rear end and getting onto the running board, paying his and their fares, and moving along the running board to take a seat with them, in doing which he was struck by a car on the other track, of the approach of which he testified that no warning was given him. Without undertaking to say that in no case would a passenger upon an electric car, who was injured by being struck by a passing car while attempting to pass along the running board, while the car on which he was was in motion, from one part of the car to another, on the side on which cars were liable to pass, be entitled to recover, the supreme judicial court of Massachusetts thinks that in this case there was nothing to justify the party, as matter of law, in so doing, and that he must be held to have assumed the risk, if not to have been wanting in due care. Generally speaking, the court says, it is the duty of a passenger who boards an electric car to place himself in a position of safety. It is not necessarily negligent for him to stand on the platform, and there may be circumstances—such as the crowded condition of the car—which justify him in standing or being upon the running board. But manifestly a position on the running board of a car in motion, on the side on which other cars are liable to pass, is one of danger; and the court thinks that a passenger who boards an electric car in which there are plenty of vacant seats at the place where he boards it, and who chooses, for his own accommodation and pleasure, to pass along the running board, while the car is in motion, to another part of the car, on the side on which other cars are liable to pass, must be held to have assumed the risk of contact with and injury from cars passing on the neighboring track.

Evidence offered by the party that he had been on previous occasions on the running board on the side next to passing cars, and had not been injured, the court holds, was rightly excluded. It had no tendency to show that he did not assume the risk, or that he was in the exercise of due care. Whether he was in the exercise of due care depended not on what he had himself done on previous occa-

sions, but on what persons of ordinary prudence would do under the same circumstances. The court also holds that the exclusion of testimony offered as to the width of the cars did the party suing no harm. It would have had no tendency to show that he did not assume the risk, or that he was in the exercise of due care. Likewise, it holds that testimony in regard to a rail being used upon the inside of some new cars was also rightly excluded. The obvious purpose of it was to prevent passengers from getting onto or off from the car on that side. The fact that it was on the new cars, and not on the old ones, was no proof of negligence on the part of the company.

POWER OF CITY TO PRESCRIBE MAXIMUM RATE OF
FARE—OCCUPATION CLASSED WITH THAT OF
HACKMEN, OMNIBUS DRIVERS AND CABMEN—
VALIDITY OF ORDINANCE REGULATING
FARES AND PROVIDING FOR TRANSFERS
—POWER TO PROVIDE FOR TRANSFER
TICKETS—WAIVER BY LESSORS—
COMPANY ORGANIZED TO
LEASE ROADS MUST COM-
PLY WITH OWN
CHARTER.

Chicago Union Traction Co. v. City of Chicago (Ill.), 65 N. E. Rep. 451. Oct. 25, 1902. Rehearing denied Dec. 16, 1902.

Has the common council of the city of Chicago the power to prescribe a reasonable maximum rate of fare to be charged for carrying a person from one point to another within the limits of the city of Chicago by a person, firm, or corporation engaged in the business of carrying passengers for hire on street railways? That is the first question taken up by the supreme court of Illinois in this case. It says that under its charter the common council of the city has power to regulate hackmen, omnibus drivers, cabmen, "and all others pursuing like occupations, and to prescribe their compensation." Street railway companies come within the purview and meaning of the words "all others pursuing like occupations," as used in connection with hackmen, omnibus drivers, and cabmen. The occupation of hackmen, omnibus drivers, and cabmen is the carrying of passengers for hire. All of the last-named vehicles are drawn by horses. The acts of 1859 and 1861, under which the company claimed its rights herein, were acts to promote the construction of horse railways, and to authorize the extension of horse railways in the city of Chicago. The ordinances of 1858 and 1859, under which, also, it claimed its rights, were ordinances authorizing the construction, extension, and operation of horse railways in the streets of Chicago. The railways referred to in these acts and ordinances were nothing more than carriages drawn by horses, with the exception that such carriages moved upon fixed iron rails, in a regular track, with wheels, while the other vehicles mentioned go with wheels upon the ordinary street way. The occupation of the traction company is the carrying of passengers for hire, and therefore its occupation is like the occupation of hackmen, omnibus drivers, and cabmen. By the application of the maxim *eiusdem generis* (of the same kind or nature), which is only an illustration or specific application of the broader maxim *noscitur a sociis* (it is known from its associates), the rule is deduced that, "when general words follow an enumeration in particular cases, such words apply only to cases of the same kind as those expressly mentioned, or, stated in different language, the word 'other,' following an enumeration of particulars, embraces enumerated particulars of like nature only, unless a broader sense is obviously intended." Here the general words, to wit, "all others pursuing like occupations," follow an enumeration of particular cases, to wit, hackmen, omnibus drivers, and cabmen, and consequently such general words apply to cases of the same kind as those expressly mentioned. Again, the court says that it necessarily follows (from the purport of decisions upon the subject) that those whose business it is to propel street railway cars along the iron tracks laid in the public streets of a city are engaged in the business of carrying passengers for hire, and that their occupation is of a like nature with the occupation of hackmen, omnibus drivers, and cabmen, whose business, also, is the car-

riage of passengers for hire. The general doctrine is that the legislature has power to regulate the charges of common carriers. The legislature, having such power can confer it upon the common council of the city. In other words, the municipality may exercise the power by delegation from the state.

Therefore, when the legislature gave to the city of Chicago, under its charters, the power to regulate, and prescribe the compensation of street railway companies as carriers of passengers, it gave the city power to pass sections 1723 and 1725 of the Revised Code of Chicago, reading: (Section 1723): "The rate of fare to be charged by any person, firm, company or corporation owning, leasing, running or operating street cars or other vehicles for the conveyance of passengers on any street railway within the limits of the city of Chicago for any distance within the city limits, shall not exceed five cents for each passenger over twelve years of age, and half fare for each passenger over seven and under twelve years of age, for one continuous trip, except when such street cars or other vehicles shall be chartered for a specific purpose. And, at any point where any line of any street railway owned, leased or operated by any person, firm or corporation does now or shall hereafter, within the limits of the city of Chicago, join, connect with, cross, intersect or come within a distance of two hundred feet of any other line of street railway owned, leased or operated by the same person, firm, company or corporation, any passenger who shall have paid his fare on any street car or other vehicles run or operated on such first mentioned line shall, on his request, be entitled to demand and receive from the person or persons in charge of such street car or other vehicle upon which he has so paid his fare, a transfer ticket, which transfer ticket shall entitle such passenger, without further charge, to be carried on any other line adjoining, connecting, crossing and intersecting, as aforesaid, and owned, leased or operated by such person, firm or corporation, for a continuous trip of any distance within the limits of the city of Chicago, if used within one hour after the same is issued at the point or place for which such transfer ticket was issued." (Section 1725): "For each and every violation of the provisions of the two last preceding sections, the person, firm, company or corporation owning, leasing or operating said street cars or other vehicles within said city shall be subject to a penalty of not less than \$50.00, nor more than \$200.00."

The grant of the power to regulate the occupation, and prescribe the compensation of those pursuing it, is accompanied by a grant of power to pass all such ordinances, rules, and regulations as may be proper or necessary to carry into effect the power so granted. If the common council had the power to fix the maximum rate of fare for any distance at five cents, as was done by said section 1723, it also had the power to provide for transfer tickets in the manner and at the places and within the time named in said section 1723. The requirement as to transfer tickets, transferring the passengers from one line to another of the same company, is a mere incident to the power to fix the maximum rate of fare. The charter of the city gave its common council power to prescribe the compensation of persons pursuing the occupation of operating street railways. The compensation referred to can be none other than the fare to be charged for carrying passengers. The power to fix the rate of fare must necessarily include the power to fix the rate for carrying a passenger over two lines operated by one company, as well as the power to fix the rate for carrying a passenger over one line operated by such company; the question being not as to the reasonableness of the charge, but as to the power to regulate or fix the charge.

The traction company insisted that if section 1723 was enforced against it that it would impair its alleged contract rights, and that therefore the section was in violation of the guaranties of the constitutions of the United States and of the state of Illinois. Its contention was that contracts were made in 1859 and 1861 with the North Chicago City Railway Company and the Chicago West Division Railway Company, and that those contracts had passed by assignment to it, the Chicago Union Traction Company. But the court is of the opinion that, if there were any such contracts as were claimed by the traction company, through assignment to it, the enforcement of section 1723 was not a violation of those contracts. The lessor companies must be held to have waived the terms of the contracts when they executed the leases to the traction company; and the traction company was estopped from insisting upon

the operation of the roads in street accordance with the terms of such contract, because it would thereby be violating the express requirements of its own charter. The court says, among other things, that the lessor companies by submitting their roads to the operation of the traction company, impliedly agreed that the latter should operate them under its own charter, and in accordance with the provisions of its own charter. It is true, as a general rule, that, where one railroad company leases its property to another, the lessee must conform to the requirements of the charter of the lessor, and be governed by such charter, in operating the road. But this can only be true where the lessee company, in operating the road in accordance with the charter of the lessor, is not violating its own charter. The cases announcing this rule are cases where the lessee road had full power under its charter to operate the road of the lessor in accordance with the terms of the latter's charter, and without conflict with the lessee's charter. There are some cases which hold that a railroad already constructed, and required by law to charge a certain rate of fare, may lease and operate another road, and charge the rate of fare prescribed by the charter of the lessor company, rather than that prescribed by its own charter. But these cases proceed upon the theory that the lessee road obeys its own charter in operating the part of the road constructed by itself, and operates the road leased by it in connection with its own road in accordance with the charter of the lessor road. In this case, however, the traction company, so far as the record showed, never constructed or owned any railroad. Its president testified that it was organized for the express purpose of buying out the North and West Side railroads. It was a corporation whose business was the leasing of railroads, and not the operation of a road leased in connection with another road constructed by it. In its business of leasing and operating leased railroads, it must comply with its own charter; that is to say, it must submit to reasonable regulations by the common council as to its rate of fare.

CAN BE COMPELLED TO EXTEND TRANSFER SYSTEM
TO SUBORDINATE LINES USED AS FEEDERS. DUTY
OF REAL OR BENEFICIAL OWNER TO GIVE
TRANSFERS. PRESUMPTION AS TO COMPAN-
NY ORGANIZED TO BUILD AND OPERATE
EXTENSION—PRESUMPTION OF REA-
SONABLENESS OF PRESCRIBED
FARE. PROFIT ALLOWED—
WHAT MUST BE SHOWN TO
PROVE RATE UN-
REASONABLE.

Chicago Union Traction Co. v. City of Chicago (Ill.), 65 N. E. Rep. 470. Oct. 25, 1902. Rehearing denied Dec. 16, 1902.

The principal question considered in this case was whether the Chicago Consolidated Traction Company bore such a relation to the Chicago Union Traction Company as to make the two companies come within the purview and meaning of section 1723 of the Revised Code of Chicago, so far as transfer tickets were concerned. The Chicago Union Traction Company was organized under the general law of the state on May 24, 1899. It was nothing more than a consolidation and union of the West Chicago Street Railroad Company and the North Chicago Street Railroad Company. The Chicago Consolidated Traction Company was organized under the general incorporation act of the state on January 28, 1899. It was nothing more than a union or consolidation of seven or eight suburban or outlying companies, which were organized as feeders to, or extensions of, the North Chicago Street Railroad Company and the West Chicago Street Railroad Company. As the original companies substantially and in effect owned and operated the outlying companies before the merger of the original companies into the Chicago Union Traction Company, and before the merger of the outlying companies into the Chicago Consolidated Traction Company, so after such mergers the same relation of subordination and control existed on the part of the Chicago Union Traction Company over the Chicago Consolidated Traction Company. Or, as the supreme court of Illinois further says, the history of the development of the railway system here involved showed that the lines of the Chicago Consolidated Traction Company were built by the lessors of the

Chicago Union Traction Company, the North Chicago Street Railroad Company, and West Chicago Street Railroad Company, and, if not built directly by such lessor companies, they were built under the superintendence of the latter, and with money raised upon bonds guaranteed by the latter, and as extensions of and feeders to the lines of the latter, and were being operated for that purpose. Under these circumstances, the court holds that the Chicago Consolidated Traction Company bore such a relation to the Chicago Union Traction Company as to make the two companies come within the meaning of section 1723 (set out in full in report of another case bearing same title, and decided same date, credited to 65 N. E. Rep. 451), so far as transfer tickets were concerned.

The requirement, embodied in section 1723, the court says, is imposed upon the street railroad companies therein specified by reason of their public character, and by reason of the fact that they are engaged in a public occupation, which permits them to use the streets and highways of the people. The duty to give the transfer tickets therein required is a duty which arises out of the public character of their business. This duty rests not merely upon the technical owner, but upon the real, beneficial owner, and in this case it could not be doubted that the Chicago Union Traction Company was the beneficial owner. It was well said by one of the counsel for the city in this case: "A corporation could not avoid its duties to give transfers from one line to a connecting line by conveying to another corporation a dry legal title to one of the lines, and it is submitted that it is equally impossible to do so by leaving a dry legal title in the hands of the corporation from which it purchased a connecting line." Where the duty of a public service corporation to the public is to be determined, the substance of things will be looked to, and consideration should not be given to mere corporate fictions.

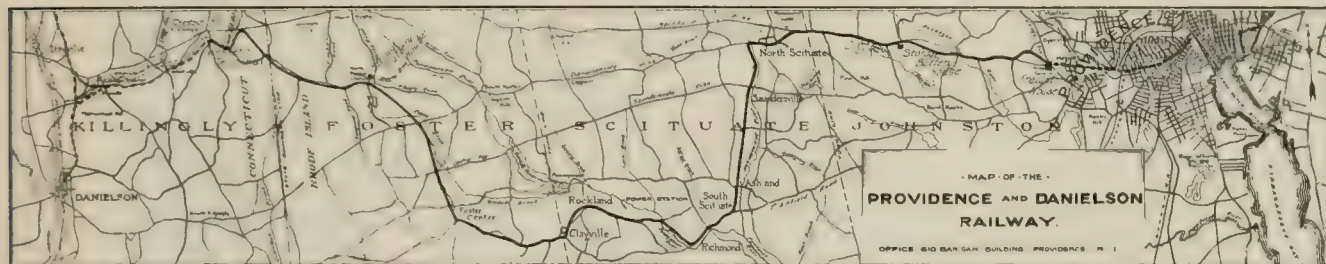
Where a company is organized to build and operate an extension of a railroad system, such company will be regarded as but the instrument of such system to carry on its business, where the stock is all placed in the names of employees of the old corporation, the principal offices of the new corporation are filled by officers of the old one, the old corporation purchases bonds of the new one to construct its road, and furnishes the rolling stock, a traffic agreement is made, by which the new corporation is to work for the old one for a long period of time, the benefit of which is to pass with the sale or mortgage of the property of the old one, and the operating divisions of the road show a single system of management.

Furthermore, the court is of the opinion that the enforcement of the ordinance under consideration, over the lines of the Chicago Union Traction Company as one system of railway, would not so reduce its earnings or profits as to constitute a taking of its property without due process of law. It says, among other things, that the rate of fare prescribed in section 1723 would be presumed to be reasonable until its unreasonableness was shown, and the burden of showing the rate to be unreasonable rested upon the Chicago Union Traction Company. A railroad company is not entitled to exact such charges for transportation as will enable it at all times not only to pay operating expenses, but to meet the interest regularly accruing upon all its outstanding obligations, and justify a dividend upon all its stock. A public service corporation is entitled, at the very most, only to a profit on the actual investment. If the original cost of the roads of the suburban companies be compared with their present value, the Consolidated Company, if it was to be considered as a separate company, had made a large profit, instead of a loss. But if, as this opinion holds, the Chicago Consolidated Traction Company was merely a part of the Chicago Union Traction Company, and owned and operated by the latter company, then it was necessary to show the profits and earnings of the whole system of railways embraced within the Chicago Union Traction Company, and the effect of the enforcement of the ordinance upon all the lines embraced within the whole system. Evidence of the earnings or expenses of a single mile or division of a system of railways is inadmissible to prove that a rate fixed by legislation is unreasonable. The Chicago Union Traction Company should have introduced proof as to the earnings of its entire line, including its original lessor companies as well as the Consolidated Company, so that such earnings of the entire line might be estimated as against all the legitimate expenses of such entire line.

The Providence & Danielson Ry.

The completion of the Providence & Danielson Ry. from Providence, R. I., to Danielson, Conn., marks an important era in electric railway development in New England, for the line not only opens up a new means of easy communication between the western part of Rhode Island and the eastern part of Connecticut, but it also forms the completing link in an unbroken system of electric lines from Worcester, Mass., to Providence, R. I. When certain short physical connections now in process of building are finished

special charter, granted in perpetuity by the General Assembly of the state of Rhode Island, Apr. 29, 1898, and has a capital stock authorized and issued of \$800,000 and a funded debt of \$600,000. This is a single line of electric railway for passengers and freight of about 30 miles in length, consisting of main line, sidings, turnouts and mill connections, mostly complete, with cars running from and through the city of Providence, by virtue of and under the terms of a 99-year contract with the Union Railroad Co., duly approved and



it is not unreasonable to suppose that the widely diverging electric systems centering at Worcester will be connected by through high-speed electric railway service with the ramifying electric systems of Rhode Island centering at Providence. The population affected by this through service, including the cities of Worcester and Providence and the tributary territory, will exceed 400,000. The line from Worcester to a point near Danielson, Conn., is maintained by the Worcester & Connecticut Eastern Railway Co. and from that point to the city of Providence by the Providence & Danielson Ry. The Worcester & Connecticut Eastern Railway Co. is owned and is operated in harmony with the New York, New Haven & Hartford R. R., which has seen fit to adopt the policy of paralleling itself

confirmed by an act of the Rhode Island Legislature; thence running westerly through the towns of Johnstown, Scituate, Saundersville, Ashland, South Scituate, Richmond, Rockland, Clayville and Foster Center to a point in Connecticut at or near East Killingly and thence running its passenger cars via the Worcester & Connecticut Eastern Railway Co. tracks to and into Danielson and other points in Connecticut, and at Dayville to a freight connection with the New York, New Haven & Hartford railroad. The villages the line passes through are mostly manufacturing points, and the enterprises there consist of woolen, cotton, netting, shoe lace, and lumber mills, etc., the raw materials and supplies for which, and the manufactured product, must be transported from and to the markets of Provi-



VIEW ALONG LINE OF PROVIDENCE & DANIELSON RY.

by establishing electric railway lines and thus cutting off competition from rival companies. The Rhode Island Co., controlling practically the entire electric railway system of the state of Rhode Island, is a competitor for business in part of the territory covered, and so the Providence & Danielson road occupies the unique position of holding at arm's length the two great rivals for electric railway business in this section of New England. The situation gives rise to interesting speculation, and future development will be watched with keen interest.

The Providence & Danielson Railway Co. was organized under

dence, New York, Boston and other points via Providence or Danielson, and the company has been given by mill owners all along the line contracts or pledges for a large amount of freight traffic. In each of the several villages there are one or more country stores where merchandise in and out will be handled by the railway instead of by teams as heretofore. The country produces much milk, dairy and other farm products to be taken to Providence or the cities of Connecticut. This traffic is in existence now and will take the electric railway route as against the present roundabout way and save a great deal of time in transit at a cost of less than is paid at present.

This is in addition to freight to and from local points on the line. The company is provided with platform, box and compartment cars designed for handling freight, express and mail of all kinds, including coal, milk, ties, wood, etc., and under the contract with the Connecticut company it will be provided that standard freight cars oper-

ing to ride, and the applications for special cars were accepted only to a very limited extent. Moswansicut Pond in Scituate is a delightful sheet of water, affording fishing, boating and outing facilities, but the company has not yet had an opportunity to do anything toward developing these features there or at other points on the



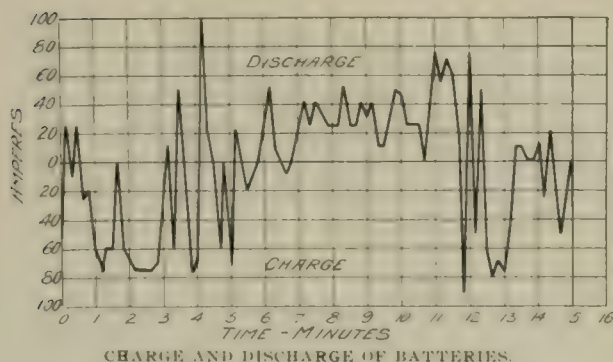
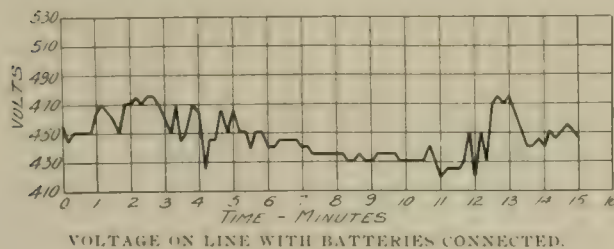
FREIGHT PLATFORM AT TERMINAL BUILDING.

ated by the New York, New Haven & Hartford Railroad Co. will be furnished for foreign bound business and the express business will be operated by Adams Express Co. The company carries the United States mails to and from Providence and the several post-offices along the line. The wood carrying business is especially important and is given particular attention.

The company has acquired the sole right for taking ice from Moswansicut Pond, in the town of Scituate, on the line of the road, the capacity of which is practically unlimited and a sale of

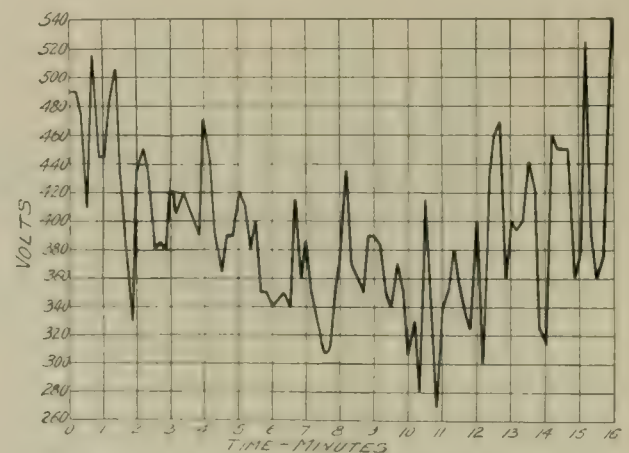
line. The line runs through some of the most picturesque parts of the state, and the excursion business will prove an important feature. With the line operating through to Connecticut, the travel now established on other but circuitous routes, will go that way and the beautiful trolley resort now established by the Worcester & Connecticut Eastern Railway Co. near Danielson will attract many from Providence and interior points on the line. The roadbed for a little less than half the distance is on the highway and the remaining mileage is on private right of way. The construction is 60-lb. T-rails with chestnut and oak ties on gravel and broken stone ballast.

The feature about the road of chief interest from an engineering point of view is the adaptation of storage batteries. When the road was first laid out it was designed for high-tension alternating current transmission with a central power house at a point approximately midway between the two terminals, and two sub-stations



this ice for the next three years, payable annually in advance, has already been made to the Providence Ice Co. at a very advantageous figure.

At times during the summer when travel is always found heaviest on all roads, the cars were unable to take on board all those desir-



located ten miles either way from the main power house. Owing, however, to the inability of the management to secure quick delivery of alternating apparatus, it was decided to use direct current with the main power house containing direct current generating machinery at the central point selected, and storage battery installa-

tions at the two sub-stations, the batteries to be supplied either from boosters or from the main feeders as conditions should develop.

Concerning these batteries the Electric Storage Battery Co. gives us the following information:

The accompanying curves are from readings taken at the Johnson battery house, which is the one near the Providence end of the line. These readings were taken at the battery house during two periods of 15 minutes each at the same relative time in the schedule, that is when a car had left the end of the line and was approaching the battery. During the first period the battery was on the line in its regular service and the readings show the voltage at the battery house under these conditions, and also the amperes discharged by the battery. The third curve, taken an hour later, shows the voltage at the battery house with the battery out of circuit. As will be seen the voltage rises higher and falls lower without the battery than with it, the battery acting as an equalizer at this point. The length of track supplied with power from the central station, which is about midway of the line, is about 26 miles. The profile of the road rises continually from the Providence end outward, the highest elevation being 578 ft. above the sea level. The country is rolling and quite hilly. A glance at the profile gives something the idea of a bowl, the power station being at the bottom of the bowl. Between three and four miles from each end of the road the ground rises rapidly and then falls away again, giving the profile the appearance of having two humps near the ends. On this account there is a long, heavy climb at each end of the road, followed by a descent towards the power station.

It would be difficult to operate the road by direct current with the small amount of copper that is now used without the storage batteries, which are located near the tops of the two humps alluded to, being near the ends of the line. The copper at present on the road consists of a No. 00 trolley re-enforced by a No. 0000 feeder throughout and a second No. 0000 feeder running $9\frac{1}{2}$ miles from the power station towards the Providence end and eight miles from the power station towards the Danielson end. The ordinary service is taken care of by an hourly headway from Olneyville, a suburb of Providence, which brings from two to three cars on that side of the power station continually. On heavy days this service is practically doubled, and considerable freight is hauled, in addition to the regular service, at irregular intervals. Many cords of wood have been brought into the city this year owing to the scarcity of coal; the company hauls all its own coal to the power station and there is

the road, has 216 cells of type F-13 in glass jars, rated at 240 amperes for one hour. Both batteries are housed in wooden buildings with monitors and are erected on wooden supports resting on a concrete floor finished with cement, the wooden support being insulated therefrom with glass insulators. At the end of the house a room



BOILER ROOM.

is partitioned off for the switchboard, which consists of blue Vermont marble and carries a Weston ammeter and voltmeter, a circuit breaker, a Bristol recording voltmeter and a single-pole single-throw knife switch. The number of cells in each case is calculated for the average voltage at that point and the battery is found to float readily on the line; that is, in the course of a twenty-four hour run the pressure at the battery houses is such that the batteries maintain about the same state of charge. Should the service increase a little on certain days, the batteries getting low at the end of the day, an extra run of an hour or so suffices to bring them up.

In the power station a 150-kw. reserve unit has been connected so that it may be thrown into service as a booster with a booster feeder consisting of three No. 4 wires which can be separated from



INTERIOR OF ENGINE ROOM.

a regular service for bringing milk into the city from the country. Mail and express are also carried. The Johnson battery, the one at the Providence end of the road, consists of 210 cells, "Chloride Accumulator," type F-15, in glass jars rated at 280 amperes for one hour. The North Foster battery, the one at the Danielson end of

the ordinary copper and will then carry current starting at 800 to 1,000 volts pressure at the power station direct to the battery houses. This booster is intended to be run when the load is heavy in order to maintain the voltage at the batteries, and can be used at any time when the batteries are discharged for forcing a more rapid

charge. This machine is run infrequently and the connections for making it a booster do not interfere in any way with using it as an ordinary generator in case of need, it being a question simply of throwing certain switches to obtain proper connections.

When the traffic grows to sufficient proportions there will be installed in the power station an alternator, either motor driven or

and two 18 x 42 in. Harris-Corliss condensing engines, each belted direct to a 150-kw. Sprague-Lundell direct current generator.

Last spring additions were made to the plant and a 20 and 36 in. x 42 in. Harris-Corliss cross-compound condensing engine was installed, belted direct to a 400-kw. Sprague-Lundell direct current generator. The engine is supplied with steam from a newly in-



FRONT OF TERMINAL BUILDING.

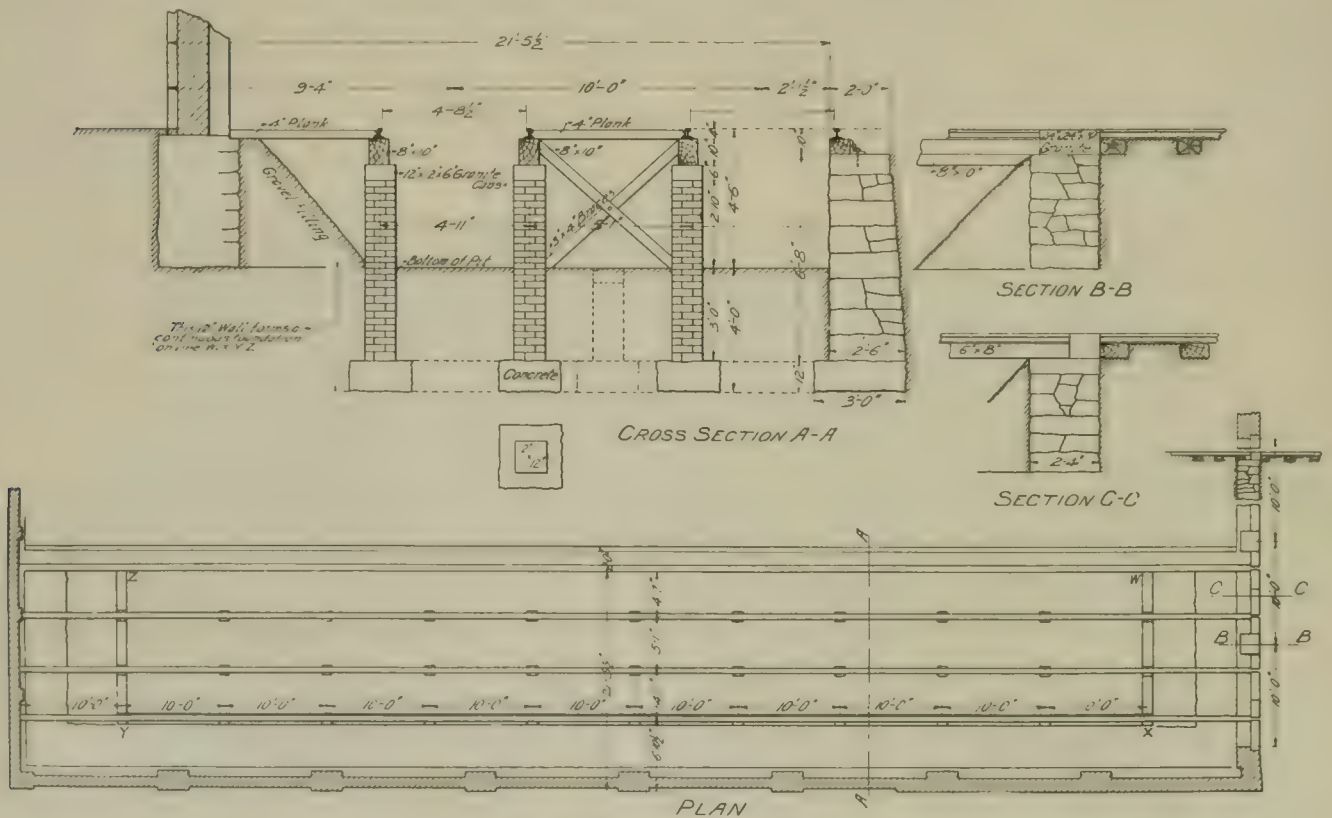


STANDARD CAR.

steam driven, which will supply alternating current over the three feeder wires now used as a direct current booster feeder, this alternating current being transformed at the battery houses by means of rotaries arranged to operate in connection with the storage batteries. Sufficient room has been left in the battery houses for the reception of the rotaries and their switchboards and for the additional number of cells required to bring up the pressure to full station voltage.

stalled 264-h. p. Babcock & Wilcox boiler, fitted with a superheater for giving about 125 degrees of superheat. For this boiler there is a steel stack 66 in. in diameter and 110 ft. high. The condensing apparatus for two of the engines is of the independent type, each engine being connected to a Deane vacuum pump with condensing chamber. The third engine has its condenser driven by a connecting rod from the crank of the engine.

The feed and condensing water are taken from a well near the



PLAN AND SECTIONS OF CAR PIT.

The power station is situated about 17 miles from Market Square, Providence, at Rockland, R. I., on the bank of the Pawtuxet River. It originally consisted of a wooden building, a portion of which is used as a car house and repair shop, the power portion containing three 100-h. p. horizontal, internally fired, locomotive type boilers;

station, which is fed by an intake pipe from the river. The overflow from condensers discharges into the river, below the intake.

The usual system of main and auxiliary feed water heaters is installed, a main heater being attached to the exhaust pipe of each engine; the auxiliary heater taking the exhaust steam from feed

pumps and condenser pumps. The feed water is first pumped through the main heater, where it is heated to, as near as possible, the temperature of the vacuum, thence the water is forced through the auxiliary heater to the boiler, it being raised to nearly 212 degrees in the latter heater. All the feed piping, from heaters to boilers, is of brass. The heaters are the "American" type, made by the Whitlock Coil Pipe Co.

The steam piping for the extension is of wrought iron, with extra heavy long radius, cast iron fittings and the valves are Crosby spring seat. The piping was tested to a pressure of 140 lb. The steam, exhaust and feed water piping was covered by the H. W. Johns-Manville Co.

The rolling stock comprises the following: Eight 38-ft. vestibule passenger cars built by the American Car & Foundry Co. and

left without flooring so that men can work on the lower side of the cars to better advantage.

The building and piping plan for the extension to the power house were prepared by Richard P. Jenks, engineer, of Providence. The designs for the car house were made by James Shaw, jr., architect.

At a meeting of the company held Jan. 15, 1903, the following officers were elected: President, James H. Morris, of the banking house of Morris Brothers & Christensen, Philadelphia; vice-president and general manager, D. F. Sherman; treasurer, George W. Prentice; secretary, Franklin A. Smith, jr. The general offices of the company are in the Banigan Building, Providence, R. I.

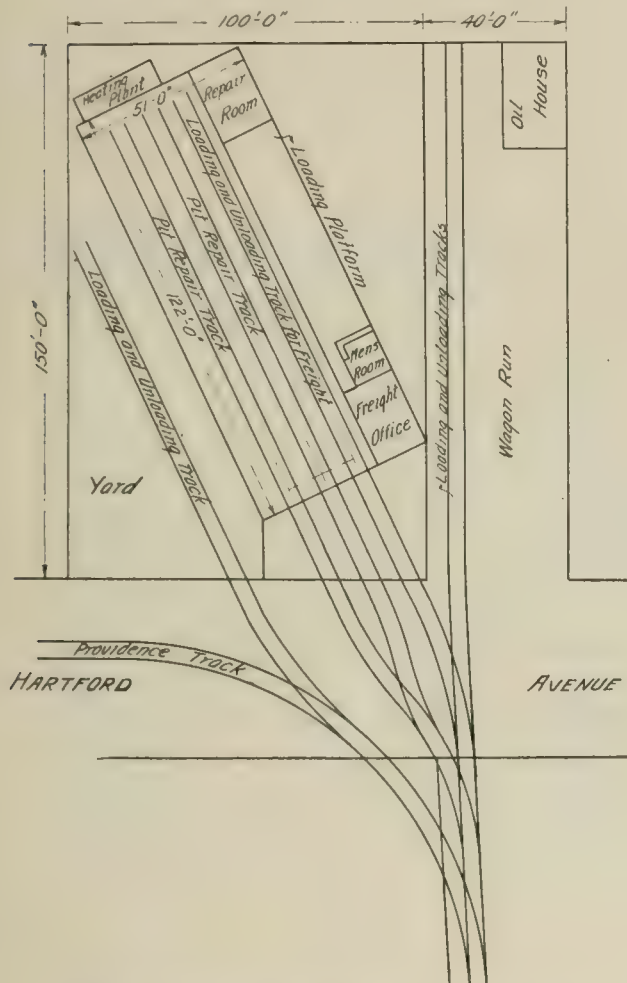
CHICAGO CITY RAILWAY REPORT.

The annual meeting of the stockholders of the Chicago City Railway Co. was held Feb. 16, 1903. The report of Pres. D. G. Hamilton which accompanied a statement of financial and operating statistics was as follows:

"Notwithstanding the trying conditions under which this company has been compelled to operate, the business, for the year 1902, has shown flattering results. Still further pursuing the policy of the management to best subserve the wants of the public, large sums have been expended in thoroughly maintaining the road and equipment, which are in good condition, as well as increasing the temporary power capacity in order to meet the traffic demands. The great increase in car mileage (2,028,684 miles), to facilitate the frequency of service, while it has furnished more accommodations to the public, has been the prolific source of increased expense. The operating expenses have been further increased by the replacement and renewal of worn-out pavement; by the rebuilding of over one mile of discarded double track, one track with grooved rail and one with T rail, and by repaving of that part of the street reserved to the company with new granite blocks, according to city specification; and by the reconstruction of eight miles of track on several streets.

"In addition to these items of maintenance, a large expenditure has been made for betterments and additions, as well as to prepare for the installation of the proposed new railway, the construction of which a franchise may warrant. The new car-house has been completed. Large repair and machine shops have been erected, the construction of an additional 77 miles of underground electric duct conduits, for feed wire has been finished; additional land bought for the site of the new proposed power station, all of which additions and betterments are needed in anticipation of the construction of an ideal railway system. Since the last report, the 125 large electric cars have been placed in service, and within a few days 80 will be added to the present equipment on the Halsted St. line, and 5.81 miles of track, on new extensions, has been built. Two years ago a large storage battery was installed and additions thereto have been made during the year; also additional boilers have been installed at the 52nd St. station in order to utilize the engines at their maximum load. A complete power plant, boiler, engines and electrical apparatus of 2,000 h. p. capacity, has been installed at the corner of 21st and Dearborn Sts., and during this month has been put into operation, to assist in handling the increased traffic of the electric lines; and yet, if the traffic increase still continues, there must be still further additions along that line.

"The proposed new power plant will contain the most modern apparatus for the economic and reliable production of power, and for which none of that in use now, except the new boilers, will be serviceable. Owing to the immense demand throughout the country for this modern apparatus, the time of its delivery will be remote, and it is believed that at least three years will be required to complete the new installation. In the meantime, the present traffic, as well as the increase thereof, must be provided for, although it involve the expenditure of large sums in which there will be small salvage. The management has used every endeavor to settle the franchise question during the year. It did not feel warranted, pending its settlement, to contract for apparatus and construction costing millions of dollars, but has exerted itself to render the best and most efficient service possible under present conditions. To carry out the policy of the company, to best subserve the wants of the public, there will be needed a large outlay for additional equipment and change of motive power, which is warranted only by reasonable grants, freed from



PLAN OF COMBINED CAR BARN AND FREIGHT HOUSE.

equipped with Peckham double trucks with four Westinghouse 49 motors to each car; two 42-ft. combination cars built by Jackson & Sharp Co., mounted on Peckham trucks with two Westinghouse 49 motors to each car. The cars have Gold heaters, Hale & Kilburn seats, and are fitted with the Wilson trolley catcher. The company owns ten 34-ft. flat cars which are run as trailers and are used in the freight service; also one heavy electric locomotive for hauling the freight cars. In addition there are two 38-ft. express cars built by the Laconia Car Co.; six open trail cars for passenger service and one Taunton snow plow. Ten new cars are soon to be added to the equipment, and among them will be one especially designed for carrying milk with a capacity of 1,000 cans.

The terminal building near the city limits of Providence is a combined car storage and repair shop and freight and express depot. The arrangement of entrance tracks and loading and unloading tracks and platforms is indicated on one of the accompanying diagrams. The repair pits at this house are built with brick piers of hard brick laid in Portland cement, and the space between pits is

conditions, which might render the large expenditure unwarranted, and the investment unsafe."

INCOME ACCOUNT FOR THE YEAR 1902

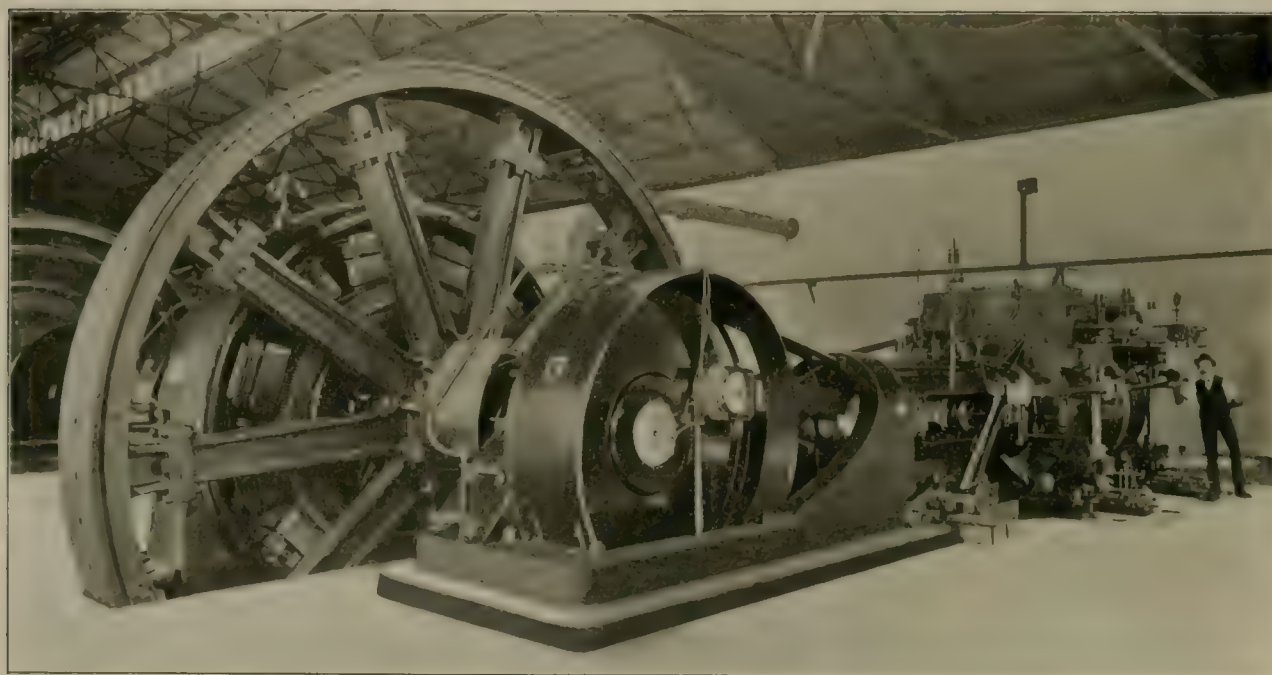
| Earnings | 1901 | 1902 | Increase |
|---|-------------|-------------|-----------|
| Passenger | \$5,850,380 | \$6,307,358 | \$510,972 |
| Other ... | 43,885 | 45,824 | 1,939 |
| Gross | \$5,900,271 | \$6,413,182 | \$512,911 |
| Expenses: | | | |
| Operating including taxes, reserves for replacements and damages. | 3,869,173 | 4,330,504 | 467,331 |
| Depreciation | 180,000 | 180,000 | ..... |
| Bond interest | 103,030 | ..... | ..... |
| Total | \$4,153,142 | \$4,516,504 | \$363,392 |
| Net income | 1,747,159 | 1,896,678 | 149,518 |
| Dividends | 1,020,000 | 1,020,000 | ..... |
| Surplus for the year | \$ 127,159 | \$ 270,678 | \$149,518 |

The ratio of net income to capital stock for the year 1902 was .1054, an increase of .0083; the ratio of operating expenses to gross

INDIANAPOLIS TRACTION & TERMINAL CO.

Dec. 29, 1902, the Indianapolis Street Railway Co. passed into the control of the Indianapolis Traction & Terminal Co. by which it was leased for the term of 30 years. The officers of the new company are Hugh J. McGowan, president and general manager; H. P. Wasson, first vice-president; James M. Jones, second vice-president and assistant general manager; W. F. Milholland, secretary and treasurer, and Miller Elliot, superintendent. The new company contemplates a large number of improvements many of which are now under way, while others to be made are not yet fully decided upon. One of the principal of these will be the building of a union station in Indianapolis which will be used as a general terminal for the city lines and all of the interurban railways entering the city. There are six of the latter now running into Indianapolis and two others which are in course of construction, besides several others for which franchises have been obtained but upon which work has not yet been started.

The six interurbans which will make use of this system are as follows: The Union Traction Co. of Indiana; the Indianapolis & Eastern; the Indianapolis, Columbus & Southern; the Indianapolis & Martinsville Railway Co.; the Indianapolis, Shelbyville & South-



NEW 2,000-H. P. BUCKEYE ENGINE, INDIANAPOLIS TRACTION & TERMINAL CO.

earnings was .6762, an increase of .0204; and the ratio of operating expenses to passenger receipts was .6811, an increase of .0204 as compared with 1901.

The passenger receipts during 1902 averaged \$17,444.82 per day, an increase of \$1,399.93 as compared with 1901.

The company now has 183.96 miles of electric track (5.81 built in 1902) and 34.75 miles of cable track; total, 218.71 miles.

During 1902 the car-miles run were: Electric, 18,333,862, being 56.11 per cent of the total and an increase of 1,606,322 over 1901. Cable, 14,244,190, being 43.60 per cent of the total and an increase of 434,570 over 1901. Horse, 93,882, being .29 per cent of the total and a decrease of 12,208, compared with 1901. Total, 32,671,934 car-miles, an increase of 2,028,684.

Passenger Statistics.

| | 1901 | 1902 | Increase |
|---------------------------|-------------|-------------|------------|
| Fare passengers | 117,863,990 | 128,097,799 | 10,233,809 |
| Transfer passengers | 49,415,733 | 55,793,502 | 6,377,829 |
| Total | 167,279,723 | 183,891,301 | 16,611,638 |

The street railway companies of Dallas, Tex., have given the employees an increase in wages amounting to two cents per hour.

eastern Traction Co. and the Indianapolis & Plainfield Railway Co. The two interurban lines now building and expected to be in operation during the coming summer, which will make use of this terminal station are the Indianapolis Northern Traction Co. and the Indianapolis, Lebanon & Frankfort Traction Co.

The terminal station is to be situated on the block bounded by Ohio, Market and Illinois Sts. and Capitol Ave. There will be tracks running transversely through this building, each of the separate companies making use of a separate track. The cars will enter the building from one side and by means of the arrangement of the tracks each company's cars can lie over in the terminal building as long as desired without interfering with the operation of the cars of any other of the lines. In leaving the terminal station the cars will pass out on the opposite side of the building from that which they entered. The plans of this building, which includes waiting rooms and a restaurant on the ground floor, and several stories devoted to business offices, are being prepared by the company's architect, and it is expected that work on the building will be commenced this spring.

All of the city lines in Indianapolis, as well as the Indianapolis & Plainfield Railway Co., are operated from a single power station located on West Washington St. and the company is making a number of additions and improvements to this plant.

There are ten boilers now in use, eight of the Babcock & Wilcox make and two built by Campbell & Zell; the latter are of 400 h. p. each. Two of the Babcock & Wilcox boilers are also of 400 h. p. capacity each and six of the same make are of 300 h. p. each. The company is now installing two additional Babcock & Wilcox boilers each of 400-h. p. capacity and the furnaces of all the boilers are to be equipped with Roney automatic stokers. The boilers are fed by Deane pumps, the feed water passing through Hoppes heaters before entering the boilers. The draft is supplied by two steel self-supporting stacks one of which is 7 ft. in diameter and 160 ft. high and the other 10 ft. in diameter and 175 ft. in height. A Hunt conveyor is also to be installed for supplying coal to the boilers.

The engine room which is contained in the same building with the boiler room and is separated from it by a brick partition wall contains three Allis engines and two Buckeye engines, and another engine of the latter type is under contract to be installed and in operation by June 1st. Engine No. 1 is a 750-h. p. compound condensing Allis engine to which a 350-kw. and a 150-kw. Westinghouse direct current generator are belted. Engine No. 2 is a 750-h. p. compound condensing Allis engine direct connected to a Westinghouse 490-kw. generator. Engine No. 3 is a 1,000-h. p. cross compound Allis engine direct connected to a Westinghouse 250-kw.

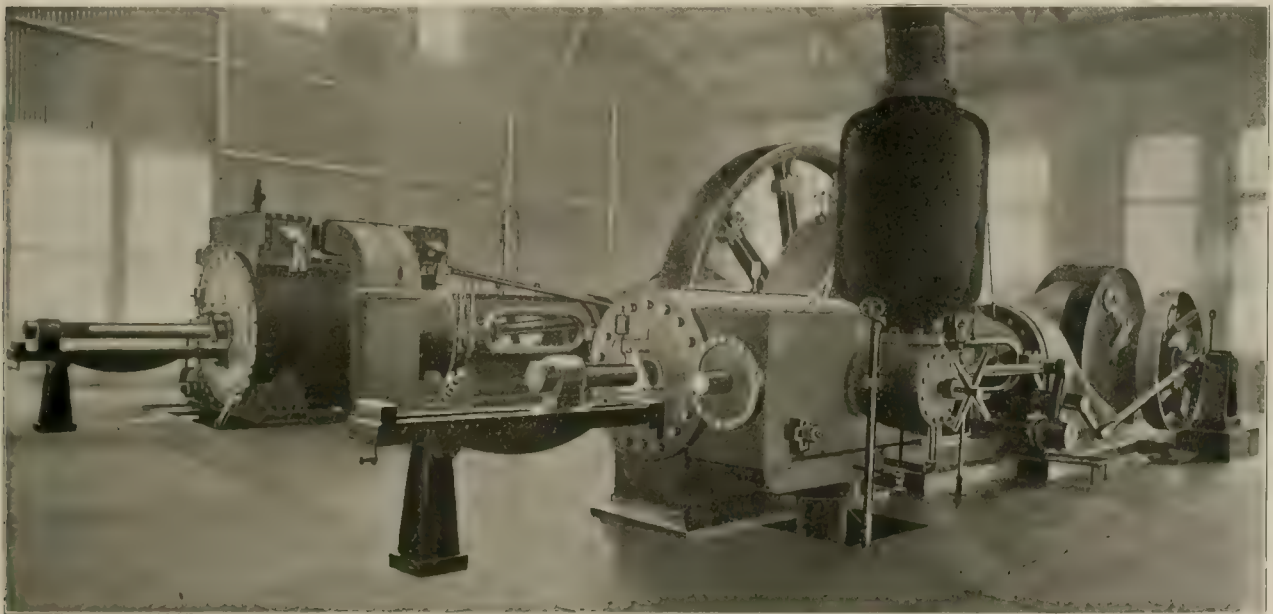
the engine room which is to make room for the new unit. When this addition is completed the engine room will be 210 x 66 ft. These engines are very massive and are specially designed for the severe duty of street railway work. The governor is large and powerful and controls the speed of the engine very exactly under all conditions of change of load.

All of the engines are equipped with independent jet condensers.

A booster set of 120-kw. capacity is installed in the engine room which supplies current for the operation of the Indianapolis & Plainfield Railway Co.

The switchboard, which is of marble, contains six generator panels, three main feed panels, three line panels and one main panel, the latter containing a Thompson recording watt meter and a total Weston ammeter. The switchboard is equipped with Weston instruments and General Incandescent Arc Co. switches. The generators are all of the direct current type the pressure at the switchboard being 575 volts. There are 22 500,000-c. m. cables entering the power house of which 20 are positive and 2 are negative.

Immediately adjoining the power house is a series of shops where not only all repairs are made, but where a large number of new cars are being built. During the last two years the company has built 150 large open cars, 35 double truck closed cars, 41 single truck



REAR VIEW OF BUCKEYE ENGINE.

generator. Engine No. 4 is a Buckeye cross compound engine of 2,000-h. p. capacity direct connected to a Siemens & Halske 1,200-kw. generator.

Engine No. 5, two views of which are shown herewith was the last unit to be installed and has been in operation but a short time. It is rated at 2,000 h. p. and is direct connected to a Westinghouse generator of 1,050 kw. capacity. The cylinders of this engine are 32½ and 60 in. in diameter by 60-in. stroke and it runs at a speed of 80 r. p. m. While the nominal capacity of this engine is 2,000 h. p. it is capable of developing up to about 2,700 h. p. if required.

The high pressure side of this engine is provided with round slide valves of the well-known Buckeye construction and it has a riding cut-off, one round valve riding within another, the two valves being driven by independent eccentrics, and the internal valve controlled by the shaft governor. The low pressure side is equipped with independent steam and exhaust gridiron valves which is a construction recently adopted by the Buckeye Engine Co. for all low pressure cylinders of compound engines.

The steam valves on the low-pressure cylinder carry riding cut-off valves which may be connected to the same governor as the riding cut-off valve of the high pressure side although in this case only the high pressure cut-off is connected to the governor. A third engine of this type, as already stated, has been ordered and will be installed this summer. The excavation has been made for the extension of

closed cars and 75 old cars have been rebuilt with accelerator platforms in both front and rear. All of the cars built at these shops have steel side panels which are made with No. 10 sheet steel for both the straight side cars and the convex and concave panel cars.

The platforms with which all the company's cars are supplied are unique and are specially designed to facilitate rapid loading and unloading of the cars. All the cars run with the same end constantly forward and the front platforms, which are vestibuled, contain a motorman's compartment which is entirely enclosed by an inside partition and which is cut off from the front entrance of the car. The arrangement is such that the passengers may enter or leave the front end of the car by passing through two doors, one in the end of the body proper, and one in the side of the vestibule without passing through the motorman's compartment. The rear platform is about double the length of the platforms in ordinary use and is supplied with a pipe railing which forms a passage-way to the rear entrance in which no passengers are allowed to stand. There is however, standing room equal to about the size of an ordinary car platform behind this railing where those who desire may ride outside. All the cars of the company are painted a standard orange color and the routes are designated by signs having deeply indented white letters upon a black background.

The woodworking shop of the company is 60 ft. wide by 300 ft. On one side of this shop is a paint shop which is a large square

room having a capacity for 10 cars, well lighted from side and overhead windows. A blacksmith shop, winding room and general machine shop are also included in this group.

The company has just completed a brick car barn 284 x 270 ft. in area. The barn is covered by a concrete roof supported on iron trusses and contains 24 tracks, each pair of which is enclosed with Kinnear rolling doors. The cars enter this barn from one end and 16 tracks, which are used merely for storage, are connected outside and at the rear of the building by a long transfer table which operates over two-thirds of the width of the building. The barn is used for both storage and operating purposes its capacity being 128 cars for storage and 40 operating cars. Each of the eight operating tracks is supplied with a pit for the purpose of general inspection. The power house, shops and all of the work in this group of buildings is in charge of Mr. Charles Remelius, master mechanic of the company.

INCREASE IN WAGES ON THE NORTH JERSEY.

The North Jersey Street Railway Co. has announced a general increase in wages paid to starters, inspectors, conductors and motormen, the new schedule taking effect from Mar. 8, 1903. The order issued by the management notifying employees of the change, reads as follows:

The management takes pleasure in announcing the following changes in the schedule of wages paid to starters, inspectors, conductors and motormen, and desires to take this opportunity to express appreciation of the loyalty and good service rendered by the employees generally.

Commencing 12:01 a. m. Sunday, Mar. 8, 1903, the rates of wages will be as follows:

Conductors and motormen who have been in the service of the company less than two years and six months will receive \$2.00 per day for eleven hours' work, or 18 cents per hour for each hour actually employed.

Conductors and motormen who have been continuously in the service over two years and six months, and less than five years, will receive \$2.05 per day for eleven hours' work, or 18½ cents per hour for each hour actually employed.

Conductors and motormen who have been continuously in the service over five years, and less than ten years, will receive \$2.10 per day for eleven hours' work, or 19 cents per hour for each hour actually employed.

Conductors and motormen who have been continuously in the service ten years and over, will receive \$2.20 per day for eleven hours' work, or 20 cents per hour for each hour actually employed.

Eleven hours of actual work will be held to constitute a day's work. Extra work, in excess of eleven hours actually worked, in all cases will be paid for at the rate of 20 cents per hour.

Inspectors will be paid \$2.25 per day. Starters now receiving \$2.15 will receive \$2.25 per day; and starters receiving \$2.25 per day, at present, will receive \$2.30 per day.

All uniformed employees will hereafter wear service stripes to indicate length of time employed in the service of the company, as follows:

After the expiration of one year's service, one blue stripe;
After the expiration of two years' service, two blue stripes;
After the expiration of three years' service, three blue stripes;
After the expiration of four years' service, four blue stripes;
After the expiration of five years' service, one gold stripe; and one additional gold stripe for each five years of service thereafter.

These stripes will be worn on the lower outside of the right sleeve of the uniform coat, and the blue stripe must be of lighter color than the cloth of which the uniform is made.

Officers and heads of departments will govern themselves in accordance with the terms of this notice.

(Signed)

David Young, Vice-President.

The Berkshire Street Railway Co., of Pittsfield, Mass., recently erected a new plate girder bridge at Craneville, Mass.

The Tanton Locomotive Manufacturing Co., of Tanton, Mass., recently furnished two 25-ton snow plows to the Fairhaven & Westville Railroad Co. of New Haven, Conn.

REPORTING POWER HOUSE DATA.

Editor "Review":—I wish to recommend strongly that you advocate in your journal that all central station data as to fuel consumption, kilowatt-hour output, etc., hereafter include the "pounds of water evaporated," stating the pressure (or temperature) to which same is raised and, if it is desired to be very exact, also stating the temperature of the water before it enters the heater or the boiler.

In considering recently the results obtained in various stations and power houses, I found extreme difficulty in comparing them with each other with a view to ascertaining the economy of operation, due largely to the difference in quality and price of coal, and in some instances, to the boilers, firing, heaters, etc. As all of these variable items are eliminated by using as a basis the pounds of water evaporated from a given temperature to another given temperature and the station showing is thus divided into two parts—one the economy and cost of evaporation; the other the economy and cost of generation—we think the evaporation should hereafter always be included as data absolutely necessary, if a comparison is to be made with other stations.

On this basis, the pounds of water evaporated per kilowatt-hour output of the station is a factor permitting the direct comparison of stations using the cheapest and best fuel obtainable with stations using the poorest and dearest fuel, and by taking into consideration the load curve and class of machinery equipment, it can quickly be determined whether or not a station is operating economically, and the total economy of systems employing different methods of distribution, A.C. and D.C., rotary converters and motor-generators, also with and without storage batteries, can be determined, and a comparison made on a reliable basis.

Trusting this suggestion will meet with your approval, and that your influence will be used towards securing this data as a part of all station data hereafter obtained.

Yours very truly,

JOS. E. LOCKWOOD, Pres.,
Michigan Electric Co.

ST. LOUIS & SUBURBAN CAR HOUSE BURNED.

Fire destroyed the car house of the St. Louis & Suburban Railway Co., at DeHodiamont and Maple Aves., St. Louis, Mo., on the morning of February 24th, together with 63 cars, 15 of which were new, costing \$5,000 each, and had just been put into service. The fire was discovered at 5:06 a. m., and within 20 minutes the structure was destroyed. The cause of the fire is unknown. Several feeder wires within reach of the fire fell, but were quickly replaced and, scraping together all the cars it could command, the company began operation with a few less cars than usual at 7:30 a. m. On the following morning the road was running on schedule time again.

Offers of assistance from other roads were general. Mr. J. D. Houseman, general manager of the St. Louis, St. Charles & Western Railroad Co., very kindly lent a few cars, and Capt. Robert McCulloch, general manager of the Chicago City Ry., tendered over the long-distance telephone 20 cars which his company had building at the St. Louis Car Co., and which were about completed. Besides the 20 cars which Captain McCulloch loaned the company began to receive last week a shipment of 10 cars which were being rebuilt at the St. Louis Car Co.'s works and an order was immediately placed with that company for 50 new cars, exact duplicates of those burned. With what it will have on hand, however, when the 10 cars just received are put in operation, the St. Louis & Suburban will be in as good, if not better shape, as far as car equipment is concerned, than before the fire. The loss sustained is large, however, being estimated at \$200,000.

An encouraging sign, in face of the disaster, is reflected in the remarkable receipts since the fire.

Mr. T. M. Jenkins, general manager of the company, advises us that there was a decrease of only \$300 the first day following the fire compared with the corresponding day of the previous year; the next day a decrease of only \$13; the next, \$2, and since then receipts have shown gains over the same days of the preceding year.

The Delaware County & Philadelphia Trolley Co. is erecting a new bridge over the railroad at Glen Riddle, Pa. The company recently opened a new waiting room at Chester, Pa.

Plans of Electric Railways for 1903.

Authentic Reports of New Construction and Track Rebuilding, Proposed Additions to Power Plant, Shop and Car House Buildings, and New Machinery and Rolling Stock for Street and Interurban Railway Companies as Reported by Railway Officials, March, 1903—Reports of Manufacturers Concerning Orders and Contracts Recently Placed for Electric Railway Work—Summary of the Principal Urban and Interurban Electric Railway Companies Incorporated Within the Last Eight Months.

REPORTS OF NEW WORK FROM RAILWAY OFFICIALS.

ALABAMA.

People's Street Railway & Improvement Co., New Decatur, Ala. Is preparing to change from horse cars to electricity, but has not completed arrangements. L. R. Nelson, president.

Montgomery Traction Co., Montgomery, Ala. Line from Montgomery to Pickett Springs opened for traffic November 15th. It is proposed to extend the line for 15 miles. W. H. Ragland, president and general manager.

Opelika & Auburn Electric Ry., Opelika, Ala. Work was begun last fall. Henry D. Capers, secretary.

ARIZONA.

Tucson Street Railway Co., Tucson, Ariz. Expects to change to electricity this season and will rebuild $1\frac{1}{2}$ miles of track with heavier rail. Will also build two miles of new track and will buy five or six cars. Charles F. Hoff, secretary and general manager.

ARKANSAS.

Fort Smith & Van Buren Light & Transit Co., Fort Smith, Ark. Will build $2\frac{1}{2}$ miles of new track, as well as a new barn, 50x120 ft. New purchases will include four cars, eight motor equipments, one 300-h. p. engine and one 200-kw. generator. R. G. Hunt, secretary and treasurer.

Interurban Railway & Power Co., Hot Springs, Ark. Will build a new power station with 5,000 h. p. water power equipment. There are 12 miles of new track to be built and the company will obtain twenty cars, with complete new motor equipments. New generators for 5,000 h. p. (five circuits) will be installed, also. D. S. Ryan, president.

CALIFORNIA.

Fresno City Railway Co., Fresno, Cal. Will build four miles of new track and purchase from three to five cars this spring. W. H. McKenzie, general manager.

J. H. Hardebeck, manager of Claravale Improvement Co., Los Angeles, Cal. Is securing rights of way for a proposed electric line from Claravale to Hueneme.

San Jose, Saratoga & Los Gatos Railway Co., San Jose, Cal. Contract let January 1st for construction. Road expected to be opened for traffic about May 1, 1903. F. S. Granger, general manager.

COLORADO.

Colorado Springs & Interurban Co., Colorado Springs, Col. Will build a new barn, 180x80 ft., and rebuild two miles of track. The material for these improvements is on hand. The company will buy four double motor equipments. D. L. Macaffree, general manager.

The Denver City Tramway Co., Denver, Col. Expects to build about four miles of new track and rebuild about eight miles of old. All track building is done by employees and is not sub-let. At the new central power plant a large addition is being erected, to contain two 1600-kw. and one 1500-kw. direct connected units. Mr. L. L. Summers of Chicago, consulting engineer, will answer inquiries. The company has contracted for 25 forty-foot combination cars of the standard Denver pattern, which are being built by the Woerber Bros. Co., of Denver. These cars will be equipped with four G. E. motors, geared for 29 miles per hour, Brill G 27 trucks and Christensen air brakes. John A. Beeler, vice-president and general manager.

CONNECTICUT.

Rockville, Broad Brook & East Windsor Railway Co., Broad Brook, Conn. Plans to build 12 miles of track this year and pos-

sibly erect a new barn. It will also buy four cars. E. W. Burd, chairman of the executive committee.

Worcester & Eastern Connecticut Railway Co. (controlled by N. Y., N. H. & H. R. R. Co.), Norwich, Conn. Will construct a trolley line between Norwich and Jewett City, Conn., this summer, to be subsequently extended to Central Village, forming a continuous line from Norwich to Worcester. The company will also eliminate various sharp curves and heavy grades between Danielson and Putnam.

DISTRICT OF COLUMBIA.

Washington, Arlington & Falls Church Railway Co., Washington, D. C. Expects to build about $5\frac{1}{2}$ miles of new track and rebuild $\frac{1}{2}$ mile of old. It has been practically decided to purchase four cars and four new motor equipments. F. B. Hubbell, vice-president and manager.

Washington, Leonardstown & Point Lookout Electric Railroad of Maryland. New survey made last fall and work of construction expected to begin during the winter. C. R. Jones, general manager.

Washington, Baltimore & Annapolis Electric Railway Co., Washington, D. C. Bids were received last month for a new power station, 80x160 ft., two stories, brick, iron and stone. It will be built early this season. Grading was begun in October and completion of line is looked for by November, 1903. C. F. Gladfelter, assistant general manager.

FLORIDA.

Jacksonville Street Railroad Co., Jacksonville, Fla. Has just rebuilt tracks in Bay, Julia and Main Sts., using heavier rail.

GEORGIA.

Augusta Railway & Electric Co., Augusta, Ga. Contemplates purchasing new cars and motors, engine and generator this year, but the plans are not formulated. W. E. Moore, general superintendent.

ILLINOIS.

Decatur Traction & Electric Co., Decatur, Ill. Will build three miles of new track and rebuild $1\frac{1}{2}$ miles of old. It will also purchase four cars and four new motor equipments. W. L. Shellabarger, secretary.

Quincy Horse Railway & Carrying Co., Quincy, Ill. Contemplates building a new barn and will rebuild about two miles of track this season. New cars and motor equipments have been contracted for. W. A. Martin, superintendent.

North Kankakee Electric Light & Railway Co., Kankakee, Ill. Will build one-fifth mile of new track this season and purchase one car and one new motor equipment. Elias Powell, general manager.

Chicago Electric Traction Co., Chicago, Ill. Contemplates the purchase of 15 cars this year and also intends to build two miles of new track. A. E. Davies, general manager.

Bloomington & Normal Railway, Electric & Heating Co., Bloomington, Ill. Will buy five cars, two engines, each 1,000 h. p., and one 700-kw. generator this season. Two miles of track will be rebuilt and one mile of new track will be laid. A. E. De Mange, president.

Illinois Valley Traction Co., La Salle, Ill. Bond issue of \$300,000 arranged for to provide funds for construction of an electric line from La Salle to Ottawa. George F. Duncan, vice-president.

Danville, Urbana & Champaign Interurban Co., Danville, Ill. Is ballasting tracks between Urbana and St. Joseph. The work was begun last fall.

Moline, East Moline & Watertown Ry., Moline, Ill. Proposes to build a power house near the new car barn in Moline. Two 250-h. p. engines will be installed. Plans have been completed and work will begin at an early date.

Central Railway Co., Peoria, Ill. Has let contract for a brick car barn, 75x172 ft., to Jacob Jobst. The barn will house 40 cars, and a number of new cars will be purchased.

Sterling, Dixon & Eastern Electric Ry., Sterling, Ill. Has completed its power house and is installing the boilers. The work of laying tracks in Sterling will be rushed this spring.

Chicago Junction Railroad Co., Chicago, Ill. Construction of proposed extension of South Side Elevated Railroad to begin as soon as material can be secured.

Joliet, Plainfield & Aurora Ry., Joliet, Ill. Expects to begin construction early in the spring. The necessary engineering work has been completed, franchises secured and right of way obtained. Arrangements for financing have been completed; also basis for terminal contracts at Aurora and Joliet secured. E. E. Fisher, president and general manager.

INDIANA.

Indianapolis & Northwestern Traction Co., Indianapolis, Ind. Is building an electric railway from Indianapolis to Lafayette, Ind., and will soon begin an extension from Lebanon to Crawfordsville. Townsend, Reed & Co., the builders, state that the main line will be in operation from Indianapolis to Frankfort by Aug. 1, 1903, and to Lafayette by Dec. 1, 1903. The power house has been completed and machinery installed. The Monon railroad and the Big Four built special switches at Frankfort and Lebanon, respectively, to facilitate handling the material and machinery.

Indianapolis, Columbus & Southern Traction Co., Columbus, Ind. Is building 21 miles of track, together with a new power station at Edinburg and a new barn in Columbus. Eight new cars, 12 motor equipments, new engines and generators, and, in fact, practically everything have been bought. William G. Irwin, general manager.

Southern Indiana Interurban Railway Co., New Albany, Ind. Has ordered all the material for its new road, which it is expected to begin to operate April 1st. R. W. Waite, secretary.

Indianapolis, Shelbyville & Southeastern Traction Co., Shelbyville, Ind. Expects to build about 30 miles of new track, rebuild two miles of old, possibly buy 10 cars and 10 motors, and probably purchase new engines and generators, the sizes of which are not determined upon. All these innovations, except the track work, will probably be postponed until fall. W. H. Gray, general manager and purchasing agent.

Indianapolis Street Railway Co., Indianapolis, Ind. Is preparing to build a belt line and two cross town lines. H. J. McGowan, president and general manager.

Fort Wayne & Southwestern Traction Co., Fort Wayne, Ind. Is constructing a line from Huntington to Van Buren and Marion, to parallel the Clover Leaf railroad most of the distance. It expects to have cars running between Van Buren and Marion by July 4, 1903, and to Huntington by late this fall.

Indiana Railway Co., South Bend, Ind. Has let contract for a bridge under Michigan Central Ry. to C. H. Defrees. Contract for 80-ft. span, overhead steel plate girder bridge to cross Big Four and Michigan Central tracks let to American Bridge Co., Toledo, O. Most of the grading for the road is completed and poles and brackets are up. The steel rails have arrived and company hopes to have cars running before June.

New Albany, Paoli & French Lick Valley Traction Co., French Lick, Ind. First survey completed and within a few weeks work will be well under way. Road expected to be in operation by July, 1904. Thomas B. Buskirk, Paoli, Ind.

Indiana Central Electric Railway Co., Columbus, Ind. Line to Brownstown and French Lick now building. John G. Burrill, president.

The Lafayette & Indianapolis Rapid Ry., Lafayette, Ind. Up to the first of the year nothing had been done, except to secure right of way. Robert A. Clarke, superintendent.

Indianapolis, Morristown & Rushville Electric R. R., Indianapolis, Ind. Expects to begin work this spring and complete line to Rushville by July, 1904. The route to Cincinnati is yet to be determined. Charles L. Henry, Anderson, Ind., sponsor.

INDIAN TERRITORY.

Indian Territory Traction Co., South McAllester, I. T. Grading was commenced in January, 1903, and it is expected to have the road in operation by Jan. 1, 1904. Samuel Grant, general manager.

IOWA.

Creston Electric Railway, Light, Heat & Power Co., Creston, Ia. Is to build 40 miles of new track, two new power stations, to be known as No. 1 and No. 2, and a car barn. It will buy four passenger and one freight cars, four 50-h. p. and sixteen 35-h. p. motors, two 250-h. p. engines and two 200-kw. generators. William J. Dobbs, secretary.

Waterloo & Cedar Falls Rapid Transit Railway, Waterloo, Ia. Anticipates building 10 miles of track this season and will buy three interurban cars and 12 motor outfits. It also expects to purchase three generators of 150 kw. each. L. S. Cass, president.

Keokuk Electric Railway & Power Co., Keokuk, Ia. It is planned with the co-operation of the citizens, to extend the road to Hamilton and Warsaw, Ill., to build a city line to the golf grounds and to construct a new fire proof power house. It is also intended to deliver freight, express and mail by trolley. A. D. Ayres, president.

KANSAS.

The Topeka & Vinewood Park Railway Co., Topeka, Kan. Is not prepared to divulge plans for the coming season, but contemplates doing more or less construction work. F. G. Keeley, secretary.

Kansas City & Bonner Springs Railway Co., Kansas City, Kan. Franchise granted through Wyandotte County for 17-mile electric railway between points named. Ultimately the line will be extended to Topeka. C. F. Hutchings, Kansas City, Kan.

KENTUCKY.

Blue Grass Consolidated Traction Co., Lexington, Ky. Is building its interurban line to connect Lexington, Versailles, Frankfort and other Kentucky cities. George B. Davis, Detroit, Mich., president. M. C. Alford and Fred H. Bean, of Lexington, also interested.

Louisville Interurban Railroad Co., Louisville, Ky. To build 16 miles to Mt. Washington. The road will use the Louisville Railway Co. tracks for six miles in the city. The capital stock was recently increased from \$100,000 to \$600,000. Charles Doherty, president; John Russell, vice president.

Louisville Railway Co., Louisville, Ky. Will build an addition to its power house this spring.

Georgetown & Lexington Traction Co., Lexington, Ky. Has ordered six new cars built by the Laconia Car Co., to be delivered in July or August. The specifications were furnished by John Blair McAfee, of Philadelphia.

The River Road Co., Louisville, Ky. Capital fully subscribed last fall and work of converting the Louisville & Nashville Railroad Co. from steam to electricity, and extending line to Prospect, practically completed. Lafon Allen, president.

LOUISIANA.

New Orleans & Southwestern Railroad Co., Thibodaux, La. Expects to begin actual work early this year. Surveys, specifications and drawings completed. C. P. Young, general manager.

MAINE.

Public Works Co., Bangor, Me. (Owns Bangor Street Ry.). Has ordered five box cars of the J. G. Brill Co. pattern. F. D. Oliver, auditor.

Penobscot Central Railway, Bangor, Me. Has under consideration the matter of extending its line, but it is not entirely settled. F. O. Beal, president.

Augusta, Me. It is expected that the proposed electric railway connecting the Augusta, Winthrop & Gardiner Ry., at Togus, with the Rockland, Thomaston & Camden road, at Warren, will be built this year.

MASSACHUSETTS.

Holyoke Street Railway Co., Holyoke, Mass. Is to rebuild 2½ miles of old track for which the rails, etc., have been bought. Two new cars will be purchased and a new barn is within the possibilities, although the matter is not fully decided. William S. Loomis, president.

Boston & Worcester Street Railway Co., Boston, Mass. Anticipates the completion of its main line, so as to be in operation not later than June. It is intended to build a branch into Natick,

Mass., which is the only branch contemplated, although consolidation with other connecting lines will probably be effected at an early date. James F. Shaw, purchasing agent.

Hampshire & Worcester Street Railway Co., Ware, Mass. Will in all probability build 10 or 12 miles of new road this summer, $2\frac{1}{2}$ miles of which will run from Lakeside Park to Warren. The rest will be an extension from West Brookfield to North Brookfield, thence to Spencer, connecting with the Worcester Consolidated Street Railway Co. This last will shorten the route from Ware to Worcester about three miles and will, if carried out, call for the addition of another unit of about 300 kw., a new car barn and booster and the addition of several cars to the present equipment. D. E. Pepin, superintendent.

Concord, Maynard & Hudson Street Railway Co., Maynard, Mass. Will build about 40 miles of track and enlarge its present power house and car barn. A number of additional cars, open and closed, will be purchased, together with 15 or 20 four-motor equipments. It is also planned to purchase new engines, 700 to 1000 h. p., and new 400-kw. or 600-kw. generators. John W. Ogden, superintendent.

Pittsfield Electric Street Railroad Co., Pittsfield, Mass. Will extend its lines from Dalton to Hinsdale and from Pittsfield to the Hancock line; will also build additions to car barn and office buildings, erect a new power station and add to its equipment generally. The company has asked the railroad commissioners for permission to issue \$200,000 mortgage bonds to cover the cost of contemplated improvements.

The Norwell and Scituate Street Railway Co., Norwell, Mass. Survey completed and right of way secured. Construction work expected to begin soon. E. C. Webb, 155 N. Congress St., Boston, Mass.

The Western Massachusetts Street Railway Co., Springfield, Mass. Is making surveys for the proposed line to connect Westfield with Lee.

Waltham Street Railway Co., Waltham, Mass. Is constructing $6\frac{1}{2}$ miles of city track. Charles E. Dresser, treasurer.

MARYLAND.

Cumberland Electric Railway Co., Cumberland, Md. Will rebuild $2\frac{1}{2}$ miles of track this season.

Westernport & Lonaconing Railway Co., Cumberland, Md. Will build eight miles of track, using Cambria steel rails. A new power station and a new barn are being built by the Pennsylvania State Construction Co. The company has bought four Brill double truck cars, eight G. E. 38-h. p. motors, two 350-h. p., Clark Bros. engines and two 250-kw. G. E. generators. All of the material has been contracted for. Joseph McCarroll, president.

Princess Anne & Deal's Island Light, Power & Railway Co., Princess Anne, Md. Will be constructed as soon as capital stock is all subscribed. Perpetual charter granted. Hampden P. Dashfield, president.

MICHIGAN.

Negaunee & Ishpeming Street Railway & Electric Co., Ishpeming, Mich. Contemplates building $2\frac{1}{2}$ miles of new track this spring. H. F. Pearce, superintendent.

Adrian Street Railway Co., Adrian, Mich. Will rebuild, $\frac{1}{2}$ mile of track this spring, using 60-lb. T-rail, and will probably erect a new barn. Two 18-ft. cars will be purchased, also. F. M. Drake, superintendent.

Michigan Traction Co., Kalamazoo, Mich. (Owned and operated by Railways Company General, Philadelphia.) Will build five miles of new track in Battle Creek and six miles in Kalamazoo. Will rebuild two miles of old track in Battle Creek and two miles in Kalamazoo. Will also build a new barn at Battle Creek and purchase 14 cars and 14 motor equipments. D. A. Hegarty, general superintendent Railways Co. General, Philadelphia, Pa.

Trans-St. Mary's Traction Co., Saulte Ste. Marie, Mich. Will build two miles of new track this season. Will also purchase seven 42-ft. closed cars. Three new motor equipments will also be purchased. G. W. Chance, manager.

Menominee Electric Light, Railway & Power Co., Menominee, Mich. Expects to extend its lines to Daley's mill on the state road this spring. Will possibly open Poplar Point as a summer resort. Edward Daniell, manager.

Menominee & Marinette Street Railway Co., Menominee, Mich.

Is planning to dam the Menominee River at Chappee Rapids to obtain power, not only for its own use, but to sell to manufacturing plants. The rapids will develop about 3,000 h. p., while the railway needs only about 1,000 h. p. It is expected to make the change within the next year or two.

Jackson & Battle Creek Traction Co., Battle Creek, Mich. Will erect a depot and freight office in Marshall, work upon which has begun. Rails are laid from Jackson to Battle Creek and all but six miles of roadbed ballasted. The laying of the third rail from Jackson westward is in progress. The third rail between Battle Creek and Albion has been laid.

Grand Rapids, Holland & Lake Michigan Rapid Ry., Detroit, Mich. It is probable that this company will construct some additional track between Holland and Macatawa this season. S. Hendrie, general manager.

MINNESOTA.

Benton Power & Traction Co., St. Cloud, Minn. Contemplates no extensions but will ballast over eight miles of roadbed this spring.

Twin City Rapid Transit Co., Minneapolis and St. Paul, Minn. Contemplates the expenditure of at least \$250,000 in improving its property in St. Paul this year. This will include street paving, rebuilding old tracks with heavier rails, new terminals at Como park and an extension of the Lafayette line to Phalen Park.

Minnesota & Iowa Electric Railway Co., Preston, Minn. Surveys made and rights of way secured last fall and winter. Judge H. R. Wells, Preston, Minn.

MISSISSIPPI.

The Biloxi Electric Railway & Power Co., of Biloxi, Miss. Is expecting to build six or eight miles of track this season, a new power house and a new barn. It will also buy six new cars. Only the contracts for the engineering work have been let as yet. This company has no connection with the Pass Christian Ry. The officers of the Biloxi company are: President, James M. Bell; secretary, William F. Gorenflo. Knox & George are the consulting engineers, and Ford & White, of Biloxi, are attorneys for the company.

Pascagoula-Moss Point Ry., Pascagoula, Miss., is building its line between the places named in the title, the injunction that held up the work hitherto having been withdrawn.

MISSOURI.

The Kansas City & St. Joseph Electric Railroad Co., of Kansas City, Mo., advises us under date of January 26th that it has completed the grading of some 12 miles of roadbed and that work will again be commenced as soon as spring opens. There has recently been a change in the officers of the company, the new officials being: President, Charles H. Holmes, Chicago; vice-president, P. A. Gibson, Erie, Pa.; treasurer James Lynn, Wabash, Ind.; secretary T. C. Alexander, Kansas City, Mo.

St. Francois County Electric Railroad Co., Farmington, Mo. Will build two miles of new track this season and buy three more cars. J. W. Buck, secretary.

NEBRASKA.

Omaha & Council Bluffs Railway Co., Omaha, Neb. Is building a new line to Florence, six miles north, and will erect a \$500,000 power plant this spring. Two lines will be extended in South Omaha, requiring the construction of three miles of double track. Next year all light rails will be replaced by heavy rails.

NEW HAMPSHIRE.

Berlin Street Railway, Berlin, N. H. Has bought two 13-bench, 8-wheel, open cars, Laconia Car Works Co. make, and will buy four new motor equipments. W. J. Jones, treasurer.

NEW MEXICO.

Las Vegas & Hot Springs Electric Railway Light & Power Co., East Las Vegas, N. M. Will build a new power station, a new barn and eight miles of new track. The new equipment will include eight cars, one 300-h. p. electric locomotive, one 200-h. p. steam locomotive, two generators and several motors. E. L. Epperson, superintendent and general manager.

NEW YORK

Monroe County Electric Belt Line, Rochester, N. Y. Reports through Chief Engineer A. J. Grant that grading will be begun this spring and carried on actively through the summer.

Jamestown Street Railway Co., Jamestown, N. Y. Will build three miles of track inside the city limits and 17 miles outside, beside making general repairs upon 22 miles of old track. A new power station is to be built, likewise a new barn, and the company will purchase 10 cars and 10 double motors, two engines of 900 h. p. each, and two 500 kw. generators, alternating and direct current. George E. Maltby, superintendent.

Elmira Water, Light & Railroad Co., Elmira, N. Y. Is contemplating a complete reconstruction of its power station, but details are not complete. William W. Cole, vice-president and general manager.

Lyons, N. Y. Rights of way have been secured for a projected electric railway from Sodus Point to Lyons. Ira Ludington, of Rochester, and James D. Bashford and Calvin Hotchkiss, of Lyons.

Schenectady Railway Co., Schenectady, N. Y. Will build a new power station, 66x48 ft., at a cost of \$30,000. It will have a capacity of 3,000 h. p., the same as the old station, making a total of 6,000 h. p.

Union Traction Co., Medina, N. Y. It was understood that work would be begun as soon as franchises were perfected. Incorporated last fall. Fred L. Downs, Medina, N. Y.

Dunkirk & Point Gratiot Traction Co., Dunkirk, N. Y. It was reported last fall that surveys had been made and the work of completing the line through to Buffalo would be begun at once. When completed, to be known as the Buffalo, Dunkirk & Western R. R.

Westchester Traction Co., White Plains, N. Y. Surveys for proposed extensions completed and it was expected that construction would be begun last fall. John M. Farley.

Ithaca, N. Y. Edward G. Wyckoff, president of the Ithaca Street Railway Co., states that work on the proposed electric railway between Ithaca and Auburn will be begun this season.

Syracuse & Ontario Railway Co., Syracuse, N. Y. Construction of 34 miles of road will be begun this spring. The survey has been made and rights of way secured.

The Watertown & Carthage Street Railway Co., Watertown, N. Y. Contemplates work on its line early in the spring. The construction will be of steel and concrete. M. P. McGrath, Easton, Pa.

Newark & Marion Ry., Newark, N. Y. Expects to be completed by June, 1903. Now under construction. F. D. Burgess, secretary.

NORTH CAROLINA.

Consolidated Railways Light & Power Co., Wilmington, N. C. Has just built a new power station and installed a 400-kw. turbine engine. Has also bought six cars, six Westinghouse, 12a double motor equipments, six Westinghouse No. 56 motor equipments and one Westinghouse No. 56 four-motor equipment. One mile of old track has been rebuilt. A. B. Skelding, general manager.

Raleigh Electric Co., Raleigh, N. C. Contemplates extensive improvements, the nature of which cannot be given out yet. William J. Andrews, president.

High Point Electric Railway Co., High Point, N. C. Expects to begin work this season. A 60-year franchise was obtained.

NORTH DAKOTA.

Fargo & Moorhead Street Railway Co., Fargo, N. D. Work will be begun as early in the spring as possible. The franchises stipulate that the road shall be completed and in operation by November, 1903. George E. Moffat, engineer.

OHIO.

The Dayton & Kenton Railway Co. of Dayton, O. Reports that its line is under construction. It is contemplated that 105 miles of track will be built during the coming year. The officers are: President, E. W. Hopkins; secretary, H. S. Forgy; treasurer, C. H. Pomeroy.

Cleveland City Railway Co., Cleveland, O. Has let contracts for building 1½ miles of new double track and rebuilding three miles of old double track. The company will buy 20 cars and 20 new motor equipments, which have been contracted for. John Ehrhardt, secretary and treasurer.

Chillicothe Electric Railroad, Light & Power Co., Chillicothe, O. Is just completing its new plant, for which engines and generators

were purchased recently. This summer a new barn will be erected and some old track will come in for repair. Joseph P. Myers, manager.

Urbana, Mechanicsburg & Columbus Electric Railway Co., Columbus, O. A new road; will build 50 miles of track and erect new power station and barn buildings. From 10 to 20 cars will be purchased, likewise. H. A. Axline, president.

The Dayton & Western Traction Co., Dayton, O. Is to build two bridges on its line, one 174 ft. span and the other 50 ft. Ten flat, or center-dump cars will be purchased, as well as one 75-h. p. engine and two generators of 110 and 60 kw. Howard Fravel, superintendent.

Oakwood Street Railway Co., Dayton, O. Will rebuild ½ mile of track this spring and build two miles of new track; also a new power station and a new barn are under way. Four new cars and four motors will be purchased, together with a 350 to 400 h. p. engine and a 300 kw. generator. Morris McGrath, secretary.

Ohio & Indiana Air Line Railway Co., Toledo, O. Will build 95 miles of track, connecting with Fort Wayne, Ind. Two new power stations will be commenced and three barns, at Bryon, Fort Wayne and Toledo, will be built. Eighteen cars will be purchased and from 50 to 120 new motor equipments will be required. B. Herbert, general superintendent.

Toledo & Western Railway Co., Sylvania, O. Is building 14 miles of track, for which all the material has been ordered and most of it delivered.

Toledo, Columbus, Springfield & Cincinnati Railway Co., Toledo, O. Will build 95 miles of track and erect a power station at Round Head, O. Will also build car barns at Round Head and other points to be determined. A number of new cars and motor equipments will be purchased. The specifications are not out in detail yet. I. N. Covault, secretary.

Dayton & Kenton Railway Co., Dayton, O. Will build and equip 60 miles of rail this season. The plans proposed also include a new power house and new car barn. E. M. Hopkins, president.

Mansfield, Mount Gilead & Delaware Electric Railway Co., Mansfield, O. Incorporated in February, 1902. Capital, \$10,000. Rights of way and franchises for a 50-mile electric interurban line have been secured and work recently begun. W. W. Stark, Mansfield, president. Others interested are C. E. Fritzinger, C. W. Fritz, of Mansfield, W. J. Burkett, of Findlay, and C. D. Smiley, of Mt. Gilead.

Cleveland, Painesville & Ashtabula Electric Railway Co., Cleveland, O. Is building rapidly toward Madison. The ties are laid and the rails are on the ground for that part of the road from Grand river to the corporation line. East of Madison the same kind of work is being done. The poles are set and the subway under the Nickel Plate road is being completed.

Toledo, Columbus, Springfield & Cincinnati Railway Co., Toledo, O. Has let contract for roadbed from Marysville to Columbus to W. H. Lutchenberg. It is expected the line will be completed by Sept. 15, 1903.

Dayton, Springfield & Urbana Electric Railway Co., Springfield, O. Is to build a depot at South Main and West Market Sts., Springfield. Much of the material is on hand.

Canton-Akron Railway Co., Canton, O. To build new car barns in Canton; contract let to Casteel & Co., Canton Bridge Co. to build the roofs. Will probably double track Market street and build two or three extensions this summer, for which capital stock will be increased. Power contract for new Canton & New Philadelphia line also signed, line to be in operation by Apr. 1, 1903. A new feeder line has been built from Canton to Navarre. Grading will soon be completed and bridges are in place, excepting at Beach City and Canal Dover. Two sub-stations are being equipped, at Beach City and Canal Dover. W. H. Hoover, C. M. Russell, Philip L. Saltonstall, Chauncey Eldridge, John C. Welty, Dr. E. C. Lewis, representing Canton-Akron and Canton-New Philadelphia lines.

Buckeye Traction Co., Bucyrus, O. Is to build the first section of its new line, between Norwalk and Plymouth, at once. Westinghouse, Church, Kerr & Co. received the contract for electrical equipment. Later an extension to Bucyrus will be built.

Toledo, Port Clinton & Lakeside Electric Railway Co., Toledo, O. Has let the contracts for rails and ties and will push the construction of the line. The Interurban Construction Co. is doing the work and has placed an order for enough 70-ton rails to con-

struct nearly 50 of the 60 miles proposed. Material is to be delivered before June 1, 1903.

Youngstown & Ohio Valley Electric Railway & Power Co., Youngstown, O. Will begin to build line between Salem and East Liverpool as soon as franchise is secured in Salem.

The Dayton & Northern Traction Co., Dayton, O. Contracts let last fall for a 46-mile extension from Greenville to Muncie, Ind. Power house located at Winchester, Ind. J. E. Feight, secretary and superintendent.

Urbana, Mechanicsburg & Columbus Electric Railway Co., Columbus, O. Expects to operate the entire line by Oct. 1, 1903. General H. A. Axline, president and manager.

Youngstown & Southern Electric Railway Co., Youngstown, O. Surveys practically complete and rights of way generally obtained. Expects to begin construction this spring. Gen. Asa W. Jones, president.

The Mansfield & Eastern Traction Co., Mansfield, O. To operate the Mansfield, Mifflin & Ashland Street Ry., and The Mansfield, Hayesville & Wooster Street Ry. To push construction rapidly and expects to be completed this summer. Charles Meily, vice-president and general manager.

The Toledo, Fostoria & Findlay Electric Railway Co., Toledo, O. Contract let to a New York firm and work will be pushed to completion this year. A new power house will be erected at some point between Toledo and Fostoria.

Bellaire, Zanesville & Cincinnati R. R., Zanesville, O. Will be changed to standard gage this spring and equipped for electricity.

The Columbus, Newark & Eastern Electric Railway Co., Columbus, O. Contracts let for material and construction work will begin about April 1st. H. R. Young.

The Cincinnati, Georgetown & Portsmouth Electric Ry., Cincinnati, O. Has just begun work on an extension from Georgetown to West Union.

Xenia & Wilmington Traction Co., Cleveland, O. Right of way secured and contracts have been let for a new power house at Xenia. The work will be pushed to rapid completion. Charles Orr, secretary.

OREGON.

City & Suburban Railway Co., Portland, Ore. Will build a new barn this season, lay three miles of new track and rebuild five miles of old. C. F. Swigert, general manager.

PENNSYLVANIA.

Allentown & Reading Traction Co., Allentown, Pa. Is to build a double track, $3\frac{1}{2}$ miles, from Allentown to Dorney Park and will buy five cars and 10 new motor equipments. Two new engines have been purchased, one 800 to 900 h. p., from Frank Toomey, Philadelphia, and one 500 h. p., from Charles E. Dustin & Co., New York. Next year the company will build a new power station at Griesemerville. I. S. Ruth, superintendent.

York County Traction Co., York, Pa. Has ordered built 35 miles of new track and has bought the required number of cars and motor equipments. A 500-kw. generating unit will probably be purchased this season. J. F. Dusman, general manager.

Conestoga Traction Co., Lancaster, Pa. Is now building a new power station, in which two 1,500 kw. units will be installed, and it expects to begin on a new storage barn right away. The company recently bought six cars, together with new motor equipments, engines and generators. Frank S. Given, general manager.

Lancaster & Rocky Springs Railway Co., Lancaster, Pa. Is a new road, taking power from the Conestoga Traction Co., which will lease and operate this line. Four and seven-tenths miles of track is to be built and the cars and motor equipments have already been secured. Frank S. Given, general manager.

Harrisburg Traction Co., Harrisburg, Pa. Is building $5\frac{1}{2}$ miles of new track and will rebuild three miles of old track. All material has been purchased. F. B. Musser, superintendent.

Philadelphia Rapid Transit Co., Philadelphia, Pa. Proposes to build a large operating and storage barn at Frankford avenue and Bridge street, Philadelphia. It is also contemplated to lay from 60 to 70 miles of additional surface track, principally on 58th and 60th Sts., Elmwood, Allegheny and Torresdale Aves. The plan to build a barn at Broad and Hoyt Sts. is in abeyance. Charles O. Kruger, manager.

West Chester Street Railway Co., West Chester, Pa. Is pushing the work on its line in Downingtown. A large force is at work on

the piers of the new bridge and another is ballasting the tracks on the street west of the Brandywine.

Doylestown & Easton Street Railway Co., Doylestown, Pa. Is preparing the road by blasting and filling-in for the new line along Rock Falls.

Pittsburg Railway Co., Pittsburg, Pa. Is building new extension to the Perrysville Ave. line over Perrysville hill to connect with the Bellevue line, a distance of about $6\frac{1}{2}$ miles. Extension to be completed by July 1st. T-rail is used.

Patterson Heights Street Railway Co., Beaver Falls, Pa. Is removing tracks from Penn St. to Bridge St. The Penn Bridge Co. has the contract.

Allentown & Reading Traction Co., Reading, Pa. Is to install a new engine and generator in the power house at Kutztown, to increase the storage battery facilities at the Blandon station, to erect new feed wires, to purchase new cars both for the Allentown-Kutztown and Reading-Kutztown divisions and to double track the line from Dorney's Park to Allentown. An automatic switch signal system may be added, also.

Jersey Shore Electric Street Railway Co., Jersey Shore, Pa. Has been completed to the "Junction" and will be extended to Oak Grove this year.

Washington & Canonsburg Street Railway Co., Washington, Pa. Has begun to vigorously push construction of new car barn. Grading and ballasting are going forward. A bridge will be built over Chartiers creek, as well as a viaduct over the Chartiers railroad track.

Wilkes Barre & Hazleton Railway Co., Hazleton, Pa. Third rail system, 27 miles. Opened for traffic about Jan. 15, 1903. A. Markee, general manager.

RHODE ISLAND.

The Newport & Bristol Ferry Railroad Co., Newport, R. I. Expects that line will be completed by May 1, of this year. The franchise was obtained some time ago.

TENNESSEE.

Knoxville Traction Co., Knoxville, Tenn. Expects to purchase five or six cars during the coming summer. One of the two extensions contemplated last year has been completed and work on the other was begun in February of this year. C. H. Harvey, general manager.

Nashville Ry., Nashville, Tenn. Will build a branch line to its new storage yard on the east side of the Cumberland River. The company recently ordered 600 tons of steel rails. Work on changing track to standard gage has begun.

Memphis Street Railway Co., Memphis, Tenn. Contemplates extensive improvements this year. All city lines, north, east, south and west, will be extended, an independent line will be constructed to Overton park and the Main street line will probably be extended to South Memphis. Orders have been placed in New York for \$75,000 worth of cars and equipment, to be delivered as early as possible, and \$150,000 is to be expended in paving streets used.

Chattanooga Electric Railway Co., Chattanooga, Tenn. Expects to build a branch to the permanent army post at Chickamauga Park, the survey for which is completed. Will extend the East Lake line to Rossville, a distance of $1\frac{1}{2}$ miles. Will open Olympia Park to the public in April. Will order a number of large cars of the latest pattern.

Decatur Street Railway Co., Decatur, Tenn. Will change to an electric railway and ask for franchises to construct electric lines in New Decatur and Decatur. W. R. Hall, of Selma, Ala., is to superintend the construction work.

Rapid Transit Co. of Chattanooga, Chattanooga, Tenn. Will double track the Belt road section in Knoxville and double the service. It will also repair the Incline & Lula Lake Railway, purchase two large steel cars for the incline, build a vaudeville theater on Lookout Mountain and better schedule on all lines. It is proposed to handle freight over the incline, also.

Tennessee Interurban Electric Ry., Nashville, Tenn. Surveys completed and franchises secured. Work is now well under way. This is a consolidation of the Nashville & Columbia and Nashville & Gallatin Electric Railways. The line will be 119 miles in length. J. H. Connor, general manager.

Nashville Electric Light & Street Railway Co., Nashville, Tenn. Estimated that \$3,000,000 will be spent upon improvements this year. Percy Warner, general manager.

TEXAS.

The Beaumont Street Railway Co., of Beaumont, Tex., completed 5 miles of track Sept. 26, 1902, which is operated as a belt line. The company proposes to build 8 miles additional this season. The officers are: President, Harry K. Johnson; secretary, A. L. Williams; general manager, Ben Johnson; superintendent, Thomas Mallory.

Austin Electric Railway Co., Austin, Tex. Has just built a new power house and a new barn and has purchased eight cars and 11 new motor equipments. It has material on hand, and the work is under way, for one mile of new track and $2\frac{1}{2}$ of old, which is to be rebuilt. The Alamo Iron Works of San Antonio, Tex., has received the contract for a new self-supporting steel stack, 120 ft. x 66 in. Frank E. Scovill, superintendent.

Galveston City Railway Co., Galveston, Tex. Will rebuild about eight miles of track this year. R. B. Baer, president and general manager.

The Texas Traction Co., Leonard, Tex. Is making preliminary surveys for an electric line to extend 60 miles. F. H. Farnham.

UTAH.

Consolidated Railway & Power Co., Salt Lake City, Utah. Expects to complete a series of short extensions early this year. Walter P. Read, general superintendent.

VERMONT.

Bennington & Hoosic Valley Railway Co., Bennington, Vt. Has completed surveys for a 72-mile system. George E. Greene, president.

VIRGINIA.

Charlottesville City & Suburban Railway Co., Charlottesville, Va. Contemplates extending its line this spring, but nothing has been definitely decided. R. R. Case, general superintendent.

Roanoke Railway & Electric Co., Roanoke, Va. Will buy eight cars, eight new motor equipments and two engines. R. D. Apperson, president, Lynchburg, Va.

Virginia Anthracite Coal & Railway Co., Blacksburg, Va. Contract has been let for five of the 10 miles to be built and the work is well under way. W. J. Kerr, general manager.

WASHINGTON.

Spokane & Montrose Motor Railroad Co., Spokane, Wash. Will be made standard gage as soon as new company of local people is organized. An extension of, perhaps, two miles will be built. The cars and material have been ordered. Charles G. Reeder, president.

Tacoma Railway & Power Co., Tacoma, Wash. Will buy 15 cars and one 1,000-kw. generator. Will also build six miles of new track and rebuild five miles of old. Benjamin J. Weeks, superintendent.

Lynden, Wash. E. E. Beard, of Blaine, has surveyed for an electric line from Whatcom to Lynden, to be completed early in 1904. Franchise secured by Charles A. Wyatt, C. E. Lykens and George Butters.

WEST VIRGINIA.

Kanawha Valley Traction Co., Charleston, W. Va. Will build 26 miles of new track and rebuild one mile of old. It also contemplates the purchase of three cars and two motor equipments. T. J. Cannack, manager.

Wheeling Traction Co., Wheeling, W. Va. Has not decided fully upon the matter of extensions, but will do considerable repair work this spring, for which will be required 8,000 ties, either white oak or white chestnut, 6 x 8-in. x 8-ft. sawed square on four sides and both ends. C. E. Flynn, general manager.

The Citizens Railway Co., Moundsville, W. Va. Is still at work upon the original line construction. The matter of power plant, cars and electrical machinery yet to be considered. A. J. Jones, secretary.

Parkersburg & Ohio Valley Railway Co., Parkersburg, W. Va. Expects to build a road from Parkersburg to Pittsburg. Preliminary survey was begun last month.

Martinsville, Sistersville & Middlebourne Electric Ry., Sistersville, W. Va. Construction work will be started this spring. The financing of this line has been completed.

WISCONSIN.

Chicago, Harvard & Geneva Lake Railway Co., Walworth, Wis. Will extend its line one mile this spring.

Chippewa Valley Electric Railroad Co., Eau Claire, Wis. Will build $2\frac{1}{4}$ miles of new track and rebuild $\frac{1}{2}$ mile of old. Will buy two summer cars and eight motors. H. G. Lawrence, superintendent.

La Crosse City Railway Co., La Crosse, Wis. Contemplates extending its lines to Galesville, about 16 miles from Detroit, and building a summer resort at that point.

Sheboygan Light, Power & Railway Co., Sheboygan, Wis. Will extend line from Sheboygan Falls to Plymouth.

Milwaukee Electric Railway & Light Co., Milwaukee, Wis. Has the Hales Corners extension well along and will build the line to East Tr., embracing Muskego, Mukwonago and Lake Beulah.

MEXICO.

Monterey Electric Railway Co., Monterey, Mex. Contracts were placed during the winter and it is expected to have road in operation by June, 1904.

ONTARIO.

The Toronto Railway Co., Toronto, Ont. Is building 30 double truck, closed motor cars and 10 single truck, open cars. In addition, the company recently experimented by joining two 18-ft. body cars, making one double truck car, which proved so satisfactory that preparations are being made to couple more cars in the same way. E. H. Keating, manager.

London, Aylmer & North Shore Electric Ry., London, Ont. Specifications prepared last December and work being rushed to completion by The Aylmer Construction Co., Ltd., of Detroit. F. H. Hitchcock, assistant secretary and purchasing agent of The Aylmer Construction Co., Ltd.; R. M. Luton, president of London, Aylmer & North Shore Electric Ry.

PHILIPPINE ISLANDS.

Manila, P. I. The Philippine commission has passed a bill providing for the construction of a standard gage electric railroad and for a power plant. Maps and specifications exhibited in Manila and Washington. Bids opened Mar. 5, 1903, at Manila.

ORDERS AND CONTRACTS RECENTLY PLACED.

The Green Fuel Economizer Co., Matteawan, N. Y., recently received orders for street railway equipment from the following: North Jersey Street Railway Co., Newark, N. J.; Jersey City, Hoboken & Paterson Street Railway Co., Hoboken, N. J.; Washington, Baltimore & Annapolis Railway Co., Annapolis; Rochester & Eastern Rapid Railway Co., Canandaigua, N. Y.; Rhode Island Co., Providence, R. I.; Georgia Railway & Electric Co., Atlanta, Ga.; Columbus Railway Co., Columbus, O.; Chicago & Milwaukee Railway Co., Highwood, Ill.; St. Joseph Railway, Light, Heat & Power Co., St. Joseph, Mo.

The Under-Feed Stoker Co. of America, Chicago, Ill., has received orders to equip the Milwaukee Electric Railway & Light Co.'s. Edge Moor water tube boilers with the Jones under-feed stokers. This stoker was adopted as standard by the Milwaukee company in its various plants, which aggregate 10,000 h. p., after competitive tests of over four months' duration. Among other

contracts closed during 1902 and the early part of the ensuing year are the following: Worcester Consolidated Street Ry., Worcester, Mass., 2,400 h. p.; Twin City Rapid Transit Co., Minneapolis, Minn., 3,000 h. p.; Winona Street Railway & Light Co., Winona, Minn., 450 h. p.; Eastern Ohio Traction Co., Cleveland, O., 1,500 h. p.; Muncie, Hartford & Fort Wayne Electric R. R., Eaton, Ind., 900 h. p.; Chicago & Milwaukee Electric Railway Co., 520 h. p.; Portland Street Railway Co., Portland, Me., 1,750 h. p.; National Pin Co. and Hotel Cadillac, Detroit, Mich.; Lafayette Hoving Mills, Lafayette, Ind.; Standard Welding Co., Cleveland, O.

The Sterling-Meaker Co., Newark, N. J., began the season with an order for 175 pairs each of Sterling safety brakes, Sterling fenders and Sterling sand-boxes for the Metropolitan Street Railway Co., of New York. Since then orders have been coming in rapidly, particularly for brakes and the Sterling No. 5 register. This register has been demonstrating its merits for nearly a year

and its makers take pleasure in submitting No. 5 for trial. The company has two new mechanisms now under test, but will not offer them for sale until their merits are assured. They are both said to be of considerable importance and destined to fill a large place in the trade if they prove to be "as good as they look."

C. H. Worcester Co., Marinette, Wis., has closed several large contracts for ties and poles. Inquiries are coming in early and the company considers the outlook exceedingly bright. It makes a specialty of white cedar poles for trolley construction. Its new Chicago office will be located in the Tribune Building and will be opened on or about April 1st. The present Chicago office is in the Lakeside building. The main office will continue to be in Marinette.

The Buckeye Engine Co., Salem, O., is installing, or building, street railway engines as follows: Union City, Winchester & Muncie Traction Co., two units, 1,500 h. p., and two exciter units; Peoria & Eastern Railway Co., 300 h. p.; Indianapolis Street Railway Co., one unit, 1,500 h. p.; Rapid Transit Co., Cincinnati, 1,400 h. p., and two exciter units; Suburban Traction Co., 1,400 h. p., and one exciter unit.

C. J. Harrington, 15 Cortlandt St., New York, has closed contracts for construction material with the Atlantic City & Suburban Traction Co., Five Mile Beach Electric Railway Co., Battle Creek Traction Co., and Westchester & Doylestown Electric Railway Co. All these roads will begin construction immediately. Mr. Harrington has also secured orders for two large export shipments.

The New York Switch & Crossing Co., Hoboken, N. J., has received an order for four sets of steam road crossings for the Brunswick & Birmingham Railroad Co., now building. The company also has many orders on hand for repairs and alterations.

The Morris-Ireland Safe Co., Boston, Mass., is in receipt of inquiries from all over the country anent its conductors' safes. Recent sales reported by this company include the following: Brooklyn Heights Railway Co., Brooklyn, N. Y.; Oneida Construction Co., Oneida, N. Y.; Citizens Railway & Light Co., Muscatine, Iowa; Wheeling Traction Co., Wheeling, W. Va.; City & Suburban Railway Co., Portland, Oregon; Fries Mfg. & Power Co., Winston-Salem, N. C.; Metropolitan Railway Co., Oklahoma City, Okla.; Chicago & Southern Shore Railway Co., LaPorte, Ind.; Exeter, Hampton & Amesbury Street Railway Co., Haverhill, Mass.; Interurban Street Railway Co., New York City; Utica & Mohawk Valley Railway Co., Utica, N. Y.; Springfield Construction Railway Co., Springfield, Ill.; The Dayton & Troy Electric Railway Co., Piqua, Ohio; Berkshire Street Railway Co., Pittsfield, Mass.; Dayton, Covington & Piqua Traction Co., West Milton, O.; Newton & Boston Street Railway Co., Newton, Mass.; Harrisburg Traction Co., Harrisburg, Pa.

The Ohmer Fare Register Co., Rochester, N. Y., and Dayton, O., since the beginning of the year, has furnished registers to the Hudson Valley Railway Co., of New York; Citizens Light & Transit Co., of Pine Bluff, Ark.; Natchez Electric Street Railway & Power Co., Natchez, Miss.; Fresno City Railway Co., Fresno, Cal.; Scranton Railway Co., of Scranton, Pa.; Peoples Railway Co., of Dayton, Ohio; Electric Railway, Light & Ice Co., Junction City, Kan.; Carrollton Electric Railway Co., Carrollton, Mo.; Danville Street Railway & Light Co., Danville, Ill.; Seattle & Renton Railway Co., Seattle, Wash.; Canton-Akron Railway Co., Canton, Ohio; Oregon Water Power & Railway Co., Portland Railway Co., and City & Suburban Railway Co., of Portland, Ore.; and Pacific Electric Railway Co., of Los Angeles, Cal. The Ohmer company has also just received a contract to complete the equipment of the entire Mexican Electric Railway Co., of Mexico City, Mex., which has three hundred cars. The company has received an order for 41 additional registers for the Pacific Electric Railway Co., of Los Angeles, a like additional number for the City & Suburban Co., of Portland, Ore., an order for 77 registers for the Los Angeles-Pacific Railway Co., of Los Angeles, Cal., eight registers for the Maumee Valley Railways & Light Co., of Toledo, and from several roads for a similar number of additional registers on city and interurban lines, which have been equipped for a year or more. The Ohmer company also

reports that several large contracts are pending. Some new machinery has just been added to its factory at Dayton which is being run to its fullest capacity.

The Climax Stock Guard Co., Chicago, Ill., recently received an order from the Aurora, Elgin & Chicago Railway Co., for guards for 45 single track crossings and five double track crossings. Only 40 single track crossings require guards, but the company ordered the extra quantity for contingencies. The Climax company's customers during 1902 included the following, the combined sales amounting to more than 3,000 guards: Mobile Light & Railroad Co., Mobile, Ala.; Westinghouse, Church, Kerr & Co., Chicago, Milwaukee & St. Paul Railroad (5 orders); Aurora, Elgin & Chicago Railway Co., Chicago & Milwaukee Electric Railway Co., Indianapolis & Plainfield Electric Railway Co., Utica & Mohawk Valley Railway, Massachusetts Construction Co., Chicago & South Shore Railway, Syracuse & Auburn (N. Y.) Inter Urban Railroad, Columbus, Delaware & Marion Electric Railway, Illinois Valley Traction Co., Sargent & Lundy, Engineers for Southern Indiana Inter Urban Railway Co., Olean (N. Y.) Street Railway Co.

The Curtain Supply Co., Chicago, Ill., is in receipt of a number of large orders for curtains, among the more recent being those for 500 cars for the new Interborough road, New York city; 120 new open cars for the Brooklyn Rapid Transit Co., and 120 rebuilt closed elevated cars for the same system.

The Jewett Car Co., Newark, O., has new orders on hand sufficient to keep its facilities taxed for several months, and it is stated that its force of 350 men will be increased to between 500 and 600 by July 1. At present orders have been received from the following roads: Rochester & Eastern Rapid Railway Co., Wheeling & Elm Grove Railway, Auburn Interurban Electric Co., Central Market Street Railway, Newark & Granville Street Railway, Wheeling Traction Co., Columbus, Buckeye Lake & Newark Traction Co., Indianapolis, Greenwood & Franklin Railway, Michigan Traction Co., Cleveland, Painesville & Ashtabula Railway Co., Waterloo & Cedar Falls Rapid Transit Co., Chicago & Joliet Railway, Indianapolis, Lebanon & Frankfort Railway, Zanesville Railway Light & Power Co., Columbus, Delaware & Marion Railway, Columbus, Newark & Zanesville Electric Railway, Canton & New Philadelphia Railway, Interborough Rapid Transit Co. The Jewett company, in addition to other styles, is building subway cars, having received an order for 100 cars for the Interborough Rapid Transit Co., New York. The company is putting up additions to its shops and installing a new power plant complete, thereby doubling the capacity. There will be new wood and iron machinery and a new electric transfer table.

The G. C. Kuhlman Car Co., Collinwood, O., has on the floor in process of construction, 30 cars for the Toledo Railway & Light Co., each car having a 28-ft. body, Detroit platform, and interior finished in cherry, the ceiling being green, with gold trimming. The Kuhlman company is also building some handsome 50-ft. passenger coaches for the Auburn Interurban Railway Co., of Auburn, N. Y., and the Jackson & Battle Creek Suburban Railway. The Cleveland City Railway Co. has contracted with the Kuhlman people for 10 closed car bodies, after the Cleveland standard, while for the Indianapolis & Eastern Railway Co. the Kuhlman shops have recently turned out six large suburban coaches, 52 ft. over all, finished in solid mahogany, with marquetry work, high plush seats, plain ceiling, and altogether an up-to-date interurban coach.

The Taunton Locomotive Mfg. Co., Taunton, Mass., has just completed for the Aurora, Elgin & Chicago Railway Co. an eight-wheel plow, which has some features of special interest. As the road is operated by third rail, this plow was designed with special reference to this form of construction. It is completely equipped, electrically, before leaving the shop. It is mounted on heavy Peckham trucks, will be sent from Taunton to Chicago on its own wheels, and is equipped with M. C. B. couplers at each end, the noses being removed so it may be used in summer as a locomotive. The Taunton company has also made for the Fair Haven & Westville Railroad Co., New Haven, Conn., an eight-wheel share plow, which is carried on Taunton trucks and is fully equipped with air for operating

the noses, as well as the brakes. During the current year the company sold 35 plows, one-half of the eight-wheel variety.

The Maltby Lumber Co., Bay City, Mich., reports having its usual trade for this time of year in all lines, but it is seemingly a little more pronounced in the telephone industry than the electric railway.

The Dorner Truck & Foundry Co., Logansport, Ind., reports orders for its high-speed interurban truck, for the following roads, all of Indiana: Union Traction Co., Indianapolis & Eastern Railway Co., Lafayette Street Railway Co., Kokomo Railway & Light Co., Wabash River Traction Co., and Logansport Railway Co. The Dorner company now makes only two types of double and one of single trucks, all high grade.

Heywood Brothers & Wakefield Co., Wakefield, Mass., reports that its car seat business has largely increased during the year past, its "Wheeler" slideover back seat being especially in demand

for street railway equipment. The "P. & S." turnover back style has also been well called for. It is interesting to note that the Pennsylvania Railroad Co., and the Philadelphia & Reading, have adopted these seats as standard. The Heywood Brothers & Wakefield Co. finds that American-made seats are being used extensively in Canada, South America and Europe, and its export business has perceptibly increased in consequence. The demand for seats covered with woven rattan webbing is very large, likewise.

E. E. Naugle Tie Co., Chicago, Ill., is shipping both cedar ties and poles in large quantities as far east as Schenectady, N. Y., and as far south as Mexico. Beside a number of street railway and other roads, this company furnishes the New York Central & Hudson River, Michigan Central, C. & B. Q., C. & N. W., C., M. & St. P., Union Pacific, Mexican Central and Great Northern railroads. It is stated that the demand for poles and ties is very great especially trolley pole lengths. The demand is, in fact, greater than the supply, and a great many roads are having trouble to get delivery of ties as wanted.

COMPANIES ORGANIZED WITHIN THE LAST EIGHT MONTHS.

ALABAMA.

Montgomery Traction Co., Montgomery, Ala. Capital, \$1,000,000. To build an electric line from Montgomery to Pickett Springs. E. A. Graham, Harry Holt and W. H. Hagland.

ARKANSAS.

Arkansas Traction Co., Little Rock, Ark. Capital, \$500,000. To construct an interurban electric railway between Harrison, Keener and Dodd City. Thomas Helm, president; R. M. Fellows, secretary and treasurer; C. Irving Page, vice-president.

Ozark and Sulphur Mountain Traction Co., Harrison, Ark. Capital, \$500,000. To build an interurban electric road between Harrison and Keener; also to Bellefonte and Sulphur Mountain. W. G. Gardiner, Allen Smalley, John J. Gaghan, Neal Dodd, Harold A. Oertling, James A. Flinn, C. M. Greene, John A. Bunch, W. L. Cassidy, W. S. Allen, William S. McK. Oertling.

Fort Smith Suburban Railway Co., Fort Smith, Ark. Capital, \$100,000. To build a six-mile electric line in and around Fort Smith. George Sengel, president; Frank Park, vice-president; S. A. Williams, secretary; E. Sengel, treasurer.

CALIFORNIA.

Bakersfield & Ventura Railway Co., Los Angeles, Cal. Capital, \$5,000,000. To build a line from Sunset to Hueneme, with two branches. Eben Smith, J. W. Burson, Gervaise Purcell, A. N. Sanford, J. W. Sawick.

San Bernardino & Highlands Electric Railway Co., San Bernardino, Cal. Capital, \$150,000. Henry Fisher, John H. Fisher, A. C. Denman, Jr., George M. Cooley, H. H. Sinclair, George B. Ellis.

San Bernardino Power Co., San Bernardino, Cal. Capital, \$300,000. To construct an electric railway north of E St. from Third, thence east to Highlands. W. A. Harris, S. F. Kelley and others.

Oakland & San Jose Railroad Co., Oakland, Cal. Capital, \$2,500,000. To operate a system of electric railways between Oakland and San Jose, with three branches extending from San Jose to Santa Clara, Saratoga and Los Gatos, a total distance of 84 miles. Bonds to the extent of \$3,000,000 have been placed. E. A. Heron, president, and W. F. Kelly, general manager, both of the Oakland Transit Co., and Frank M. Smith, F. C. Havens and W. H. Martin, of Oakland.

Indian Valley Railway Co., Gridley, Cal. Capital, \$1,000,000. To build a 25-mile electric line along the Indian Creek and the north fork of Feather River. H. M. Yard, Samuel Gillen, Adolph Eckman and Charleston Gray.

Los Angeles, Hermosa Beach & Redondo Railway Co., Los Angeles, Cal. Capital, \$1,000,000. To build an electric line over the route indicated by the title. M. H. Sherman, E. P. Clark and J. D. Pope.

Fresno Intermountain Railway Co., Fresno, Cal. Capital, \$500,000. To build a 25-mile line from the eastern terminus of the Fresno City R. R. to Clovis and Leach. S. N. Griffith.

COLORADO.

Rapid Transit Co., Pueblo, Col. Capital, \$100,000. To build an electric railway system to connect with proposed lines to Beulah. H. R. Holbrook, W. A. Betty and J. J. Burns.

Leadville District Railway & Power Co., Leadville, Col. Capital, \$100,000. To construct a street railway system in Leadville and furnish electricity for lighting and industrial purposes. Theodore W. Kroman, of Brooklyn, N. Y., and G. E. Griswold, of Bayonne, N. J.

Pueblo & Suburban Traction & Lighting Co., Pueblo, Col. Capital, \$3,500,000. To transmit electric power from Beaver Creek Falls to Pueblo, a distance of 50 miles, for purposes of operating electric cars and lighting. M. D. Thatcher, John F. Vail, Ward Rice, T. H. Devine and H. F. Woods, all of Pueblo.

Colorado Springs & Interurban Ry., Colorado Springs, Col. To combine the electric lines in and around Colorado Springs, Manitou, Cripple Creek, Victor and Colorado City.

DELAWARE.

Keystone Electric Railway Co., Wilmington, Del. Capital, \$2,000. West Chester, Kennett & Wilmington Electric & Railway Co., Wilmington, Del. Capital \$150,000.

Delaware Suburban Railway Co., Wilmington, Del. Capital, \$100,000. To construct an electric railway system from the Stanton terminus of the Wilmington City Ry. to Newark, Elkton and Chesapeake City. George F. Schlegelmich, vice-president German-American Trust Co., principal promoter.

Jacksonville Traction Co., Jacksonville, Fla. Capital, \$400,000. To construct, operate and maintain street railways, electric, cable or other motive power. G. W. Shook, P. A. Dignan, J. F. Cannon, Arthur F. Perry.

North Jacksonville Street Railway, Town & Improvement Co., Jacksonville, Fla. Capital, \$150,000. To build an electric railway in the northern suburbs of Jacksonville and to establish a summer resort en route. R. R. Robinson, president, and George E. Ross, secretary, of Jacksonville; John D. McDuffy, treasurer, Ocala, Fla.

GEORGIA.

Chattahoochie Terminal Co., Atlanta, Ga. Capital, \$250,000 (may increase to \$2,000,000). To build a 20-mile line from Atlanta to Marietta. Newton A. Morris, T. W. Glover, John Awtry, H. L. Collinsworth, W. F. Spaulding, Alex C. King, Jack C. Spaulding, Charles D. Tuller, B. M. Fowler.

Atlanta Terminal Co., Atlanta, Ga. Capital, \$600,000. To build a line in Augusta. J. S. B. Thompson, L. L. McCloskey and William A. Stokes.

Augusta-Alken Railway & Electric Co., Augusta, Ga. Capital, \$2,300,000. To promote and construct urban and interurban railways and the construction and equipment of gas, water and electric light and power plants.

ILLINOIS.

The Chicago & Illinois Western Electric R. R., Chicago, Ill. Capital, \$25,000. To build an electric line through Cook, Will and Kane counties. John T. Evans, Herbert S. Dunscombe, Dave Plummer, A. V. Kosberg, W. E. Phillips.

The Southwestern Elevated Railroad Co., Chicago, Ill. Capital, \$100,000. To build an overhead line to the Union Stock Yards and into the suburb of Englewood. John A. Spoor, Frederick S. Winston, S. R. Flynn, James Miles, John D. Black, William Raymond.

Englewood Elevated Railroad Co., Chicago, Ill. Capital, \$50,000. Incorporators, Leslie Carter, Noble B. Judah, Henry G. Miller, Franklin E. Vaughn, Donald S. Trumbull. Directors, Mr. Carter, Byron L. Smith, Charles H. Wacker, Marcellus Hopkins and Mr. Judah.

St. Louis, Vandalia & Eastern Electric R. R., Vandalia, Ill. Capital, \$50,000. To construct an electric line from East St. Louis to Marshall. William Fogler, C. G. Sonnemann, G. D. Steinhauer, H. C. Doyle, T. N. Lakin.

St. Louis & Eastern Electric Railroad Co., St. Elmo, Ill. Capital, \$50,000. To build an electric road from East St. Louis through St. Clair, Madison, Bond and Fayette counties to St. Elmo. B. F. Johnston, P. M. Johnston, G. W. Bledsoe, G. W. Harlan, G. T. Turner.

The Southern Illinois Electric Railway Co., Mt. Vernon, Ill. Capital, \$50,000. Incorporators, John P. Puercey, Norman H. Moss and Louis G. Pavey.

Galesburg & Aledo Interurban Railway Co., Galesburg, Ill. Capital, \$10,000. To build an electric line between the cities named in the title. J. T. McKnight, Lake W. Sanborn, J. J. Welsh, C. L. Gerould, G. B. Churchill, A. L. Richey, Charles E. Johnson, W. E. Stevenson, C. W. Postwaite, George A. Cooke.

Quincy & Western Illinois Railway Co., Quincy, Ill. Capital, \$500,000. To construct an electric railway from Quincy to Beardstown; also from Rushville to Havana, and from Quincy to Niota. Smith H. Bracey, John Traise, Frank E. Lonas, Alved B. Nettleton, L. J. Highland.

Rockford & Freeport Electric Railway Co., Rockford, Ill. Organized to build a 28-mile line between these cities, to be completed during 1903. T. M. Ellis, president and general manager; J. H. Camlin, secretary; G. H. Knox, electrical engineer; Weston Bros., consulting engineers.

Western Illinois Railway Co., Rock Island, Ill. Capital, \$15,000. To build an electric railway to connect Aledo and Rock Island. F. H. Caldwell, R. E. Little, E. E. Reynolds, G. B. Morgan, W. H. Holmes. Offices at Milan, Ill.

Rochelle & Southern Railway Co., Rochelle, Ill. Capital, \$100,000. To build an electric line from Davis Junction to McNabb by way of Rochelle. Leslie Carter, W. H. Morrison, A. Uhrlaub, C. S. Jefferson and Andrew Craig, all of Chicago.

Bloomington, Pontiac & Joliet Electric Ry., Pontiac, Ill. Capital, \$100,000. To build from Joliet through Jackson to Bloomington. J. S. Murphy and J. A. Caruthers, of Pontiac; J. McWilliams, Jr., of Odell; B. F. Harbor, Bloomington; A. M. Legg, Pontiac.

Danville, Paxton & Wilmington Electric Railway Co., Paxton, Ill. Incorporated to build a line between cities named in the title. Directors, John A. Montellus, Piper City; J. K. Butz, Potomac; J. W. Dale, Danville; T. M. King, W. O. Johnson, J. P. Middlecoff (president), Paxton.

Paris & Terre Haute Traction Co., Paris, Ill. Capital, \$5,000. To build an electric railway between Paris, Ill., and Terre Haute, Ind. George W. Hughes, of Humes, Ill., and J. D. Hunter, A. J. Hunter and J. E. Parish, of Paris.

Galesburg & Kewanee Electric Railway Co., Galesburg, Ill. Capital, \$600,000. To build 42 miles of road between Galesburg and Kewanee, connecting Galva, Altona, Oneida and Wataga. H. W. Crane, president; H. C. Lucas, secretary and treasurer; F. W. Emery, general manager; C. D. Lindsey, superintendent; I. K. Pierson, chief engineer; W. D. Godfrey, attorney; P. K. Hart & Sons, contractors.

Joliet & Northwestern Railroad Co., Joliet, Ill. Capital, \$500,000. E. H. Young, Bristol, Ill.

Quincy & Western Illinois Railway Co., Quincy, Ill. Capital, \$3,000,000. Has purchased franchise of Quincy & Southeastern Electric Ry. and will build two lines, one north to Niota, 55 miles, and one

east to Beardstown, 70 miles. It is expected that the eastern line will be ready for operation by Aug. 1903. Bracey-Howard Construction Co., Chicago, general contractor.

Central Illinois Traction Co., Mattoon, Ill. Capital, \$250,000. To build a trolley line between Mattoon and Charleston.

Kewanee, Cambridge & Geneseo Railroad Co., Kewanee, Ill. Capital, \$100,000. To build an electric line between cities named in the title. G. A. Anthony, Theodore Boltenberg and R. W. Olmstead.

Sterling, Dixon & Eastern Electric Railway Co., Sterling, Ill. Capital, \$300,000. H. C. Higgins, of Neenah, Wis.; Harry O'Neal, of Omaha, Neb.; T. F. Springfield, of Rochester, N. H.; Ward S. Arnold, of Chicago; Frank E. Andrews, of Sterling.

Suburban Belt & Terminal Railway Co., East St. Louis, Ill. To build a line through Madison, Monroe and St. Clair counties, connecting East St. Louis, Alton and Crystal City, Mo.

Northern Illinois Traction Co., Chicago, Ill. To build a line from Cicero to the northern boundary of Lake County. William D. Ball, Evanston; Frederick B. MacKinnon, Oak Park; W. I. Block, C. H. Lenhart and Edwin B. Smith, Chicago.

Chicago, Elgin & Waukegan Electric Railway Co., Chicago, Ill. To build a system of electric railways through Lake, Cook, Kane, DuPage, Will, Kendall, Grundy and DeKalb counties, with an important line to be known as the Joliet & Northwestern Ry., which will run from Aurora to Sandwich, Plano, Morris, Platteville, Newark and Joliet. John J. Reagan, S. S. Overhiser, W. R. Newton, E. H. Young, E. G. Young and E. W. Stees. Henry L. Triener & Co., Bankers, Chicago, are the backers of the road.

Chicago Junction Railroad Co., Chicago, Ill. Capital, \$50,000. To extend the South Side Elevated Railroad to the Stock Yards and along the Lake Shore boulevard route to a connection with the Illinois Central Railroad. Frederick W. Babcock, James Miles, Edward W. Everett, William Raymond and John D. Black.

Chicago, Milwaukee Avenue & Inland Lakes Traction Co. Capital, \$50,000. To build an electric railway system and furnish electric power for lighting and industrial purposes. S. A. Walther, Gideon F. Lanaghan and John A. Walther.

Danville, Urbana & Champaign Ry., Danville, Ill. Capital, \$250,000. To construct a 24-mile, single track line. W. B. McKinley, president and general manager; George F. Duncan, vice-president; Edward Woodman, secretary and treasurer; H. J. Pepper, superintendent, and R. D. Smith, chief engineer.

INDIANA.

Indianapolis, Danville & Rockville Traction Co., Indianapolis, Ind. Capital, \$100,000. W. B. Blair, W. C. Osborne, John W. Ader, Everett Wagner, John W. Trotter, Charles P. Hornaday, George F. Patterson.

Knox, Chicago & Northern Traction Co., LaPorte, Ind. To build a road 140 miles long, in two sections, one from Logansport to Winamac, Bass Lake, Knox and LaPorte, and the other connecting Rochester with Culver City, Bass Lake, Knox, Wanatah, Valparaiso and Hammond.

The Indiana Northern Traction Co., Marion, Ind. Capital, \$25,000. To build an interurban line from Marion to Lafontaine, Wabash, North Manchester and Warsaw. R. E. Breed, G. A. H. Shideler, F. F. Burke, E. H. Neal, George & Breed.

Huntington, Columbia City & Northern Traction Co., Huntington, Ind. Capital, \$50,000. To build an interurban line from Huntington to Columbia City. John A. Kintz, president; F. J. Heller, vice-president; W. A. Jones, secretary; B. E. Gates, treasurer.

Winchester, Union City & Muncie Traction Co., Winchester, Ind. Capital, \$275,000. Joseph E. Lowes, John E. Feight and R. E. De Wesse, Dayton, O., directors.

Southern Indiana Traction Co., Vincennes, Ind. Capital, \$100,000. To build an electric line from Vincennes to Jasper, via Petersburg and Ottwell. Smiley N. Chambers, president; Robert M. Gray, Fred E. Chappell.

Western Indiana Traction Co., Vincennes, Ind. Capital, \$100,000. To build interurban railways in Vanderburg, Posey, Gibson, Knox, Sullivan and Vigo counties. Edgar H. DeVolf, Fred J. S. Robinson, Charles W. Benham, Samuel W. Williams and John D. LaCroix.

New Castle & Muncie Traction Co., New Castle, Ind. Capital, \$10,000. To construct and operate street railway systems, electric light and power and steam heating systems in New Castle, Mt. Summit, Springport, Oakville, Cowan, Muncie, Alexandria, Marion, Hartford City, Portland, Bluffton, Fort Wayne, Cambridge City, Knightstown, Dunreith and Connersville, and to connect these places by interurban lines. E. T. Ice and F. W. Nixon.

Southern Indiana Interurban Railway Co., of New Albany, Ind. Capital, \$300,000. To build an electric railway system connecting New Albany and Jeffersonville. All contracts awarded.

Muncie & Portland Traction Co., Muncie, Ind. Capital, \$100,000. To build an electric line 28 miles long. G. O. Driscoll, of Muncie, president; Harvey Leffler, of Muncie, vice-president; Truman O. Boyd, of Portland, secretary, and Nathan B. Hawkins, of Portland, treasurer.

Fort Wayne, Van Wert & Lima Traction Co., Fort Wayne, Ind. Capital, \$2,000,000. Building 55 miles of interurban lines between Fort Wayne and Lima, Ohio & Indiana Construction Co., Fort Wayne, contractors. James Murdock, of Lafayette, Ind., president of new company; D. J. Cable, of Lima, O., vice-president and general counsel; J. D. S. Neely, of Lima, secretary and treasurer. Directors, the officers and Henry C. Paul, of Fort Wayne; John B. Chapman, Pittsburg, Pa.; W. H. Duffield, Lima, O., and C. M. Murdock, Lafayette, Ind.

Consolidated Traction Co., Indianapolis, Ind. Capital, \$300,000. To build and operate electric lines northwest of Indianapolis. Main object said to be the absorption of lines now in the territory named.

Indiana Co., Indianapolis, Ind. Capital, \$1,000,000. Will build a belt-line in Indianapolis. Randall Morgan, Thomas Dolan, F. N. Mac-Morris, C. G. Edwards, G. S. Martin.

Oil Belt Traction Line, Hartford City, Ind. To build an interurban line between Hartford City and Fairmount, line to be operated by Dec. 1, 1904. John P. McGeath, Hartford City, W. M. Amsden and W. J. Block, of Marion.

Indianapolis & Cincinnati Traction Co., Indianapolis, Ind. Capital, \$500,000. Directors, Charles L. Berry, William L. Taylor, Theodore F. Rose, Ephraim Marsh, William F. Razee, Eudora M. Johnson, James M. Brown.

Huntington & Winona Traction Co., Huntington, Ind. To build a street car line from Huntington to South Whitley, Princeton, Warsaw and North Webster, connecting at Winona and North Webster with the proposed Gordon and Fort Wayne line, also connecting at Huntington with the Fort Wayne & Northwestern Traction Co., and the proposed Huntington & Marion line. George Lee, president, Edward B. Power, vice-president, Charles R. Parks, secretary, M. W. Webster, treasurer, Ed L. Hubbard, superintendent.

Indiana Southern Interurban Aurora, Ind. To build a line from Ellettsburg to Aurora, Vincennes and Osgood and connect with the Indianapolis, Richmond & Southern Traction Co.'s line at Greensburg & Batesville.

Fort Wayne, Logansport & LaFayette Traction Co., Fort Wayne, Ind. Capital, \$1,000,000. To operate street and interurban railways between Fort Wayne, Huntington, Wabash, Peru, Logansport, Delphi

and LaFayette. Horace C. Stillwell, president, Muncie; C. W. McGuire, vice-president; Horace C. Guthrie, secretary; William C. Sampson, treasurer.

Elkhart, South Bend & Chicago Railway Co., Elkhart, Ind. Capital, \$15,000. To build a 30-mile electric line from Warsaw to Elkhart via Nappanee.

New Albany, Paoli & French Lick Valley Traction Co., French Lick, Ind. Capital, \$100,000. To build an electric line through Washington, Orange, Harrison and Floyd counties. Thomas Taggart, Bernard T. Jenp, Indianapolis; L. T. Dickinson, Chicago, Thomas B. Buskirk, Paoli; Crawford Fairbanks, Terre Haute.

Winona, Warsaw, Elkhart & South Bend Traction Co., Elkhart, Ind. Capital, \$400,000. To build an electric line between the cities named in the title. S. F. George, president; George W. Scott, vice-president; Charles W. Gethart, treasurer; S. A. Collins, secretary and manager.

INDIAN TERRITORY.

Lehigh Traction Co., Colgate, I. T. Capital, \$300,000. To construct electric line from Atoka to Coalgate by way of Lehigh and several other mining towns. Charles Copeland, of McAlester, and David J. Young, of Fort Smith.

IOWA.

Marshalltown Electric Street & Interurban Railway Co., Marshalltown, Ia. Capital, \$25,000. W. E. Sloan, E. L. Weil, A. G. Glick, H. P. Densel, Charles Glick, George R. Estabrook and F. E. Glick.

John U. May Electric Railway Co., Clinton, Ia. To build an electric line from Clinton to Davenport. John U. May, president; Miss Mary Harrah, vice-president and treasurer; J. J. Melchert, secretary.

Cedar Falls & New Hartford Electric Railway Co., Cedar Falls, Ia. Capital, \$300,000. To build an electric railway between the towns named in the title. W. G. Eruen, A. P. Humburg, John C. Welling, Blewett Lee and Frank L. DeLay.

Chariton, Knoxville & Southern Railway Co., Chariton, Ia. Capital, \$100,000. To build an electric railway from Chariton to Knoxville and later extend to Corydon. S. H. Mallory, president; J. S. Bellamy, Knoxville, vice-president; Eli Manning, secretary; F. R. Crocker, treasurer.

Atlantic, Villisca & Grant Railway Co., Atlantic, Ia. Capital, \$25,000. To build a 36-mile line between the cities named. E. C. Pinkney, president.

Clarinda, College Springs & Southern Railway Co., Clarinda, Ia. Capital, \$100,000. To build a 120-mile line from Blanchard to Des Moines via College Springs, Clarinda and Winterset. E. B. Dunham, Louis A. Coburn, Chadron, Neb.; D. J. Atwater, Chicago, Ill.

Des Moines, Mt. Ayr & Southern Electric Railway Co., Des Moines, Ia. Capital, \$600,000. To build an interurban from Creston to Mt. Ayr. F. E. Sheldon, president; J. F. Wall, vice-president; H. C. Beard, secretary; Clyde Dunning, treasurer.

Davenport & Western Electric Railway Co., Davenport, Ia. Capital, \$150,000. J. P. Hord, president and general manager, Aurora, Ill.; F. Y. Keator, vice-president and treasurer; W. E. Snyder, secretary.

KANSAS.

Kansas City, Olathe & Southwestern Suburban Electric Railroad & Power Co., Kansas City, Kan. Capital, \$10,000. To build an electric line between Kansas City and Olathe.

Union Electric Railway & Construction Co., McPherson, Kan. To build an electric line connecting McPherson, Newton, Arkansas City and intermediate points with Wichita. The traffic will be both passenger and freight.

KENTUCKY.

Louisville & Interurban Railway Co., Louisville, Ky. Capital, \$500,000. To operate several electric lines, which will revert to the Louisville Railway Co. T. J. Minary, J. E. Speed, Atilla Cox, John Stiles, Harry Bishop, Clarence Dallam and J. M. Jubbart.

Brownsville Railway Co., Louisville, Ky. Capital, \$25,000. To build an electric line on the Brownsville pike from Louisville through the counties of Jefferson, Oldham, Henry, Trimble, Shelby, Spencer, Nelson and Bullitt. Clayton W. Blakely.

LOUISIANA.

Shreveport & Suburban Traction Co., Shreveport, La. Capital, \$100,000. To build a trolley road in Shreveport. John R. Miller, William S. Lambert, Herman Hedberg, Austin Miller, C. L. Bland.

New Orleans & Southwestern Railroad Co., New Orleans, La. Capital, \$2,000,000. To construct an 100-mile interurban line to connect New Orleans, Thibodaux, Lockport, Raceland, Hanna and Shreiner. The road will handle the heaviest class of freight. C. P. Shever, president; C. P. Young, general manager.

MAINE.

Maine & New Hampshire Railroad Co., Biddeford, Me. Capital, \$400,000. To build a 90-mile electric line from Hiram through Standish, Cornish, Leamington and Dayton to Biddeford, with branches through Limerick, Waterboro, Newfield, Shopleigh and Acton. George B. James, Boston; A. C. Kennett, Conway, N. H.; E. E. Hastings and Henry Andrews, Fryeburg, Me.; Leslie C. Cornish, Augusta, Me. Auburn, Mechanics Falls & Norway Street Railway Co., Auburn, Me. Capital, \$100,000. To build a 24-mile railway to be operated by electricity or compressed air. Frederick H. Wilson, Brunswick; Frank E. Southard, Bath.

MARYLAND.

Princess Anne & Deal's Island Light, Power & Railway Co., Princess Anne, Md. Capital, \$200,000. To construct a 25-mile electric railway from Princess Anne through Somerset county to Deal's Island. Hampden P. Dashfield, president; William F. Lankford, secretary; H. P. Dashfield, Oliver T. Beaucamp, Roger Woolford and S. Frank Ashfield, executive committee.

Cumberland Narrows Electric Railway Co., Cumberland, Md. Capital, \$20,000. To construct an electric line between Narrows Park and the Baltimore & Ohio depot at Cumberland. H. H. Koch, Baltimore.

A. Richmond, Harry E. Weber, D. J. Blackstone and Richard S. Bell. Baltimore & Bel Air Electric Railway Co., Baltimore, Md. Capital, \$500,000. To build an electric railway, for both passenger and freight service, to connect with the United Railways & Electric Co. S. A. Williams, George L. Van Bibber, John D. Worthington, Harold Walsh and J. A. Shriver.

Baltimore & Chestertown Railroad Co., Baltimore, Md. Capital, \$75,000. To build an electric railway from Chesterton to Rock Hall and Tolchester Beach. H. R. Fothergill, Wilmington, Del.; Harcourt N. Trimble, Philadelphia, and Thomas R. Hubbard, Kent County, Del.

MASSACHUSETTS.

Sandwich, Hyannis & Chatham Street Railway Co., Middleboro, Mass. To build a line from Sandwich Station to a point near Chatham Light, a distance of 10 miles. The line will probably be an extension of the Middleboro, Wareham & Buzzard's Bay Street Railway line.

Haverhill & Andover Street Railway Co., Haverhill, Mass. Capital, \$80,000. To build an electric line between the points named.

MAINE. **Andover & Portland Street Railway Co.** Andover, Me. Capital, \$100,000. To build an electric line through Andover, Saco, Portland and other places, and to build a bridge over the Andover river.

New York & Portsmouth Street Railway Co. Great Barrington, Mass. Capital, \$100,000. To build an electric line from Great Barrington, N. Y., to the city of Portsmouth, N. H., and to build a bridge over the Portsmouth river.

Andover & Portland Street Railway Co. Andover, Me. Capital, \$100,000. To build an electric line through Andover, Saco, Portland and other places, and to build a bridge over the Andover river.

Andover & Portland Street Railway Co. Andover, Me. Capital, \$100,000. To build an electric line through Andover, Saco, Portland and other places, and to build a bridge over the Andover river.

MICHIGAN

International Traction Co. South St. Marie, Mich. Granted a charter to construct electric railways at South St. Marie, both on the American and Canadian sides, in the interest of the Consolidated Lake Superior Co. Bonds to the amount of \$500,000 have been sold. A ferry line across the St. Mary river will be operated in connection with the railway.

Jackson & Battle Creek Traction Co. Jackson, Mich. Capital, \$100,000. To construct a line between the cities named. Lines in operation between the cities have been turned over to new company. C. M. Spitzer, president, and A. L. Spitzer, vice-president, both of Toledo, O.; N. S. Potter, treasurer, and W. A. Foster, secretary, of Jackson. The officers named and W. A. Boland, William Robinson and Horton C. Renick, of Toledo, are directors.

Michigan Central Traction Co. Lansing, Mich. Capital, \$200,000. To build an electric line between Lansing and Battle Creek. E. F. Pangburn and A. J. White, of Battle Creek, Mich.

Grand Rapids, Lansing & Battle Creek Electric Railway Co. Grand Rapids, Mich. Capital, \$200,000. To build an electric line between Grand Rapids, Charlotte, Lansing and Battle Creek. W. A. Smith and William A. Tateum.

Detroit, Monroe & Toledo Short Line Co. Detroit, Mich. Capital, \$200,000. For the purpose of acquiring the Toledo & Monroe Ry. and extending it to Detroit. E. M. Fowler, Matthew Slush, M. Clemens, Charles R. Hannah, Council Bluffs, Ia.; Simon J. Murphy, C. J. Reilly, Arthur Hill, Saginaw; Clarence A. Black, A. E. F. White, J. M. Mulkey and Eliska H. Finn.

Adrian & Northwestern Railway Co. Adrian, Mich. To build an electric railway from Adrian to Jackson. O. B. Bowen, H. Smith, L. S. Darling and J. F. Lewis, Addison, Mich.

MINNESOTA

Mankato, Minn. A franchise for a street railway to St. Peter via Kasota, a distance of 12 miles, was granted in November, 1902. U. P. Hord and F. Y. Keator, of Aurora, Ill. Later the line will be extended toward Minneapolis.

Minnesota & Iowa Electric Railway Co. Preston, Minn. Incorporated in January, 1902. Capital, \$500,000. To build 150 miles of interurban electric lines this season from Decorah, Ia., to St. Paul via Preston. Judge H. R. Wells, president; R. E. Thompson, vice-president; H. Nupson, treasurer; S. A. Langum, secretary.

MISSISSIPPI

Jackson Belt Line Railway Co. Jackson, Miss. Capital, \$200,000. J. B. Harris, president; J. S. Hamilton, general manager.

MISSOURI

Kansas City, Parkville & St. Joseph Railway Co. Kansas City, Mo. To build an electric interurban line to connect cities named, and to build a \$500,000 bridge over the Missouri river. N. B. Hasbrouck, of Cleveland, secretary.

Kansas City Outer Belt & Electric Railroad, Kansas City. Applied for incorporation. To build 10-mile electric line in Clay and Jackson counties. A. J. Stillwell, Kansas City, Kan.; B. N. Simpson, Kansas City, Mo., and D. W. Mulvane, Topeka, Kan.

Kansas City, Dallas & Olathe Railway Co. Kansas City, Mo. Capital, \$500,000. To build an electric line between the cities named. Willard E. Winger, H. G. Post and A. A. Potter.

St. Louis County Street Railway Co. St. Louis, Mo. Capital, \$50,000. To build a double track electric railway system from the city limits on the Olive Street road to Creve Coeur Lake. Directors, Judge Henry W. Bond, P. E. Flannagan, A. W. Fleming and William Schneider, of St. Louis; Jacob G. Hawken, of Kirkwood, and George P. Autenrieth, of Clayton.

Missouri Central R. R. Glasgow, Mo. Capital, \$4,000,000. To build an 194-mile electric road between Brookfield and Culver Springs, and ultimately connect with Kansas City and St. Louis. Survey, maps, profile and engineer's estimates completed. George B. Harrison, president; Edwin M. Price, vice-president and treasurer; W. H. Chase, general manager; Charles A. Loomis, general counsel; Howard Ellis, secretary.

West Olive Street Railway Co. Clayton, Mo. Capital, \$25,000. To build an electric line from the city limits of Clayton to Creve Coeur Lake. W. Carl Feld, C. O. Giers and W. J. Jones, Central, Mo.

Carrollton Water, Light & Railway Co. Carrollton, Mo. Capital, \$100,000. To acquire the street railway, electric lighting and water-works system of Carrollton. Herndon Ely, president; T. L. West, vice-president; P. L. Trotter, secretary; J. T. Marshall, treasurer.

MONTANA

Helena Light & Traction Co. Helena, Mont. Capital, \$200,000. To build and operate street railways in Helena, and to furnish power for lighting and industrial purposes. A. Marlowe and H. M. Parthou.

NEBRASKA

Omaha & Council Bluffs Street Railway Co. formerly Omaha & Florence Street Railway Co. Omaha, Neb. Capital increased to \$15,000,000. To take over Omaha Street Railway and the Omaha & Council Bluffs Railway & Bridge Co., and to build extensions to Blair, Fremont, Plattsmouth, Wahoo, Lincoln and Griswold, Ia. J. W. Selligman, New York, president.

Omaha, Decatur & Northern Railway Co. Omaha, Neb. Capital, \$1,000,000. To build an electric railway through the counties of Douglas, Washington, Burt, Thurston and Dakota. C. E. Burlew, A. M. Anderson, E. H. Martin, H. D. Ryan, P. P. Gordon, W. R. Lewis and others.

NEW HAMPSHIRE

Pelham & Derry Electric Railway Co. Pelham, N. H. Incorporated to build an electric line from Lowell to Manchester, through Windham and Derry, with a branch to Derry Depot. F. M. Woodbury, of Pelham.

Billingham, Brentwood & Kingston Street Railway Co. Effingham, N. H.

Nashua & Hollis Electric Railway Co. Nashua, N. H. To build an electric railway between the places named.

Portland & Hallow Street Railway Co. Hallow, N. H. To build an electric line between the places named in the title.

Dover & Portsmouth Street Railway Co. Dover, N. H.

Manchester, Concord & Portland Street Railway Co. Deerfield, N. H. To build an electric line between the places named.

NEW JERSEY

New Jersey Southern Gas & Electric Co. Paterson, N. J. Capital, \$500,000. To build an electric line from Paterson to Paterson to be operated by the road from Vineland through Camden and Gloucester. Alfred M. Mosatan, J. H. McNair, R. M. Anderson.

Elizabethport, Amboy & Long Branch Railway Co. Elizabethport, N. J. Capital, \$500,000. To bid for franchise across the projected bridge at Perth Amboy. Andrew Kirkpatrick, Edwin Furman, W. F. Kitchin.

Easton & Washington Traction Co. Washington, N. J. Capital, \$100,000. To build a system of electric lines connecting Easton, Washington, Hackettstown, and Elizabeth.

Interstate Railway Co. Trenton, N. J. Capital, \$1,000,000. Purpose reported to be to take over Trenton, New Jersey, and to build suburban lines in New York, Pennsylvania, New Jersey, Delaware and Maryland. Frank B. Hays, William F. Elder, and George B. Martin, incorporators. John A. Rigg and W. W. Light also interested.

Jersey Central Traction Co. Keyport, N. J. To build 12-mile extension from Keyport to Red Bank. Thomas R. Hall, Keyport.

Atlantic City & Suburban Traction Co. Atlantic City, N. J. Capital, \$500,000. To build an 18-mile electric railway from Atlantic City to Pleasantville, with branch along bay shore to connect suburban towns. E. R. Sponsler, Harrisburg, Pa.; C. Taylor Leland, Philadelphia, and A. M. Jordan, Atlantic City.

People's Traction Co. Camden, N. J. Capital, \$175,000. To build electric railways in New Jersey. J. A. Sweigard, Atlantic City; W. C. Parry, Hainesport, N. J.; J. K. Tougher, Philadelphia, Pa.

Camden, Atlantic City & Chelsea Passenger Railway Co. Camden, N. J. Capital, \$250,000. To build an electric line to connect Atlantic City, Chelsea and other towns.

Delaware Valley Traction Co. Atlantic City, N. J. Capital, \$25,000. To build an electric line from Atlantic City to Pleasantville and Somers Point.

Newark, Elton & Eastern Shore Electric Railway Co. Newark, N. J. Organized to build an electric line from Newark to Elton, Chesapeake City and along the eastern shore of Maryland. Directors, John G. Williams, Albert Constable, Jr., Joshua Clayton, Joseph H. Steel and Charles S. Ellason.

NEW YORK

Union Traction Co. Medina, N. Y. To build a 50-mile electric road from Batavia to Oakfield, Smithville, Wheatville, Alabama Center, Shelby Center, Medina, Ridgeway, Lyndonville, Yates, County Line, Somerset and Olean. Fred L. Dawes, Medina, N. Y.

Canisteo, Jasper & Woodhull Railway Co. Jasper, N. Y. Capital, \$250,000. To build a 12-mile electric railway from Canisteo to Jasper. G. M. Sturges, of Canisteo; C. E. Brown, of Jasper, and M. W. Comstock, of Buffalo.

Mincola, Roslyn & Port Washington Traction Co. Port Washington, N. Y. Capital, \$50,000. To build a 15-mile surface electric line from Mincola to Port Washington. Directors, I. H. Odell, Frederick H. Barker, Jacob Besant and G. P. Harrington, of New York City.

Bull's Head & Annadale Beach Railroad Co. New York, N. Y. Capital, \$250,000. To build an eight-mile electric railway from Bull's Head, in Richmond Borough, to Annadale Beach.

Suburban Railway Co. New York City. Capital, \$100,000. Directors, J. C. Simon, William Balin and Max Cohen, all of New York.

Syracuse & Ontario Railroad Co. Syracuse, N. Y. Capital, \$100,000. To build an electric railway through Baldwinsville, West Phoenix, Fulton, Minetto and Oswego. Charles M. Warner, president; A. R. Peck, treasurer; W. E. Rockwell, general manager.

The Cross Country Railroad Co. Flushing, N. Y. Capital, \$250,000. Has filed an amended certificate of incorporation, including a material enlargement of its plans. It is proposed to build 15 miles of road through Flushing, Whitestone, Willets Point, College Point and Jamaica. Joseph F. McClean, Andrew A. Halsey, Theodore Bernard, Charles H. Kelley, George F. Keller, James Crowley, Francis Bacon, James Irwin and Charles Brandon, of Brooklyn.

Burney Traction Co. Salamanca, N. Y. Capital, \$50,000. To operate an electric railway in Salamanca. Andrew J. Edgett, president.

Forest Park Railway Co. Troy, N. Y. Capital, \$20,000. To build a two-mile electric line from Ford street to Forest Park Cemetery. Directors, Joseph A. Leggett, Jacob V. Jacobs, Arthur G. Sherry, E. W. Marvin, T. D. Husted, G. D. Baltimore, Charles E. Gardner, John W. Craver and Northrup R. Holmes.

Vermont & Whitehall Railway Co. Whitehall, N. Y. Capital, \$500,000. To build an electric railway from Whitehall to the Vermont state line. Daniel A. Slatter, J. Osgood Nichols, K. C. Mourhouse and L. W. Baldwin, of New York City, and Ezra A. Tuttle, of Brooklyn.

The Chautauqua Traction Co. Lakewood, N. Y. Capital, \$500,000. To build a 17-mile trolley line from Lakewood to Mayville, passing through the Chautauqua Assembly grounds.

South Shore Traction Co. Patchogue, N. Y. Capital, \$2,000,000. To build a road from Jamaica to Brook Haven. R. Lee Slintuff, Arthur C. Hume, James A. Howes, S. B. Thompson, C. G. Perot, Samuel Worthington, Edward Phillips, Charles H. Davis.

Brookport, Niagara & Rochester Railway Co. of Brookport, N. Y. Capital, \$500,000. To build an electric railway 44 miles long between Rochester and Medina. Frederick Beck, Brookport; William Shields, Waterville; S. J. Spencer, J. L. Boch and Steven J. O'Gorman, Buffalo; John Helling, Rochester; Samuel W. Smith, Holly, and G. L. Smith, Glade Run, Pa.

NORTH CAROLINA

People's Transportation & Power Co. High Point, N. C. Capital, \$500,000. To build a local system of electric railways. D. A. Waters and C. E. Elder, of Philadelphia, and E. D. Steele, of High Point.

OHIO

Ohio Central Traction Co. Columbus, O. Capital, \$1,500,000.

Crestline & Galion Railway Co. Crestline, O. Capital, \$50,000. To build an electric railway through Mansfield and Galion. Frank N. Wilcox, O. N. Wilcox, D. M. Glasscock, Frank Butler, C. W. Collier.

Interurban Construction Co. Toledo, O. Capital, \$10,000,000. To promote and construct electric railways, build bridges, telephone and telegraph lines, etc.

Portland Peninsula Electric Railroad Co. Bowling Green, O. To build an electric railway from Port Clinton to Marblehead and Lakeside via Oak Harbor and Elsmore. Charles I. York, Dr. W. M. Fuller, Dr. F. N. Rogers, R. A. Beatty and Charles M. Draper.

Zanesville Railway, Light & Power Co. Zanesville, O. Capital, \$1,000,000. To build an extensive local system of electric railways. George H. Warrington, John Ross, E. F. Gunther and Thomas D. Braxton, Jr., all of Cincinnati.

Youngstown & Southern Railroad Co. Youngstown, O. To build an electric line from Youngstown to Struthers and Poland. H. G. Hamilton, E. H. Moore, J. Gordon Cook, James McNally and Thomas Connell.

Sandusky Southwestern Railway Co., Wapakoneta, O. Capital, \$100,000. To construct an electric railway from Wapakoneta to Sandusky. Telegraph and telephone lines will also be constructed. S. W. McFarland, Frederick O. Olsen, Samuel P. Douglas, William H. Wyke and Ithamer E. Yarnell, all of Toledo.

Fort Wayne, Bluffton & Richmond Traction Co., Versailles, O. Incorporated to build an electric line between Fort Wayne and Richmond, Ind. E. N. Schaffer, president, Charles Darst, secretary; E. C. Manier, treasurer.

Cincinnati, Dayton & Fort Wayne Railway Co., Dayton, O. Capital, \$100,000. To build an electric line from Cincinnati to a point at Van Wert county on the Indiana line, where a connection will be made with another road to Fort Wayne, Ind.

People's Rapid Transit Co., Toledo, O. Capital, \$100,000. To build an electric railway from Toledo to Cincinnati with spurs to Columbus and Fort Wayne. J. W. Morgan, president and general manager; A. Morkley, first vice-president, L. J. Weadock, secretary; Adam Bauer, treasurer.

Toledo, Fayette & Western Railway Co., Toledo, O. Capital, \$10,000. To build an electric line from Fayette, Fulton county, through Fulton and Williams counties to the state line. Luther Allen, Francis McMillan and Carlos M. Stone, of Cleveland, and Frank E. and James R. Seagrave, Charles E. French and Charles F. Franklin, of Toledo.

Youngstown & Ohio River Railroad Co., Salem, O. Capital, \$10,000. To construct and operate an electric road from Youngstown to East Liverpool. S. Fishel, Ernest Mueller, Max P. Goodman, Charles Zucker, H. Schmidt and L. A. Stout.

Mansfield & Eastern Traction Co., Mansfield, O. Capital, \$300,000. To build 40 miles of single track. The road will consist of two branches and be operated under the names of the Mansfield, Milfill and Ashland Electric Railway and the Mansfield, Hayesville & Wooster Railway. The line from Mansfield to Ashland will be open for traffic about June 1, 1903. The Petersburg Lake Farm, halfway between the cities, will be improved for a pleasure resort. W. J. Peetz, Cleveland, president; J. W. Galbraith, secretary; James J. McGuire, treasurer; Charles Miley, general manager, Mansfield, O.; Greenville, Bradford & Covington Traction Co., Greenville, O. To build an electric railway from Greenville to Covington.

Cleveland, Akron & Southern East Line, Cleveland, O. Capital, \$10,000. To build an electric railway from Cleveland to Akron, and also to extend to Canton and Massillon.

Mansfield, Wooster & Canton Traction Co., Mansfield, O. Capital, \$10,000. To build an electric line from Mansfield to Canton. George H. Billman, J. M. Downey and George H. Taylor.

Cincinnati, Hamilton & Indiana Traction Co., Hamilton, O. To build an electric railway from Hamilton to Oxford and College Corner, where connections will be made with other roads, offering a direct route from Cincinnati to Indianapolis. John C. Hooven, of Hamilton.

Delaware & Magnetic Springs Railway Co., Magnetic Springs, O. Capital, \$200,000. To construct railways to be operated by electricity or other motive power, except steam. F. W. Stonecipher, M. H. McFarland and J. A. Odell, all of Pittsburg.

Toledo, Port Clinton & Lakeside Electric Railway Co., Toledo, O. Capital, \$100,000. To build an electric line from Toledo to Milbury, Elmira, Oak Harbor, Port Clinton and Lakeside. H. R. Klausner, P. McClary, E. E. Flory, H. S. Landis and D. H. James.

Kenton & Southern Railway Co., Kenton, O. Capital, \$600,000. To operate an electric railway between Kenton and Bellefontaine.

Middletown & Sharon (O.) Electric Railway Co., Middletown, O. A franchise has been granted for an electric railway through Bloomfield, Greene, Gustavus, Farmdale and Five Points, the line to be in operation by Jan. 1, 1904.

Canton & New Philadelphia Railway Co., Canton, O. To build a 23-mile line from Massillon to New Philadelphia, via Navarre, Beach City, Strasburg and Canal Dover, Phillip L. Saltonstall, president; Chauncey Eldridge, secretary and treasurer, 53 State St., Boston, Mass.

Cincinnati, Dayton & Fort Wayne Railway Co., Dayton, O. Capital, \$1,000,000. To construct an electric line between the cities named. Samuel F. George, Charles W. Gebhart, James E. Welliver, Benjamin H. Levy and Gustave E. Gheble.

Carrollton, Louisville & Cincinnati Traction Co., Cincinnati, O. Capital, \$200,000. To build an electric line from Newport, Ky.

Norwood, Oakley, Madisonville & Red Bank Traction Co., Cincinnati, O. Capital, \$100,000. To build a system of electric lines in the suburbs of Cincinnati. David Davis, Captain Peter Eichels, Red Bank, L. M. Strater, B. W. Harrison and A. E. Carr, Cincinnati.

Western Reserve Traction Co., Cleveland, O. Capital, \$10,000. To build an electric line at Warren, O. Thomas E. Willard, E. J. Pinner, A. H. Gebert, Conway W. Noble and M. A. Lander.

Greenville Union City Traction Co., Dayton, O. Capital, \$10,000. To build an electric railway from Greenville to Union City. J. E. Lowes, John Feight and W. B. Gebhart.

Cincinnati, Milford & Loveland Traction Co., Cincinnati, O. Capital, \$700,000. To build an electric railway between the cities named as the title. H. B. Krueger, H. Nexon Roberts, J. M. Wilson, C. Ashbrook and H. L. Gordon.

Columbus & Painesville Traction Co., Cleveland, O. Capital, \$10,000. To build an electric railway from Cleveland via Warren to Sharon, Pa. F. B. Krause, E. L. Krause, Charles C. Gilbert, C. C. Dougherty and E. A. Jenkins.

OKLAHOMA.

South Oklahoma City Street Railway Co., Oklahoma City, Okla. Capital, \$25,000. S. Hooker, T. N. Thompson and H. C. Shillings.

Mountain Park Electric Railway Co., Mountain Park, Okla. Capital, \$5,000. To build an electric line between Wildman and Mountain Park a distance of 15 miles. R. D. Simpson, G. J. Galena, Mark Robertson and J. C. Brown.

ONTARIO.

London, Aylmer & North Shore Electric Railroad Co., London, Ont. Capital, \$200,000. To construct electric lines through Middlesex and Essex counties, Ontario, with termini at Port Huron and London. J. L. Hockett and J. H. Hitchcock, of New York, Frank Hassler and Frederick Hittcock, of Detroit, Mich. W. A. Dornell, of Grand Rapids, Mich. and S. E. Lyon, of Aylmer, Ont. directors.

Mount St. Charles Railway Co., Toronto, Ont. Capital, \$250,000. To build an electric railway system in the suburbs of Toronto. Sir Richard Cartwright, Peter Ross, Ernest Thompson and E. L. Sawyer.

OREGON.

Rockburg Street & Suburban Railway Co., Roseburg, Ore. Capital, \$10,000. To build a double electric line. S. C. Elmer and E. F. Alby.

PENNSYLVANIA.

The Philadelphia & Trenton Rapid Transit Railway Co., Philadelphia, Pa. Capital, \$1,000,000. To build an electric line in Philadelphia to connect with the Trenton & Bristol line at Trenton.

York & Gettysburg Street Railway Co., York, Pa. To build a trolley line from York to Gettysburg via East Berlin. C. J. Eichenor, L. J. Wilson, C. S. Linger, E. M. Biddle, Jr., J. L. Zug and J. S. Shepley.

Wellsville Street Railway Co., York, Pa. Capital, \$25,000. To build a trolley line from Dover to Wellsville, being an extension of the York Traction Co.'s system.

Sharon & West Middlesex Street Railway Co., West Middlesex, Pa. Capital, \$50,000. To build an electric railway from Wheatland to West Middlesex. R. Montgomery, president; W. Perkins, William J. McIntyre, R. Hastings and N. A. Norris, directors.

Warren & Jamestown Electric Railroad Co., Warren, Pa. Capital, \$100,000. To build a 10-mile line between the cities named in the title. D. H. Siggins, J. M. Siegfried and H. M. Preston, directors.

Blue Ridge Traction Co., Slatington, Pa. Capital, \$50,000. To build an eight-mile electric line from Slatington to Danielsville. J. S. Mayer, of Bethlehem.

Jefferson Street Railway Co., Reynoldsville, Pa. Capital, \$65,000. To build an eight-mile electric railway from Reynoldsville through Wishaw to Big Run. Directors, J. A. Whitman, G. G. Johnson and L. J. Macdonald, of Punxsutawney, and E. M. Clark, of Brookville.

Hazleton, Weatherly & Mauch Chunk Traction Co., Mauch Chunk, Pa. Capital, \$100,000. To construct an electric railway between points named, a total distance of 15 miles. Weatherly and Wilkesbarre capitalists are interested.

Lancaster & York Furnace Electric Railway Co., Lancaster, Pa. Capital, \$225,000. To build an electric line from Millerville to York Furnace, the line to form a link in the proposed chain of street railways between York and Lancaster.

Ephrata & Lebanon Traction Co., Lancaster, Pa. Capital, \$125,000. To build an electric line from Ephrata to Lebanon, Pa. R. R. Bard, S. S. Hauenstein, S. D. Erb, A. E. Lane, Henry Westerhoff, Martin Kinports, T. A. Wilson and S. S. Wissler, Messrs. Hauenstein and Lane and Daniel Munshower, of Ephrata, comprise the commission to solicit stock subscriptions.

Johnstown & Geistown Passenger Railway Co., Johnstown, Pa. Capital, \$42,000. Has applied for charter. To construct an electric railway through to the South Fork and build a pleasure park. Joseph Ruth, president; Jacob Grosch, secretary; Charles J. Hoffman, treasurer.

Fairhaven & Georgetown Railway Co., Georgetown, Pa. To construct a 45-mile electric line from Six Mile Ferry via Allegheny to Georgetown. Estimated cost, \$3,000,000. Final surveys made under supervision of L. D. Barnes, of Pittsburg. Walter S. Reed, secretary of the Moreland Trust Co., Pittsburg, is president.

West Chester, Kennett & Wilmington and Kennett & Oxford Railways, Kennett Square, Pa. To build 28 miles of new lines. G. W. Taft, president; D. D. Phillips, secretary and treasurer. B. F. Wickcrsham, contractor.

PORTO RICO.

Porto Rican Railway & Power Co., San Juan, P. R. Has been organized by the Vandergrif Construction Co., of Philadelphia, and has been granted a concession to build an electric railroad between Ponce and San Juan, and to use exclusively several waterfalls along the line to develop power.

SOUTH CAROLINA.

Augusta & Columbia Railway Co., Columbia, S. C. To build an electric line from Columbia to Augusta, passing through Aiken. James U. Jackson, W. B. Smith Whaley, W. H. Lyles, Henry Buist, Walter M. Jackson, E. B. Clark.

Winnsboro & Rock City Electric Railway Co., Winnsboro, S. C. Capital, \$50,000. To build an electric line from Winnsboro to the granite quarries in Fairfield county.

SOUTH DAKOTA.

Electric Railroad Securities Co., Huron, S. D. Capital, \$5,000,000. S. M. McDonald, Thomas M. Kenyon, Philip Lawrence.

TENNESSEE.

Tennessee Interurban Electric Railway, Nashville, Tenn. Capital, \$3,000,000. This is a consolidation of the Nashville & Columbia and Nashville & Gallatin electric railways, for the purposes of extending the lines to a total length of 119 miles. C. W. Ruth and Frank Haskell, Pittsburg; J. H. Connor, J. P. Fulcher and John H. McMillin, Nashville; Van Leer Polk, Paris, France; D. D. Spillers, Gallatin; J. M. Dedman and Major W. J. Whitthorne, Columbia, Tenn. Frank P. Bond is secretary.

TEXAS.

Texarkana Traction Co., Texarkana, Tex. Capital, \$100,000. E. J. Spencer, R. W. Rogers, W. C. Wade and others.

Palestine Traction Co., Palestine, Tex. Capital, \$150,000. To build a system of suburban railways. E. J. Spencer, of St. Louis; J. S. Tittle, M. C. Wade and W. R. Rogers, of Texarkana.

Sherman, Tex. A company is to be incorporated with a capital of \$3,000,000 to build a double-track electric road from Sherman to Waco, a distance of about 160 miles.

Metropolitan Street Railway Co., Dallas, Tex. Capital, \$1,500,000. To construct and maintain electric railways in Texas. C. E. Tripp, A. K. Bonta, Henry C. Coke, C. F. Byrne, John Frost.

El Paso & Southwestern Railway Co., El Paso, Tex. Capital, \$2,000,000. To build a six-mile electric railway to connect El Paso with the Mexican border.

Beaumont Traction Co., Beaumont, Tex. Capital, \$600,000. To build electric railways in and about Beaumont and to build a union depot. Ben Johnson, Natchez, Miss.; Morris Block, W. P. Ellison and C. F. Chester, Beaumont; G. J. Baldwin, Savannah, Ga.; H. L. Rogers, Boston.

UTAH.

Salt Lake & Suburban Railway Co., Salt Lake City, Utah. Capital, \$500,000. To build 40 miles of electric railways, to cost \$20,000, connecting with every smelter in the county. J. H. Powers, president, and A. V. Taylor, treasurer and attorney.

VERMONT.

Franklin County Traction Co., St. Albans, Vt. Capital, \$200,000. To operate an electric line through St. Albans, Georgia, Fairfax, Westford, Milton, Colchester and Essex. J. J. Flynn, E. E. Carpenter and A. A. Hall, Montpelier.

A company has been incorporated to build an electric line between Bennington, Vt., and North Adams, Mass., a distance of 19 miles. Capital, \$350,000. Arthur J. Dewey, W. H. Bradford, Fred S. Pratt, of Bennington, and Gardner T. Parker, Pawnee, Vt.

WASHINGTON.

Seattle, Wash. Articles of incorporation have been filed for an interurban line from Seattle to Everett, a distance of 3 miles. Capital, \$1,500,000. M. D. Haynes, James E. McMurray, Fred E. Sander and Charles E. Shepard.

Puget Sound Electric Railway Co., Puget Sound, Wash. Capital increased to \$1,500,000. To operate electric railways, power and lighting plants. Preston Player, Nathan H. Daniels, Jr., Howard L. Rogers, Henry R. Hays, George C. England and others.

Everett & Snohomish Rapid Transit Co., Everett, Wash. Capital, \$500,000. To build between the towns named in the title. Charles K. Green, Seattle.

WEST VIRGINIA.

South Parkersburg Electric Railway Co., Parkersburg, W. Va. Capital, \$500,000. Joe E. Lay, Weston, W. Va.; G. L. Fries, W. G. Pickett, John Mossman, and J. P. Camden, Parkersburg.

WISCONSIN.

South Wisconsin Interurban Railway Co., Janesville, Wis. Capital, \$2,000,000. To construct electric line from Janesville to Madison.

Madison & Northwestern Railroad Co., Madison, Wis. Capital, \$500,000. To construct an interurban electric line east of Madison, which will ultimately be extended to Beloit, a distance of 180 miles. R. Rogers, of Wausau; A. L. Hutchinson, of Wausau; and W. E. Repler, of Sun Prairie.

Knox Construction Co., Green Bay, Wis. Capital, \$12,000. To build and operate an electric railway from Green Bay to Kaukauna by way of De Pere, and to furnish power, light and heat for commercial purposes. E. H. Stoddard, E. L. Parker, Jerome R. North.

La Crosse & Northern Railway Co., La Crosse, Wis. To construct an electric line from La Crosse to Winona, for passengers and live stock. B. E. Edwards, W. S. Cargill, Peter Valler, G. Van Steenwyk, M. Fink.

La Crosse & Southwestern Railroad Co., La Crosse, Wis. Capital, \$300,000. To construct and operate a road by electricity, steam or other motive power. Passenger, freight, express and mail service

are provided for. Joseph Borchert, D. H. Palmer, John P. Reeve, John B. Taylor, E. C. Higbee, all of La Crosse, and F. A. Cummings and James Turner, of Chicago.

East Wisconsin Traction Co., Green Bay, Wis. Capital, \$50,000. To operate in Green Bay, De Pere, Two Rivers and Manitowish. William F. Paul and Chester D. Cleveland, Jr., of Oshkosh, and Daniel M. Maxey, of Washburne.

CUBA.

Havana & Jaimanitas Railway Co., Havana, Cuba. Franchises have been granted to Park & Hamilton, of Youngstown, O., for a modern electric railway system in Havana and suburbs. Associated with Park & Hamilton are: Devitt, Tremble & Co. and H. W. McDonald & Co., Chicago; G. F. Penhale & Co. and H. W. Whipple, New York; W. J. Harless & Sons, Cleveland.

Cuba Securities Co., Santiago, Cuba. Capital, \$80,000,000. To build and operate railroads and electric railroads in Cuba. William C. Whitney, Samuel Thomas, P. A. E. Widener, Thomas F. Ryan, E. J. Berward and Sir William C. Van Horne.

QUEBEC.

Valleyfield Electric Railway Co., Valleyfield, Quebec, Can. To build an electric line in the counties of Blainville, Huntingdon and Charlevoix. S. A. Bradner, Daniel Dion, J. M. Deschênes and George H. Thibault.

NEW PUBLICATIONS.

TESTS OF REINFORCED CONCRETE BEAMS, W. Kendrick Hatt. This is an authorized reprint from the copyrighted Proceedings of the American Society for Testing Materials. Vol. II, 1902. It is in pamphlet form and contains 20 pages.

PRELIMINARY REPORT on the Income Account of Railways in the United States for the year ending June 30, 1902, prepared by the statistician to the Interstate Commerce Commission. Paper cover, 72 pages. Washington Government Printing Office.

THE PENNSYLVANIA RAILROAD has issued a pamphlet containing a list of the transportation lines owned and operated by it during the year 1902. This is a book of 40 pages and lists a total of 19,720 miles of track, of which 10,556 are main track and 5,916 sidings.

BULLETIN NO. 32.—REPORT OF COMMITTEE ON ROADWAY. Issued by the American Railway Engineering and Maintenance of Way Association. This report, which was issued in advance of the fourth annual convention of the association held at Chicago, March 17-18, 1903, comprises 27 printed pages, and is divided into two sections: 1. Historical data relative to roadway construction for railroads. 2. A modern specification for the construction of roadway.

THE JOURNAL OF ELECTRICITY, POWER & GAS, of San Francisco, Cal., celebrated the new year by the publication of a special annual number which contains 124 pages of reading matter. The principal articles in this number are "The Laying of the American Trans-Pacific Cable," "The Generating Transmission and Distribution Systems of the Edison Electric Co., of Los Angeles," "The Gas and Electric Systems of South Yuba" and the "Systems of the United Electric, Gas & Power Co., of Santa Barbara."

STONE & WEBSTER RAILWAY AND LIGHTING PROPERTIES, 1903. A pamphlet of 50 pages bound in flexible leather. Published by Stone & Webster, Boston, Jan. 1, 1903. This book contains maps and data covering the questions most commonly asked regarding the various railway and lighting properties which are under the management of Stone & Webster. The information given includes fifteen properties in operation and seven that are not yet in full operation. A valuable appendix consists of a number of suggestions for the guidance of those desiring to transfer stock.

SCIENCE ABSTRACTS. This interesting digest of engineering publications will in future be published in two sections, Section A, embracing light, heat, sound, electricity, chemical physics, electrochemistry, physics and astronomy, and Section B, embracing steam, gas, oil engines, automobiles, balloons, air ships; electrical engineering including traction, lighting, telephony and telegraphy. The American Physical Society is now joined with the Institution of Electrical Engineers and the Physical Society of London in the direction of this publication and has chosen Prof. E. H. Hall, of Harvard University, as its representative on the publishing committee. The subscription price will be 18 shillings, or \$4.50 for each section separately, including the index, and for the two sections, 30 shillings,

or \$7.50. Members of the American Institute of Electrical Engineers will in future be able to secure a reduced subscription price through the secretary of the Institution. Science Abstracts is published at 82 Victoria St., Grosvenor Mansions, London, Eng.

THE GENERAL ELECTRIC CO. has recently issued the following publications: Index to Bulletins, Jan. 1, 1903. Bulletin No. 4289, superseding No. 4248, "Small Alternating Current Motors." Bulletin No. 4304, superseding No. 4243, "Induction Motors." Bulletin No. 4305, superseding No. 4254, "A Series Alternating System." Bulletin No. 4306, "Rotary Converters for 60 Cycles per Second." Bulletin No. 4307, "Alternating Current Generator Panels for Circuits of 1150 and 2500 Volts." Bulletin No. 4309, "Small Plant Switchboards." Bulletin No. 4310, "Incandescent Lamps for Street Car Headlights." Catalog and price list Nos. 7569, 7570, 7571, on "Fuse Boxes, Blocks and Cut-Outs," "Repair Parts of G. E.—52-A, Railway Motors" and "Parts of Carbon Feed Enclosed Arc Lamps Form 3, for Alternating Current Multiple Circuits." Flyer No. 2106, "A Street Lamp Bracket for Series Incandescent Systems." Flyer No. 2108, "Attaching Plugs." Flyer No. 2109, "Combined Socket and Attaching Plug." Flyer No. 2110, "Porcelain Junction Boxes with Fuses." Also, "The Test by Fire," a 16-page pamphlet, 42½ x 7 in., describing the effect on transformers of a recent fire at Atlantic City, "Series Enclosed Arc Lamp Street Lighting Systems," a 40-page pamphlet, 5 x 8 in., and "Transformers at the Pan-American and Other Expositions," a 32-page pamphlet, 5 x 8 in.

THE CININNATI CAR CO.

The Cincinnati Car Co., organized Dec. 31, 1902, for the sole purpose of manufacturing cars, has acquired the commodious plant built for the Cincinnati Street Railway Co., at what was the once famous "Chester Park Race Track," at Winton Place, O., just outside the Cincinnati corporation line. The plant was comprehensively described in the "Review" in March, 1897, page 181. The company is equipped to build surface and interurban cars, complete with trucks and motors, and has already booked orders for 66 cars, 40 of which are of the double truck, open pattern, 13 and 15 benches; 16 closed interurban cars, 8 enclosed city cars and six 9-bench open cars.

The company can set up in its erecting shop forty-eight 40-ft. cars at one time, and the paint shop has capacity for sixty 40-ft. cars. Other departments are equally spacious and include a machine shop, blacksmith shop, foundry and mill room. The mill room has been recently entirely equipped with up-to-date machinery.

The officers of the Cincinnati Car Co. are: President, George H. Warrington; vice-president and general manager, Robert Dunning; secretary, S. C. Cooper; treasurer, W. H. MacAlister.

On March 15th the Chicago General Railway Co. issued to passengers transfers purporting to be good on certain lines of the Chicago City Ry. and of the Chicago Union Traction Co. The Chicago General Ry. leases certain tracks from the other two companies and claims that under the city ordinances the latter are compelled to honor transfers given to passengers paying full fare on these leased lines. These transfers were not recognized by the City Railway and the Union Traction companies.

PERSONAL.

MR. E. J. ZIMMER has been appointed received for the Chicago General Railway Co. to succeed Mr. Frank H. Seilers, resigned.

MR. T. K. GLENN, vice-president and secretary of the Georgia Railway & Electric Co., has also been appointed general manager to succeed Mr. D. A. Belden.

MR. ALEXANDER HOLLEY RUDD was on March 1st, appointed assistant signal engineer in the department of maintenance of way of the Pennsylvania Railroad.

MR. A. L. DRUM, assistant manager of the Union Traction Co., of Anderson, Ind., has removed to Indianapolis to give his personal attention to new work of the Indianapolis Northern Traction Co.

MR. B. S. JOSSELYN, general manager of the Hudson Valley Railway Co., of Waterford, N. Y., has resigned to become general manager of the Union Terminal Railway Co., with headquarters at Sioux City, Ia.

MR. ALONZO F. WALTER, general superintendent of the Michigan Traction Co., of Kalamazoo, Mich., has resigned because of poor health. His successor is Mr. F. E. Tobe, of Battle Creek, who acted as superintendent during Mr. Walter's illness.

MR. GEORGE B. SHEPLEY, who has been in charge of line and track work for the Worcester (Mass.) Consolidated Street Railway Co. for two years, severed his connection with that company March 1 to enter a partnership with Mr. Edward Smith, contractor.

MR. C. O. FITCH, chief electrician of the Hudson Valley Railway Co., of Waterford, N. Y., has resigned to go to Omaha, Neb., to resume his old position as chief electrician of the Cudahy Packing Co.'s plants. Mr. Robert L. Fryer, of England, succeeds Mr. Fitch at Waterford.

MR. GUY W. BUXTON, who has been for some time connected with the New York office of the H. W. Johns-Manville Co., has been recently appointed auditor of that company, the branches of which are located in Milwaukee, Chicago, St. Louis, Pittsburg, Cleveland, New Orleans, Boston and Philadelphia.

MR. W. J. BARNES, for two years electrician of the Toronto Suburban Street Railway Co., Ltd., of Toronto Junction, Can., has resigned to accept a position with the Aurora, Elgin & Chicago Railway Co., of Aurora, Ill. His associates at Toronto Junction presented him an address and a gold watch.

MR. M. J. KENNEDY, general superintendent of the Montreal Street Railway Co., of Montreal, Que., has resigned and will establish a business of his own. With the exception of five years, 1886 to 1891, when he was with the Twin City Rapid Transit Co., of Minneapolis, Minn., Mr. Kennedy has been employed by the Montreal Street Railway Co. since 1877.

MR. CHESTER P. WILSON, who is well known to many of our readers from his former connection with the Sioux City and Milwaukee street railway companies, and who has more recently been in South Africa as general manager in charge of the construction of electric railways for an English syndicate, has been appointed superintendent of the Lackawanna & Wyoming Valley Railway Co., of Scranton, Pa.

MR. E. H. KEATING, manager of the Toronto Railway Co., of Toronto, Can., has been appointed to the commission to inquire into and report upon the proposed drydock at Montreal. Mr. Keating superintended the construction of the Admiralty dock at Halifax, N. S., and has been consulted about many other docks and harbor works on this continent. His new duties will in nowise interfere with his railway work.

MR. J. J. SULLIVAN was elected president of the American Railways Co., of Philadelphia, on February 25th, to succeed Mr. Samuel G. De Coursey, deceased. The vacancy in the board from the same cause was filled by the choice of Mr. C. L. S. Tingley, who was also made second vice-president. Mr. Walter W. Perkins was elected secretary and treasurer, vice Mr. Tingley, and Mr. Frank J. Pryor, jr., was chosen comptroller and assistant treasurer.

MR. WILLIAM JENNINGS was on March 2d appointed mechanical superintendent of the Pacific Electric Railway Co., Los Angeles, in general charge of the three departments heretofore known as the mechanical, power and electrical, which are now combined as the mechanical department. Mr. Jennings has been connected with the Mexican International Railway Co. for 19 years

and was superintendent of the mechanical department for that company.

MR. CHARLES S. POWELL, who has been associated with the Westinghouse electric interests since 1893, and who, for the past six years, has been manager of the Cleveland office of the Westinghouse Electric & Manufacturing Co., has been appointed assistant manager of the British Westinghouse Electric & Manufacturing Co., Ltd., and has entered upon the duties of his new position. His headquarters are in the Westinghouse Building, Norfolk St., Strand, London, W. C.

MR. HOWARD E. HUNTINGTON was on March 1st appointed assistant to the general manager of the Pacific Electric Railway Co., of Los Angeles, Cal., and will in the absence of Mr. Epes Randolph perform the duties and assume the responsibilities of general manager. Mr. Huntington is a son of Mr. H. E. Huntington, president of the company, and has already had five years' experience in railway engineering work, being for two years in the engineering department of the Southern Pacific Ry.; he has just spent a year at Harvard engaged in special work.

MR. HENRY C. PAGE, who, for the past two years, has been general superintendent of the Boston & Northern division of the Massachusetts Electric Companies, has resigned to become general manager of the Berkshire Street Railroad Co. with headquarters at Pittsfield, Mass. The Berkshire

Street R. R. comprises about 40 miles of track running from Pittsfield to North Adams, and from Pittsfield to Lenox. The road has been fully described in recent issues of the "Street Railway Review." Mr. Page began his career as conductor on the old Lynn & Boston R. R. He at once attracted the attention of the management, and was advanced from position to position until he was soon performing duties of considerable importance and responsibility. He became general manager of the Newberryport & Amesbury road and was next called to take the position of superintendent of the Salem division of the Lynn & Boston road. During the consolidations of late years in eastern Massachusetts, he has been given charge of the enlarged systems, and as the general superintendent of the Boston & Northern division, he has had charge of virtually 455 miles of electric railway track, all located north of the city of Boston. Mr. Page will take with him the best wishes of a host of friends and acquaintances, and especially of the employees as well as the management with whom he has been associated on the Boston & Northern. Mr. Page was born in Brownville, Me., June 19, 1863. On his retirement Mr. Page was tendered a banquet at the Essex House, Salem, Mass., March 7th. Mr. Alexander H. Libby, president of the Salem Electric Light Co., presided and Hon. Joseph N. Petersen, mayor of Salem, was among the guests of honor.

MR. CLOYD MARSHALL has been appointed superintendent of electrical machinery in the Department of Electricity of the Louisiana Purchase Exposition, and has entered upon his new duties. The electrical and engineering training which Mr. Marshall has received has well fitted him for the work he has now undertaken. After graduating from the school of electrical engineering of Purdue University in 1895 he was retained as assistant in the electrical laboratory. Later he resigned to become electrical editor of the "Street Railway Review," of Chicago, and, during the period of this connection, from 1896 to 1898, he served as secretary of the Chicago Electrical Association. Mr. Marshall for two years held the position of designing and testing engineer for the Jenney Electric Manufacturing Co., and then took up experimental work for the Railway Materials Co., of Chicago. In 1901 he accepted the position of plant engineer, and, later, of engineer of the sales department of the C. W. Hunt Co., of New York. The latter position he has just resigned in accepting the appointment of the World's Fair Directors. The record Mr. Marshall has made as a progressive engineer and business man argue well for the success of the department of the great exposition with which he is connected. As has



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already been reported in these columns, a fine electrical display at the exposition is already assured, though the electrical industry can not too carefully safeguard the opportunity it now has of making the electrical features of the exposition overwhelmingly successful. The directors of the exposition are to be congratulated upon securing the services of Mr. Marshall in a capacity for which he is especially qualified.

MR. D. A. BELDEN has been appointed general manager of the Birmingham Railway, Light and Power Company, to succeed Mr. George H. Davis, resigned. Mr. Davis is of the well known firm of Ford, Bacon & Davis, Engineers, New York, and enjoys a wide reputation as a thoroughly practical street railroad man, being familiar with every detail of the business. For the past few months Mr. Davis has been at Hot Springs, Ark., seeking to regain his health, which was impaired by excessive work. He was advised by his physicians to take a long rest and acting on this advice he resigned his position as General Manager and as soon as he is able to do so he will go for an extended tour in Europe. Mr. Belden comes to Birmingham from Atlanta, where he was general manager of the Georgia Railway & Electric Company for two years. Mr. Belden was for a long while manager at Aurora, Ill., and while still a very young man, is thoroughly familiar with street railroad work from every point of view and will no doubt manage the affairs of the extensive properties in a highly creditable manner. The Birmingham Company is fortunate in securing the services of such an able successor for Mr. Davis.

OBITUARY.

MR. SIMOND D. CASSEL, electrician for the Harrisburg (Pa.) Fraction Co., was killed on February 27th, by the bursting of a 16-in. emery wheel at the Third St. repair shop of the company. Mr. Cassel has been connected with this company for 14 years.

MR. EVERTON BURRITT ARNOLD, prominently identified with the Arnold Electric Power Station Co., of Chicago, died March 9th at Lock Haven, Pa., of typhoid pneumonia. He was born in Ashland, Neb., 31 years ago and was educated in the public schools of his native place and at Hillsdale (Mich.) College. From 1893 to 1895 he had charge of the Pumperly-Sarley Storage Battery Co. factory, Chicago. In 1895 he became associated with the Arnold company in a confidential capacity. He directed the financial part of the company's installations, including the Chicago & Englewood storage battery road, the Baring Cross shops of the St. Louis, Iron Mountain & Southern R. R., the Lansing, St. Johns & St. Louis Railway Co., and the New York Central railroad shops at Oak Grove, Pa., where he was stricken with illness 10 days before his demise. Beside his mother, Mr. Arnold is survived by five adult brothers—Bion J., Wayland L. and Ralph G., of the Arnold Electric Power Station Co.; Ward S., of the Chicago office of the Stanley Electric Manufacturing Co., and Harold W., of the Western Electric Co.—and one sister, Mrs. Gould, wife of Mr. D. C. Gould, of the Stromberg-Carlson Telephone Manufacturing Co.

ACCIDENTS.

In a collision of three electric cars on the Peoria & Pekin Terminal Railway, Peoria, Ill., which occurred near South Bartonville on the morning of March 4th, eight persons were seriously injured, three of them presumably fatally. One, Daniel White, a motorman, died. Misinterpreted orders and a dense fog were held responsible.

In a grade crossing accident at Indianapolis, Ind., at 11:30 p. m., March 2d, 14 persons were injured. A street car containing 25 passengers was struck by a string of freight cars at the Indiana, Decatur & Western railroad crossing.

An interurban car collided with a Lake Shore fast mail train at a grade crossing in Sandusky, O., February 15th, resulting in the wrecking of the car and injury of four persons on it, none fatally. A slippery track was said to be the cause.

Slippery rails caused a collision between an electric car and a stock train at the Center Ave. crossing of the Grand Trunk railroad in Chicago, Ill., on February 19th. Four persons were injured. On the same morning a Halsted St. electric car and a Lincoln Ave. cable train came together at the intersection of two streets and 10 persons were injured.

As a result of a grade crossing accident in Newark, N. J., on the morning of February 19th, nine school children and the engineer of the train that crashed into their car lost their lives. Twenty-five others of the passengers were injured, some of them seriously, as was the motorman of the car. The trolley car was a special of the North Jersey Street Railway Co., run for the accommodation of high school pupils. The train that struck it was the Delaware and Passaic express of the Delaware, Lackawanna & Western Railroad Co. The accident occurred at the foot of Clifton Ave. hill, which has not a very heavy grade. The rails were slippery and the motorman was unable to control the car. It crashed through the railroad safety gates and out on the tracks in front of the train. An inquest by a coroner's jury was held and there was also an investigation by Newark officials and leading business men. The finding of the jury charged the street railway company with negligence, although it was also found that the express train was going too fast.

Mr. Charles M. Shipman, superintendent of the North Jersey Street Railway Co., stated that the sandbox on the rear end of the car was two-thirds full of sand when he examined it after the accident and he had no doubt the box at the front end contained sand, likewise. The sand is all heat dried and runs freely. He also stated that the car was equipped with an electric brake of the latest pattern and there was not the slightest doubt but that the wheels were locked and slid along as would a sled. No brake could stop it. Furthermore a man was stationed on the hill on the morning in question to sand the tracks, "and," said Mr. Shipman, "there was sand on the tracks." Mr. David Young, vice-president of the street railway company, said that overcrowding did not cause the accident. The car weighed 30,000 lb. and if it were full the added weight of the passengers would have had no effect except, perhaps, on a very heavy grade.

STRIKES OF THE MONTH.

The strike of the motormen and conductors on the Waterbury division of the Connecticut Railway & Lighting Co., reference to which was made in the "Review" for Feb. 20, 1903, is still on. On the night of March 8th a policeman was murdered on the car he was guarding, a non-union motorman was brutally beaten and a conductor was pounded almost into insensibility by masked men, who boarded the car and fired revolvers at the occupants. On March 2d Mr. Durant, the prosecuting attorney, who has been directing the arrests of the lawless, was attacked by two men with clubs and knocked down. He fired four shots at his assailants, who escaped. On March 3d a night car on the South Main St. line was wrecked by stones hurled at it and it had to be taken out of service. On February 23d a motorman was knocked senseless by a stone thrown by an occupant of a labor union bus. On February 20th six men who had participated in disturbances were fined from \$15 to \$50 each and another was sent to jail for eight months.

March 14th the Connecticut Railway & Lighting Co. secured a temporary injunction restraining the street car union and other unions from in any way interfering with the business of the railway company in Waterbury. The petition on which this order was granted asked for damages in the sum of \$20,000. A writ of attachment for funds of the union, amounting to \$25,000, deposited in the various banks, was granted pending a hearing on the merits of the complaint.

The strike at South Bend, Ind., which was noted in the "Review" for February 20th, is reported to be practically over. Cars are running regularly with new crews and many of the strikers have surrendered their badges and gone elsewhere to seek employment. Public sentiment was aroused by the rioting of February 22d, when a mob of 150 men tried to wreck the power house of the Indiana Railway Co., and injured four of the seven men at work there. The police arrested 30 of the rioters, two of them being ex-employees of the company.

A freshet at Rensselaer, N. Y., early this month crippled the street railway service for a time, although the damage resulting was slight compared with former floods. The Albany & Hudson cars could not get into Rensselaer and had to land passengers in East Greenbush. The United Traction Co., of Albany, experienced the most difficulty.

THE WESTINGHOUSE HORIZONTAL GAS ENGINE.

The Westinghouse Machine Co., whose vertical single acting gas engine is well known and has been installed and operated in various classes of service for several years past, now enters the field with a horizontal double-acting type of gas engine, built either single or double, and resembling in form the single or double (cross-compound) steam engine. In Fig. 1 is shown a general view of the single-crank engine, while Fig. 2 represents the double machine, both directly connected to electric generators mounted upon the crank shafts.

From the illustrations the resemblance to the modern high-speed tandem-compound steam engine is quite noticeable, and it is stated

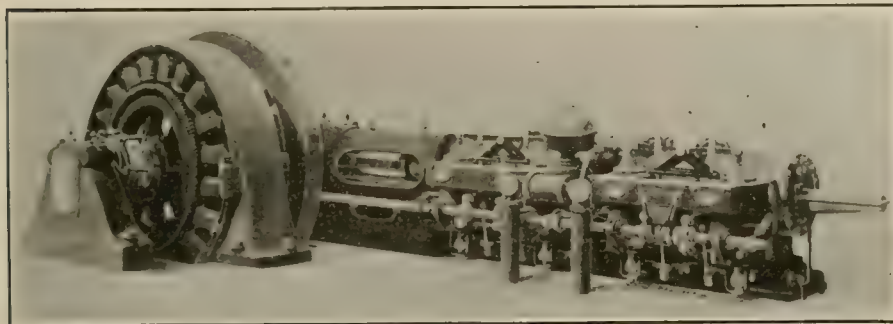


FIG. 1 SINGLE WESTINGHOUSE HORIZONTAL GAS ENGINE.

that this resemblance is further carried out in the matter of crank effort. Every revolution is accompanied by two impulses, one occurring at each successive in-stroke and out-stroke; the engine operates, therefore, upon the four-stroke cycle, involving distinct periods of admission, compression, explosion, expansion and exhaust—a cycle yielding the highest practical as well as theoretical thermal efficiency and economy of fuel.

The employment of the four-stroke cycle involves a feature of the greatest importance; that of positive scavenging. A comparison of the thermal values of natural and blast furnace gases emphasizes the necessity for pure working mixtures. The former yields approximately 1,000 B. t. u. per cu. ft. and the latter only 100. Although the comparative weakness of the latter is partly due to the absence of the highly calorific CH_4 (methane or marsh gas), it is mainly attributed to the presence of CO and N, both inert gases resulting from previous combustion.

The construction of the engine under description is in many respects unique in that it departs materially from the accepted European design and embodies many established features of modern steam engine practice; from crank to cylinders, the construction is that of a horizontal steam engine suitably strengthened in proportion to the increased maximum pressure resulting from the rapid combustion of the highly compressed gas. The design of cylinders, pistons and valves, of course, departs materially from steam engine practice. The cylinders are double-walled, with the outer walls split peripherally to permit independent expansion and contraction without placing the cylinder castings under stress. The two cylinders are united at the top by heavy tie rods, engaging peripheral bosses, and at the bottom by a stout cast-iron distance piece. The rear section of the bed plate which supports the two cylinders is cored hollow, and a central draining wall, and a rear set for draining and cooling are provided. All connections are piped directly to these reservoirs, thus avoiding a large amount of piping about the engine. Through the bed plate extend the four vertical exhaust pipes, which connect immediately below with an exhaust duct. The exhaust passages leading from

the valve chambers are cast integral with the cylinders, upon their under sides, and are water cooled.

At the ends of each cylinder occur horizontal side ports resembling straight steam ports, which communicate with removable combustion chambers. The cylinders are closed by water-jacketed heads, those located between the two cylinders being split diametrically for facility in inspection of the interior, and the two halves are united with a ground fit, no packing being found necessary. This feature obviates the necessity for completely dismantling the engine for inspection.

The combustion chambers are independent castings, with plain machined faces, circular valve liner seats, and cored-out passages for circulating water. Both admission and exhaust valves, which are of the standard poppet type, operate vertically and with opposite throw. They open by cam movement and are held to their seats by spring pressure. The central space, closed by the admission valve above, and the exhaust valve below, communicates directly with the cylinder port, the exhaust space with the exhaust passages on the under sides of the cylinders, and the admission space with the supply pipe. This supply pipe is a rectangular cast-iron main extending along the entire front and provided with openings opposite each admission valve. It receives its supply from the governor chamber located midway between the two ends, this in turn communicating with a mixing chamber supplied with gas

and with air through separate valves. These two valves are shown in Fig. 1 and are provided with graduated indexes, so that the exact proportions of gas and air may at all times be visible and under the control of the attendant. Each valve, together with its spindle and seating spring, is independently mounted, and by simply removing the bolts from the bonnet the entire valve, seat and liner may be drawn out for inspection or replacement by a spare.

Similarly, the igniters, which are of the make-and-break electrical-contact type, are mounted in a removable plug extending into the combustion chamber through the side walls. The valve gear is of the standard cam and roller pattern and is driven by a helical gear engaging a similar split gear bolted around the main shaft.

The cooling water for the pistons enters a cavity on the cross-

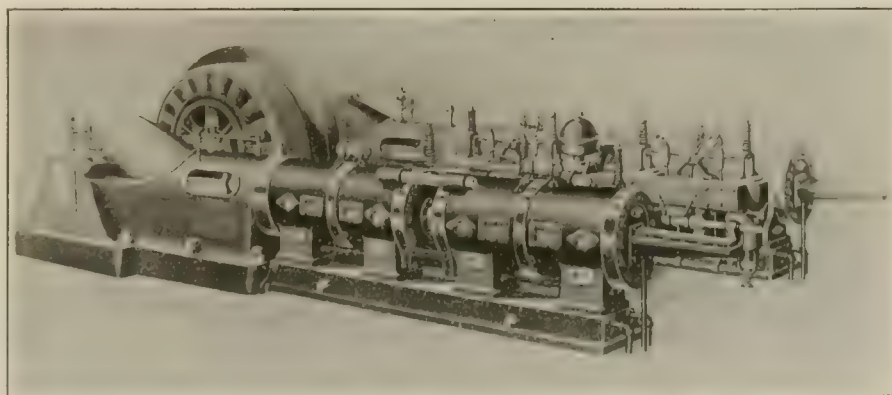


FIG. 2 DOUBLE WESTINGHOUSE HORIZONTAL GAS ENGINE.

head by means of a flexible pipe connection provided with special swinging joints. It then flows through the hollow piston rod to the front and rear piston, through which it circulates, finally emerging through a bronze tail-rod extending through the rear head, there emptying into a cast-iron jacket communicating with the hot water return pipe. Similarly, cold water is conducted through suitable pipes to the cylinder jackets, thence to the jackets surrounding the exhaust valves and ports, and finally to the return pipe, emerging at a sufficiently high temperature for use in heating and drying coils, radiators, etc. By this method the proper temperature relations between pistons and cylinders is at all times secured, thus

allowing close piston fits to be made without danger of excessive friction or rupture. This point may be more readily appreciated from the fact that a cold piston clearance of approximately 1-16 in. is necessary in moderate-sized engines not fitted with water-cooled pistons. The pistons are constructed in two parts, with packing rings and babbitted bearing surfaces. They are secured in position on the rods by internal nuts and present plain convex surfaces to the burning gases. Piston rods are of forged steel, with bored water ducts. The pacing for both piston rod and tail rod is of the metallic ring type.

The engine is started by compressed air pumped into a steel reservoir during a previous run before shutting down. For this purpose a special disengaging gear is provided, which isolates the rear cylinder and, on admitting the compressed air, allows this cylinder to operate as an air motor until the regular combustion cycle is taken up in the forward cylinder. The rear cylinder may then be thrown into normal action.

Oiling is accomplished by steam engine appliances, such as sight-feed cups, cylinder pumps, and oil rings for crank pins. The engine is governed by a sensitive fly-ball governor of standard design, protected by a circular housing. It operates a vertical piston valve supplying a fuel mixture of constant quality, but in quantities proportionate to the load. The single-crank engine is at present manufactured in sizes ranging from 250 to 750 h. p. and the double-crank from 750 to 1,500 h. p. In the latter cranks are placed at 90° angularity, giving four impulses per revolution, and a crank effort corresponding to that of a cross-compound double-acting steam engine.

CARS FOR AURORA-ELGIN-CHICAGO.

The many unusual and interesting features connected with the installation of the Aurora, Elgin & Chicago Ry. have brought this road into considerable prominence, and the decisions reached as regards details of construction and operation have been watched with interest. This road was fully described in the "Review" for August, 1902, but the accompanying engraving will be of interest. The view shows a train of ten cars all of which were built for the Aurora, Elgin & Chicago road by the John Stephenson Co., of Elizabeth, N. J.

The rolling stock for the Aurora road has been designed especially to meet the conditions of the exceptionally high speeds to which the cars will be subjected. The bodies are 47 ft. 3 in. long over the end plates and 8 ft. 6 in. in extreme width over side sills. Both ends are vestibuled, the vestibules having the usual side doors for exit and entrance, and also end doors to allow passage from one car to another when cars are operated in trains of two or more.

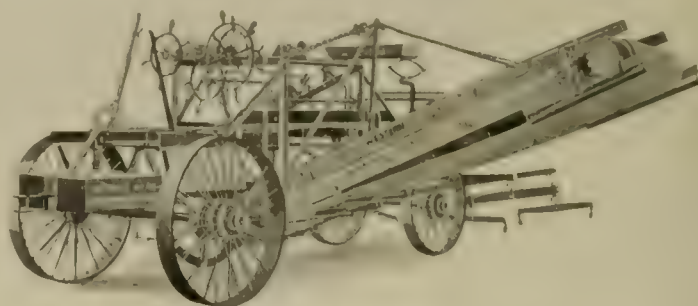
Double sashes for winter service are provided and all outside doors have wedge locks to prevent rattling and ingress of wind while running at high speed.

The seats are of the Hale & Kilburn walk-over pattern, made of rattan and furnished with high back and roll top head rests. Consolidated electric heaters are distributed along the sides and the other special equipments include Nichols-Intern pneumatic sanders; Van Dorn draw bars and couplers; Stanwood double steel steps; foot gongs; push buttons; two trolley poles; rear and front signal lights; rear flags; fire extinguishers; and a full line of tools in tool boxes to be used in case of accident.

The cars are mounted on Peckham M. C. B. No. 30 trucks, with 6½-in. axles and 36-in. M. C. B. standard double plate cast iron wheels. The trucks combine a number of special features, and are built on lines to insure the maximum safety as well as strength and wear. The rolling stock is to be operated with the General Electric multiple control system, known as type M. The cars are supplied with Christensen air brakes, equipped with independent motor-driven compressors and automatic governors.

INTERURBAN ROADBED CONSTRUCTION.

In building interurban roadbeds the construction of light embankments is frequently necessary and a machine has been especially designed for work of this nature by the Western Wheeled Scraper



ELEVATING GRADER.

Co., of Aurora, Ill. It is called an elevating grader and consists essentially of a frame and truck which support a plow and endless carrier. The plow takes up the earth and deposits it on the carrier, which elevates it to the opposite side of the machine and throws it into the embankment. From 12 to 16 horses are used on the machine, according to the quality of the soil, and beside two drivers only one operator is required. The company guarantees that the machine will move at least 1,000 cu. yd. per day of 10 hours with the power named.

An illustration of the elevating grader is shown herewith. The main frame is constructed of steel channel bars and the other parts of steel angle bars, insuring strength and durability. There



TRAIN OF TEN STEPHENSON CARS FOR AURORA, ELGIN & CHICAGO RY.

The design of the car follows closely what is known as the Pullman style of sleeping car with compound gothic windows. The under framing is entirely of 9-in. and 6-in. steel I-beams, riveted together with special channels and plates. The construction throughout is considered to give the greatest strength and durability and to afford the fullest possible protection to passengers in the event of collision or derailment. The interior finish, including trimmings and decorative accessories, gives an especially rich and pleasing effect, fully equalling the finest coaches built for fast steam service.

are four adjustments of plow, longitudinal, transverse, vertical and tilting, the last two of which can be made by the operator from his position without the use of wrench or removal of bolts. The plow beam is made of two steel channel bars, backed up to each other and securely fastened. The elevator is of an improved pattern and the device for adjusting the tension of the belt is new. It can be adjusted while the machine is in operation and does not change the distance between the foot of the elevator and plow. The drums or rollers at each end of the elevator have adjusting

devices by which the belt can always be made to run true to center. The elevator is put in and out of gear by throwing the gears in and out of mesh, so that the gears are never run except when the elevator is in use. There is a caster gage wheel on the front end of the plow beam to regulate the depth of plowing and which permits the machine to be turned to the right or left without raising the front end of the beam from the ground. The machine is made in two sizes, one being two feet narrower and one foot shorter than the other.

The Western Wheeled Scraper Co. has issued a 14-page catalog descriptive of its earth and stone handling machinery especially adapted to interurban roadbed construction, including ballast, side dump, flat and rail cars.

WESTON ELECTRICAL INSTRUMENT CO.

For the greater convenience of its numerous customers and to better care for the continued increase of business in New York and vicinity the Weston Electrical Instrument Co., Waverly Park, Newark, N. J., has opened a New York Office at No. 74 Cortlandt St. This office will be under the management of Mr. Caxton Brown, who has a theoretical as well as a practical knowledge of the different instruments manufactured by the Weston company and their particular adaptabilities. This will enable the purchaser or any person visiting or doing business in New York who may wish to make inquiries relative to electrical measuring instruments, to come in direct contact with a man who is properly qualified to answer such inquiries.

There will be a show room in connection with the New York office in which will be exhibited the different types of Weston instruments and their special advantages, also the individual parts which make up the instruments. Besides being a great convenience to customers the new office will eliminate much correspondence in the nature of inquiries, thus reducing time of delivery of orders.

A general impression has prevailed that the Weston Electrical Instrument Co., only made voltmeters and ammeters which is not the case. Having what are credited with being the largest and best equipped works in the world for the production of electrical measuring instruments of all kinds, the company is particularly fitted to turn out work of any special character in which the highest excellence of mechanical and electrical work and design are the important features, and has in fact been turning out a large amount of special laboratory apparatus for several years past and is now prepared to make standard cells, standard resistances, galvanometers and the highest grade of special bridge work, speed indicators, etc.

CONVERTIBLE CARS FOR MACON, GA.

The Electric Railways and Light Company of America, operating largely in the southern states and having offices in Richmond, Va., has recently equipped its lines in Macon, Ga., with convertible cars



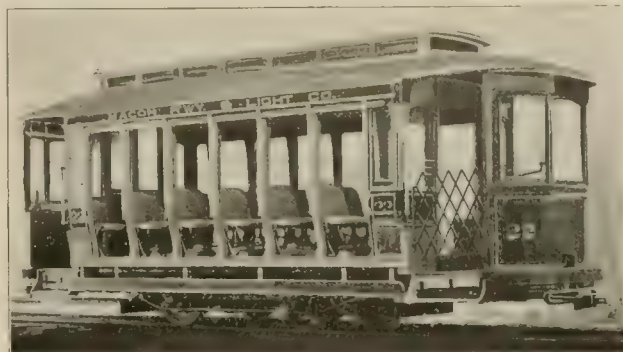
BRILL CONVERTIBLE CAR CLOSED.

built by the J. G. Brill Company, of Philadelphia. It is stated that the form of car was decided upon after an exceedingly careful study of the local conditions and thorough observation of the performance, durability and popularity of the car in other cities of similar requirements.

Macon is a city of about 25,000 population, one of the most im-

portant railroad centers of the south, and situated in the heart of the Georgia cotton belt. The street railway operated by this company is distinctly a city system running between principal points and having short lines into the suburbs. One of the lines extends to a popular point on the Ocmulgee River, where the company has laid out a park.

This type of car is too well known to require a detailed description, one of its chief features being the roof storage system of win-



BRILL CONVERTIBLE CAR OPEN.

dows and panels, and it is a type which has grown in favor during the last few years in various parts of the country. As shown in the illustrations the car embodies the features of both open and closed cars and has the advantage over either in that weather changes are always provided for and at but few minutes notice. These cars, of which 10 were ordered, are 18 ft. 4 in. long over the end panels, have 4-ft. 6-in. platforms and are 27 ft. 4 in. over the crown pieces. The width over sills and sill plates is 7 ft. 5 1/4 in. and over the posts at belt 8 ft. The sweep of the posts is 3 1/2 in. From center to center of the posts 2 ft. 7 in. Side sills of long leaf yellow pine are 5 1/4 x 7 in. plated with 5/8 x 7-in. steel. The end sills are of white oak 4 1/4 x 6 in. The corner posts are 3 3/4 in. thick and the side posts 3 3/8 in. The interiors are finished in natural cherry with decorated birch ceilings, and the trimmings throughout are solid bronze.

The cars are furnished with Brill portable vestibules, a feature peculiarly suited to this type. Folding gates are provided at the platform entrances, and other specialties of the builder's make with which the cars are equipped are angle-iron bumpers, alarm gongs, draw bars, brake-handles, and conductor's gongs. The trucks are Brill No. 21-E, with 33-in. wheels and 7-ft. wheel-base.

RODGER BALLAST CARS.

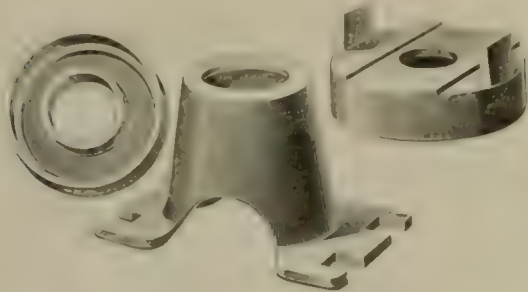
In the "Review" for September, 1902, we illustrated several types of Rodger ballast cars which have been developed to meet the various requirements of railways for convertible side and center dump cars. The latest improvement made by the Rodger Ballast Car Co. in its cars is the application of steel underframes. The construction of the Rodger car makes it available for three distinct classes of service, as besides the automatic center and side dumping arrangement it may be readily converted into a standard gondola car suitable for use with a top plow. When thus used the ends of the car fold down and form a platform between the cars for the plow to pass over. As a gondola the car is also available for general freight service.

With reference to the manner in which the cars fill the needs of contractors engaged in building interurban railways, the Rodger Ballast Car Co. cites a letter from a prominent contractor, who says: "I have had considerable experience in using the Rodger cars in the construction of electric roads, having used them on two or three different lines. I can cheerfully recommend them as being very economical and practical in every respect, and my experience has been that there is a saving of over 50 per cent in favor of the Rodger over any other car I have ever used."

The Decatur (Ill.) Traction & Electric Co. has increased the wages of its employes 10 cents per day.

A NEW THIRD RAIL INSULATOR.

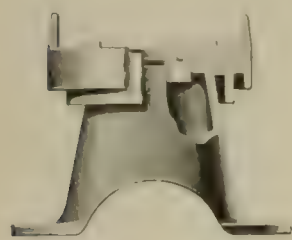
A new and improved factory manufacturing support for the contact rail is shown in the details in construction work that has attracted the attention of engineers engaged in that line of construction. The accompanying illustrations show the third rail support designed by Mr. Ernest Gonzenbach for the Aurora, Elgin & Chicago Railway Co., which embodies several new features. It consists of but three pieces, which are not fastened together in any manner, but they are kept in their relative position



PARTS OF THIRD RAIL INSULATOR.

by the weight of the contact rail. Instead of using heavy insulating blocks of comparatively low current resisting character, standard high insulating compound is used, which compound is practically the same as that used on regular overhead trolley fixtures.

The principal difference in this compound is, that it is much tougher and of greater tensile strength, due to the introduction of a specially prepared fibrous material. This insulation, which is in the form of a ring or inverted cup, is so placed that it is out of reach of all mechanical injury, shocks or strains. The shape of this insulating ring is such that there can be no shearing stress on any of the insulation, and the only force to which it is subjected being that due to the weight of the rail, which does not exceed 50 lb. per sq. in., even with the heaviest rails. In view of the fact that compound insulations of this character are used in overhead work under constant stresses of 1,000 lb. per sq. in. and over, the margin of safety is very large in this third rail support.



ASSEMBLED INSULATOR.

The base casting and the insulating ring, being both of considerable diameter and extending over almost the entire surface of the rail base, it will be seen that movement of the rail over this support, due to expansion and contraction, cannot exert any leverage or strain tending to break the insulation. The three parts of the device being entirely separate and not held together by anything but the weight of the rail, the slight sinking of the ties as the car passes and which depression the contact rail does not follow, does not strain the insulating support, as the metallic rail cap holds fast to the rail and the under portion of the support follows the sinking motion of the tie. Provision is made in the insulator for a movement of $\frac{1}{2}$ in. of this character, and this can be made even greater if desirable. The top cap has the usual lugs, which are bent over the heel of the rail with sufficient clearance to allow the rail to move without straining the cap longitudinally. The base shell and the rail cap are made of malleable iron.

The arrangement of skirts or petticoats on the insulating portion, as well as the rail cap, is one of the most important features of this device, producing as it does a third rail support that is absolutely impervious to salt or brine commonly used to cut sleet and ice from the contact rail during the winter season. That the insulator is not affected by this was shown during the winter just past on the Aurora, Elgin & Chicago Ry., where these insulators are now in use in large numbers, there being no trouble whatever on this road on account of salt or brine applied to the rail.

This insulator is manufactured and sold by the Mayer & Englund Co., Philadelphia, and will be known as the "Keystone" third rail

insulator. It is claimed for the "Keystone" that the serious leakage of current such as has been experienced with some other types is entirely eliminated, and that there is no deterioration of the insulation such as in other types results from corrosion or erosion of the insulating blocks or from the accumulation of dirt on their surfaces.

BITUMINIZED FIBER CONDUIT.

A very handsomely printed pamphlet recently issued by the American Conduit Co., of Philadelphia, comprehensively describes its bituminized fiber conduit for underground electrical work. By way of introduction the origin of underground electrical work, the development of underground construction and the essentials for an underground system of ducts are succinctly related.

In a chapter on special features of the American Conduit Co.'s product it is pointed out that it is electrolysis proof and that the material from which it is made, being of a bituminous nature, is absolutely non-corrosive. The fiber entering into its construction is thoroughly saturated and coated with the bituminous compound and thus practically loses its identity, except for the stiffening and strengthening qualities for which it is used. This coating protects against moisture or any elements which might cause decay.

Bituminized fiber conduit has a male and female slip joint turned true on a lathe, making a self-aligning joint, and also making it possible to rapidly slip unit after unit together in the trench, all ready for the grouting. No wrapping with burlap or other material is required and no trowel work is necessary. A pot of liquid compound is kept conveniently at hand and into this the workman lightly dips the end of each unit as he passes it into the trench. The non-abrasive feature of this conduit is likewise emphasized, it being shown that cables with lighter lead covering may be used.

An idea of the lightness of the conduit and the ease with which it can be handled may be obtained from the statement that 20,000 ft. of the 3-in. size can be loaded in a standard box car and almost twice this amount in a furniture or vehicle car. A light two-horse wagon will haul 1,000 ft. of the 3-in. conduit and two men will handle a crate containing 140 ft. of this size. The conduit is made in four sizes, all in 7-ft. lengths, and other sizes are made to order. It can easily be cut with an ordinary handsaw. Being non-brittle, as well as impervious to the action of the elements, it can be laid without concrete and with simply a heavy board protection at the top. The machinery with which the conduit is made, and the product itself, are protected by patents.

The pamphlet mentioned is illustrated, showing how the conduit is handled and laid and there are included letters from a few users of the conduit attesting its efficacy.

BALL BEARINGS FOR RAILWAY CARS.

The Baltimore Railway Specialty Co., which was recently chartered under the laws of Delaware, will manufacture and introduce an important device for railroads. It owns the patents for the Norwood ball-bearing center and side plates, which are devised to supply frictionless bearings for railroad cars. These plates carry the load and are placed between the car bolster and the trucks. Flat plates are used at present for this purpose, and railroad men have long looked for some device which would displace them and eliminate the expensive friction their use entails.

Mr. J. E. Norwood, the inventor, organized the Baltimore Ball Bearing Co. to manufacture his invention. This company has been absorbed by the Baltimore Railway Specialty Co. which has much larger resources. Thomas H. Symington is president of the new company; J. W. Middendorf, vice-president; W. Eason Williams, secretary and treasurer, and Mr. Norwood, mechanical engineer.

The company is preparing to manufacture center and side bearings in large quantities by special machinery which will insure perfect working and interchangeability of parts.

Owing to a reported opposition on the part of the Big Four railway to allowing the proposed Central Illinois interurban road to cross the railroad tracks between Cleveland and Mattoon, a change of route between those cities may be necessary, but at all events it is believed that the new electric line will be running from Cleveland to Charleston by August next.

SALE OF McGUIRE RHEOSTAT BUSINESS.

On February 20th the McGuire Mfg. Co., of Chicago, announced the sale of the rheostat branch of its business to the Magneto Electric Co., of Amsterdam, N. Y., and that it would be unable to accept any orders for delivery inside of 40 days. It was further stated that on and after March 20th the Magneto Electric Co. will be prepared, with greatly increased facilities, to fill all orders promptly.

BOND AND MOTOR TESTING.

At the December meeting of the New England Street Railway Club the subject for discussion was "Labor Saving Devices for Car Houses and Shops," and in this connection the Conant bond and motor testing instruments were highly endorsed by officials of the Boston Elevated Railway Co. and of the Union Railway Co., of New Bedford.

The bond tester is being generally adopted by bond manufacturers and contractors as well as by railway companies. It is so constructed that it can be placed in the hands of the ordinary track man and used by him without any fear of its being damaged by rough handling and therefore is especially suited for use in re-bonding work. Only those particular bonds that are found defective need be replaced. One man is all that is necessary to operate

compressors, cranes, etc. Extensive improvements in the manufacturing plant have already been made, and an additional building will be erected for a store and engine house, early in the spring. A portion of the new machinery is already in operation, but there is yet to be purchased, screw machines, turret lathes, shapers, universal grinder, gear cutter, milling machine, and engine lathes.

The tools made by this company have received a very gratifying recognition and orders for compression riveting machines, pneumatic hammers, and pneumatic motor hoists covering its capacity for several months are now booked. Several new types of compression riveting machines have recently been brought out, in addition to those which have been on sale for several years, and the company will have one of the most complete lines of pneumatic machinery handled by any concern in the business.

NEW INTERURBAN CAR.

The accompanying engraving is a view of a car representing a shipment of about 50 cars built for the New Hampshire Traction Co., by the Laconia Car Co., of Boston. This car is 30 ft. 2 in. long over the body; 39 ft. 6 in. over vestibules; 8 ft. 2 in. wide over posts; has straight sides, sheathed; steam car type of roof; finished in cherry; ceilings of quartered oak; curtains of "Crown" pattern mounted on Hartshorn rollers with fixtures supplied by the Curtain Supply Co. There are 11 double sash windows on a side, arranged



LACONIA CAR FOR NEW HAMPSHIRE TRACTION CO.

it and it is stated joints can be tested at the rate of one hundred per hour.

The Boston Elevated Railway Co. is using the instrument in testing the bonding on the third rail, while current is on, as well as on the track rail joints.

The motor testing instrument locates the defective motor coils without the necessity of opening the motor or disconnecting its wiring and thus enables a defect to be repaired or a bad field coil to be replaced before the trouble spreads to the rest of the winding. When a motor with a baked or weak field spool is operating with another motor whose field is perfect and therefore stronger, the weak motor does the most of the work and necessarily deteriorates its perfect coils much more quickly on account of the overloaded condition of its windings. As this deterioration covers a period of some months, a test at any convenient time will locate the exact spool that may be defective and it may then be removed at once or at some later time when the motor is opened for cleaning or other reason.

Mr. Conant also contracts to keep the bonds and motors of a road thoroughly tested, making periodical tests, locating and marking all defects.

PNEUMATIC TOOLS.

The General Pneumatic Tool Co. recently incorporated, is a re-organization of the business of the machinery department of the Havana Bridge Works, Montour Falls, N. Y., which has been engaged for some years in the production and sale of improved pneumatic tools. The new corporation will manufacture pneumatic tools, compression riveting machines, pneumatic motor hoists, air

to drop flush with the window stool, making a comfortable summer car. Wheeler No. 42 reversible cross seats are placed in center of car with longitudinal seats at each end, which arrangement has been found very satisfactory on cars that cater to city and interurban service. The car is mounted on Laconia latest improved No. 9-B-2 double tracks with 5-ft. wheel base, and fitted with Laconia 33-in. double plate wheels. These cars are equipped with Westinghouse traction air brakes, General Electric motors, Consolidated heaters, International registers and Clark scrapers.

HEATERS FOR MANHATTAN.

The Consolidated Car Heating Co. has received an order from the Manhattan Elevated Railway Co., of New York, for electric heater equipments for 110 cars. The Manhattan company has decided to use panel heaters of the same type as installed in the cars of the Metropolitan Street Ry. by the Consolidated Car Heating Co. There will be 22 heaters in each car, and they will be controlled by three quick break knife switches as made by the Consolidated company. This order was secured through the New York branch, which is in charge of C. S. Hawley who makes his headquarters in the Park Row Building.

The Consolidated Car Heating Co. has also received orders for heating and lighting couplers for 240 cars of the Brooklyn Rapid Transit Co.; an order from Ford, Bacon & Davis for electric heating equipments for 25 cars now being built at the Brill shops for the Nashville Street Ry.; and an order for 20 electric heating equipments for the Washington Railway & Electric Co., Washington, D. C.

CROCKER-WHEELER RAILWAY GENERATORS.

The development and extension of electric railways has called for a special type of generator to meet the requirements of this service. The modern generator operates at fairly high voltage, and must give a steady reliable supply of current under sudden and varying fluctuations in load. It is of importance therefore, that the machine be so designed as to accommodate the rapid changes in current output without altering the field to such an extent as to change the point of commutation. It is by this means that sparking is prevented and the machine will operate quietly without requiring shifting of the brushes with change of load.

Even on the best designed systems the generator will be called upon at times for heavy overloads, and all the parts of the machine carrying current must be designed generously large in order to prevent overheating. A relatively large voltage between adjacent commutator bars calls for strong insulation between them. Added to these particular points of design, the machine must be constructed throughout of the very best materials and given the most careful workmanship, for the best machine on the market is the most economical in the end.

The Crocker Wheeler Co. has for many years maintained a reputation for building only the best in electrical apparatus, and has recently gone into the railway field, confident that its generators would prove themselves efficient and reliable machines for this kind of service. That the company has done so is shown by the installa-

CLEVELAND TRACK DRILL.

The Ludlow Supply Co., Cleveland, O., advises us that it has decided to change the name of the track drill, which was fully described in the February "Review," from the "Improved Gore Track Drilling Machine" to the "Cleveland Track Drilling Machine." Although the improved drill has been on the market but one month, the company has sold them to five different roads and has a great many inquiries which will undoubtedly result in orders later in the season, when construction work begins. It has also had a number of applications for agencies, but up to date has given but two, Porter & Berg, Chicago, northwestern agents and the Western Electrical Supply Co., St. Louis, southwestern agent.

ST. LOUIS CARS FOR CINCINNATI.

The accompanying illustration shows a type of car recently built by the St. Louis Car Co. on the order of the Tennis Railway Equipment Co., of Cincinnati, for the Cincinnati, Georgetown & Portsmouth Railway Co. The length of the car body over vestibules is 50 ft., width over all 8 ft. 10 in. and height from sill to roof 9 ft. 4 in. These cars are intended for high-speed service and the bottom framing is reinforced with steel channels in side sills and steel I-beams in the center or intermediate sills. The sides are double sheathed with windows arranged in pairs, similar to the Pullman construction, the lower sash being arranged to raise. The interior



ST. LOUIS INTERURBAN CAR.

tions which are already in operation, and by the orders which are being received for additional railway power plants. During the past few months the following railway generators have been ordered: Washington & Cannonsburg R. R. Co., Washington Co., Pa., two 400-kw.; Lake Construction Co., Thornton, Pa., two 400-kw.; Steubenville Traction & Light Co., Steubenville, O., one 250-kw. and one 400-kw.; Tennis Construction Co., Kenneth Sq., Pa., two 400-kw.; Vandergrift Construction Co., Philadelphia, Pa., three 300-kw. and one 200-kw.; Erie Rapid Transit R. R., Harbor Creek, Pa., one 200-kw.; Philadelphia & Lehigh Valley Traction Co., Quakertown, Pa., one 200-kw.

EUREKA FLEXIBLE CONDUIT.

In placing the "Eureka" flexible conduit upon the market, the manufacturer, the Rittenhouse-Miller Co., of Philadelphia, points out that its three salient points of merit are economy, range of application and durability. Among the claims made for the "Eureka" are that it is an unusually flexible conduit, that it is not affected by moisture or high temperature, that it cannot be broken, that it is not affected by the action of lime or building cement, that it will not stretch, that its interior cannot be ripped out, that its insulating qualities are of the highest, that it will withstand abrasion, and that its edges will not fray out. The maker announces that to meet the increasing demand for flexible conduit in colors, to match the finishes and decorations of offices and houses, it now manufactures the "Eureka" in colors, as well as in black.

It is reported that the Camden & Trenton Railway Co. will erect a large power house at Bordentown, N. J.

finish is of white oak with ceiling of the same. These cars are provided with a smoking compartment and toilet room and are heated by Peter Smith hot-water heaters. Among the appliances of these cars may be mentioned Pantasote curtains, St. Louis Car Co.'s, walk-over seats covered with canvas-lined rattan, St. Louis 23-B high-speed motor trucks, M. C. B. type, and Christensen air brakes. The cars are vestibuled at both ends, each platform being provided with double steps with folding trap doors. The cars are equipped with four Westinghouse No. 56 motors each.

BROWN CORLISS ENGINE CO. INCREASES CAPITAL.

The Brown Corliss Engine Co., of Corliss, Wis., on Feb. 26, 1903, increased its capital stock from \$1,000,000 to \$1,200,000 in order to make available the larger working capital which is needed because of the long time required to complete the class of engines which the company is building. The work offered to the company runs into the largest type of engines requiring from three to eight months to build and as this is the kind of work the company most desires the need of new capital is a sign of success upon which it is deserving of congratulations. From Dec. 2, 1902, to Feb. 16, 1903, the Brown Corliss Company bid on \$1,295,464 of new work, which may be taken as an indication of a prosperous year. The company reports the following recent orders for engines: Two 26 x 54 simple engines for Montello Brick Co., Reading, Pa.; a 14 and 26 x 42-in. and a 16 and 30 x 42-in. tandem compounds for the Sheffield Co., Sheffield, Tenn.; an 18 and 36 x 42-in. vertical cross compound for the Louisville Gas Co., Louisville, Ky.

PORTER & BERG, INCORPORATED.

Among the houses in the West making a specialty of electric railway supplies exclusively, one of the most progressive and successful is Porter & Berg, of Chicago. This concern has grown to large proportions and to better handle the business a corporation was recently formed under the old firm name. The officers are: President and treasurer, J. W. Porter; vice-president, Edward R. Mason; secretary, Max. A. Berg. The company now occupies two stores, one at No. 309 Dearborn St., in which the offices and sales-rooms are located, and the other at No. 47 Plymouth Place, in the Windsor & Kenfield Building. A large and complete stock is always carried on hand, especially selected with a view of meeting promptly the requirements of electric railway customers. The gentlemen interested in the corporation all have a wide acquaintance among street railway men, having for years been the representatives of some of the largest and best known houses in the country.

Mr. Porter became a partner in this business in May, 1899, but has been active in the electrical field since 1890, when he was in the erecting department of the Edison General Electric Co. Later he was in the sales department of the Electrical Supply Co., of Chicago, and in 1893, became manager of a central lighting station in Chicago.

Mr. Berg was formerly manager of the railway department of the Electrical Supply Co., Chicago, and in 1896 became associated with the Ohio Brass Co., of Mansfield, O., of which he was assistant secretary when he resigned some years later to enter the supply business as a member of the firm of McGill, Porter & Berg, organized in 1900, and which was soon succeeded by Porter & Berg.

Mr. Mason is the company's representative on the road and has been associated with Porter & Berg ever since the firm was organized. Mr. Mason is well known to street railway operators in the middle West and has achieved an enviable reputation which is a deserved tribute to his integrity and high character. Before going with Porter & Berg, he had already had several years experience in the railway supply business, having been associated with his father, W. R. Mason. Mr. Mason has taken an active interest in state military affairs and now holds a commission as lieutenant in the Illinois Naval Militia. He is a graduate of the Nautical School and on the declaration of war with Spain he enlisted with the Naval Militia and was in active service for nine months on board the U. S. S. Cincinnati.

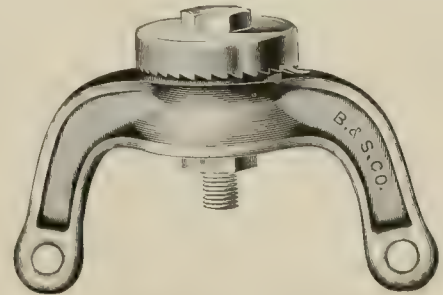
LARGE CAR ORDERS.

The Niles Car & Manufacturing Co., of Niles, O., has shipped during the past 30 days 10 vestibuled 28-ft. cars to the Toledo Railways & Light Co.; ten 20-ft. car bodies to the Havana Electric Railway Co., Havana, Cuba; two double truck baggage and work cars to the Western Ohio Railway Co., Lima, O., and ten 62-ft. passenger coaches, full vestibuled, six wheel trucks, to the Seaboard Air Line Railway Co., Richmond, Va. These coaches are finished in quartered oak, inlaid, with full empire decks, and are for the run between Jersey and Florida. Within a few weeks ten 28-ft. vestibuled cars will be shipped to the Des Moines City Railway Co.; six 28-ft. car bodies to the Pennsylvania & Mahoning Valley Railway Co.; four 28-ft. vestibule car bodies to the United Power Co., East Liverpool, O., and 25 electric car bodies to the Havana Electric Railway Co. The Niles company is also constructing 10 additional coaches for the Western Ohio Railway Co., and eleven 70-ft. passenger coaches and five combination coaches for the Terre Haute & Indianapolis Vandalia system of the Pennsylvania R. R. These cars will be about 78 ft. over all and are the first of this type the Pennsylvania company has had built. They will be mounted on six wheel standard trucks. The seats in the passenger coaches will be of the Hale & Kilburn walkover, high back pattern, upholstered in plush; the seats in the combination cars will be upholstered in horse hide. These coaches will run on through trains between Jersey City and St. Louis. The Niles company is making extensive additions to its works, a large blacksmith and machine shop, containing the most modern machinery, being the chief feature.

The Union Traction Co. of Indiana, will expend \$40,000 on additions to its power house and car shops in Anderson.

MODERN OVERHEAD MATERIAL.

The accompanying illustrations show a number of overhead electric railway devices, manufactured by the Billings & Spencer Co., which have been tested for about eight years in practical use and which are reported to be giving universal satisfaction. The B. & S. type of trolley wire hanger equipped with this company's special conical insulated stud has been very widely used and the company filled one order for 12,000, which was only obtained after submitting samples, taken at random from stock, to a severe test by the purchaser's electrical engineer. The company does not furnish cheap material, but claims for the B. & S. material that actual serv-



DOUBLE CURVE HANGER.

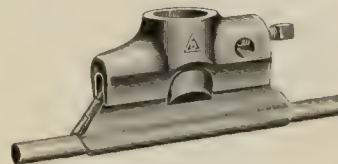


FIG. 8 FEEDER CLIP.

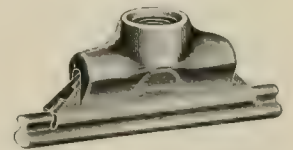
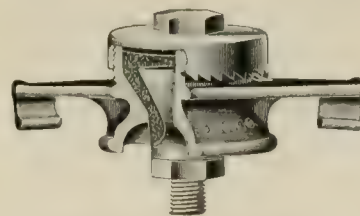


FIG. 8 CLIP.



STRAIGHT LINE HANGER.



CONICAL STUD.



LINK BALL STRAIN INSULATOR. SINGLE CURVE HANGER.

ice will prove its value and ultimate economy. The design of this hanger and stud is distinctive and one of the hangers and studs assembled was submitted by the company to a stress of 12,000 lb. without injuring either the stud or hanger. It required 17,830 lb. stress to break the stud in the thread and then the insulating material remained intact. The B. & S. link ball strain insulator has also stood the test of time and has proved equal to all requirements. The metal parts of this insulator are drop forged steel and galvanized. The mechanical construction of the device is of a practical nature and its insulation meets all requirements. The mechanical clips or ears produced by this company are easily applied and thousands have been sold from which not a complaint has been received. The company also makes drop forged galvanized iron bolt, frog pull off attachment, long and short clevis bolts and drop forged connector bars for street railway work.

THE MOTORMAN'S MIRROR.

The International Railway Co. has devised a mirror to enable the motorman to see through the front window of the car without being disturbed by passing wagons. A very large proportion of the accidents that occur on street railways are brought about

by a severe blow, a plate of cork composition is placed behind the mirror and covered with a viscous compound to prevent the pieces of glass flying and injuring passengers should the glass be broken. Strips of the same composition are placed over the front edges of mirror so as to cushion it. To guard against breakage the metal parts of the mirror are made of bronze so that

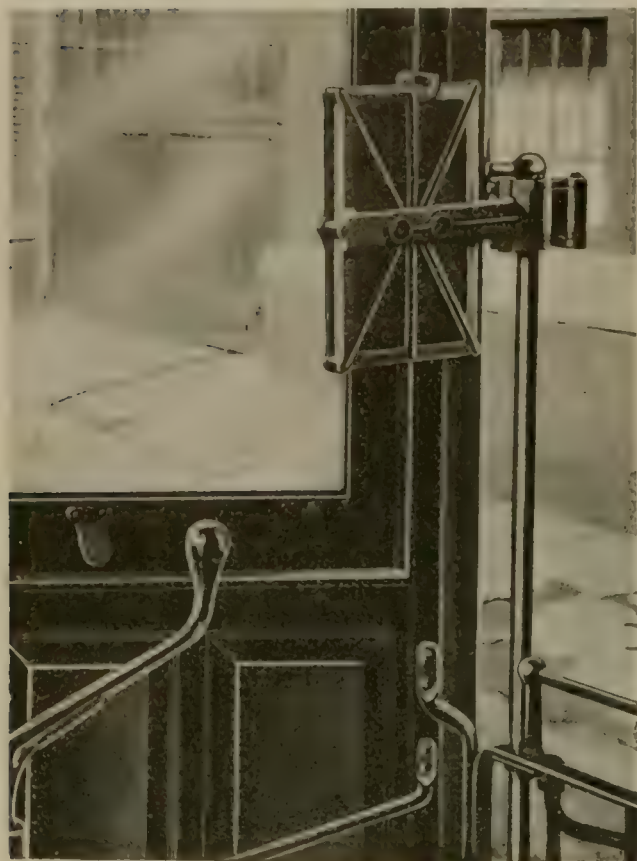


FIG. 1.



FIG. 2.

injuries received by passengers getting on or off the car who are thrown down by its unexpected starting.

This mirror is placed on the right of the car front and projects about 3 in. beyond the edge of the car at an angle of 45 degrees. This is shown clearly in Fig. 1. Fig. 2 shows a view of the mirror from the point occupied by the motorman's eye and the man getting on the rear platform is distinctly seen. From a point inside the

car the conductor may also see the rear platform when collecting fares near the front of the car, provided no one is standing on the front platform. Also only a slight turn of the motorman's head is necessary to enable him to command a view of the entire right side of the car. Fig. 3 is a view of the mirror from the rear end, showing how slight a projection beyond the outer line of the car is necessary.

However, with even this slight projection it is liable to be struck by passing wagons in crowded streets or at crossings. Therefore the mirror is hinged so as to move either way and the frame cannot be broken if the car strikes

in case of a severe blow they will bend rather than break. Even malleable iron or cast steel might be broken by a blow, especially in cold weather, and fragments be thrown through the front window of the car, possibly injuring a passenger. Bronze is therefore used.

Railroads using this mirror report a large saving in running time as well as prevention of accidents due to starting cars while passengers are getting on or off. The mirror relieves the conductor from fear of accidents on the rear platform when he is taking fares and thus increases his efficiency as a collector.

The device is covered by very broad patents and is manufactured by Harold P. Brown, of 120 Liberty St., New York.

INTERNATIONAL RAILWAY CO., BUFFALO.

In the "Review" for February, page 118, we gave comparative statements for the operations of the International Railway Co. for the months of December, 1901 and 1902, and for the quarters ending Dec. 31, 1901 and 1902. The figures as published were inadvertently transposed, those for the quarterly statements being placed under the monthly heading and vice versa.

At the annual meeting of the New York & New Jersey Railroad Co., Jersey City, N. J., held on February 11th, David Young, G. Tracy Rogers and Charles W. King were chosen directors.

The first "flat wheel" case to come up in Atlanta, Ga., where an ordinance was recently passed prohibiting flat wheels on street cars, came on March 2d, when Vice-President T. K. Glen, of the Georgia Railway & Electric Co., was summoned to answer a complaint made by a patrolman. A fine of \$10 was assessed.



FIG. 3.

a wagon in overtaking it or if a wagon strikes the mirror when passing the car in the same direction. The blow which the mirror might receive is merely the amount necessary to compress the springs of the hinge.

COMMUTATOR CARBON BRUSHES.

The science of producing direct current electricity has now reached so high a state of advancement that it is more than probable no revolutionary method of generation or production will be discovered for some time to come, and any marked economies or improvements will be brought about by improvement in details that have heretofore been more or less neglected. This careful attention that is now being bestowed on the minute details is strikingly illustrated in the matter of commutator brushes for both generators and motors. It is now universally recognized that by the use of inferior or unsuitable brushes all the advancement in generator and motor construction can at once be neutralized and put to naught. It is also important that the proper grade of brush be used to suit the conditions. For instance, a generator that is overloaded requires a different grade of brush than a machine which is carrying its rated load. Then, too, in the case of motor brushes, climatic conditions, the presence of heavy grades on the line, the use of trailers and other elements ought to be carefully considered in selecting the proper grade of car motor brush.

The Le Valley-Vitae Carbon Brush Co., of 119 to 125 East 42d St., New York City, claims to have been the first company to put upon the market a high grade, permanent and perfectly self-lubricating brush. Mr. John V. Clarke, president of the company, who is an expert on the subject of commutator brushes, states that not only has the company aimed to keep up the same high standard of the Le Valley-Vitae brush since it was first put upon the market 10 years ago, but it has brought out many improved forms and grades to fill the various different conditions that are constantly arising in electric railway and lighting work. The company now makes brushes in every conceivable size and grade for car motor and generator purposes. The Le Valley-Vitae company sells its goods under a guarantee that its brushes will stand up under the heaviest loads, will not spark, will run absolutely noiselessly, will not heat, and at the same time will not cut the commutator or wear it perceptibly.

The company has letters from some of the largest consumers and best firms in the electrical business, commending Le Valley-Vitae brushes, and confirming its claims. Sample brushes will be sent on application to the company, provided information be sent as to the conditions under which they are to be used.

SAND BOXES FOR BOSTON ELEVATED.

"Ridlon's Representative," the house organ of the Frank Ridlon Co., of Boston, in the February issue contains a facsimile reproduction of a letter received recently from the Boston Elevated Railway Co., ordering the Kilbourn track sanding device for 1355 cars of the Boston Elevated system. In the same issue appears a copy of the original order for 1,400 Wilson trolley catchers. These orders are positive proof that the Ridlon company's specialties have unusual merit, inasmuch as the Boston Elevated company's reputation for buying only the best is widely known.

ELECTRIC CRANE DEMAND.

Pawling & Harnischfeger, Milwaukee, Wis., advise us that the crane demand continues extremely satisfactory. The booking of orders still continues on an average of one crane each day, which is nearly the capacity of the works. The best crane demand still comes from the iron and steel districts of Pennsylvania and Ohio, though the Central States are well represented. The outlook for sales to steam railroads and electric railroads is improving, with many more inquiries from electric plants than prevailed last year.

The company reports sales from January 1, 1903, to March 1, of 58 cranes, partly represented by the following list:

Chicago & Eastern Illinois Railroad Co., Danville, Ill., 3 cranes; Western Tube Co., Kewanee, Ill.; Westinghouse Machine Co., East Pittsburg; South Penn. Oil Co., Folsom, W. Va.; Pittsburg Plate Glass Co., Ford City, Pa.; Ansonia Brass & Copper Co., Torrington, Conn.; Fairbanks, Morse & Co., Beloit, Wis.; St. Paul Foundry Co., St. Paul; Ingersoll-Sergeant Drill Co., Philipsburg, N. J., 14 cranes; American Bridge Co., Ambridge Works, Leominster, Pa., 2 cranes; Standard Steel Works, Burnham,

Pa.; City of Boston, Water Dept., Boston; Beloit Iron Works, Beloit, Wis.; International Steam Pump Co., Laidlaw-Dunn-Gordon Works, Elmwood Place, O.; Wheeling Steel & Iron Co., Benwood, W. Va.; Coe Brass Mfg. Co., Torrington, Conn.; McConway & Torley Co., Pittsburg; Ironton Engine Co., Ironton, O., 2 cranes; Joseph T. Ryerson & Son, Chicago; Hammond Iron Works, Struthers, Pa.; Cambria Steel Co., Johnstown, Pa.; American Bridge Co., Pencoyd Plant, Pencoyd, Pa.; C. A. Lawton & Co., De Pere, Wis.; Perry-Mathews-Buskirk Stone Co., Bedford, Ind., 2 cranes; Toledo Machine & Tool Co., Toledo; American Sheet Steel Co., Wellsville Works, Wellsville, O.; Landis Tool Co., Waynesboro, Pa., 3 cranes; Goodman Mfg. Co., Chicago; Southern Creosoting Co., Slidell, La.; National Malleable Castings Co., Indianapolis, Ind.; C. Trimborn, Milwaukee; Louisville Railway Co., Louisville, Ky.

ORDERS FOR GOULD STORAGE BATTERIES.

The Gould Storage Battery Co., 25 West 33d St., New York City, reports among recent contracts for storage batteries closed by the company, the following: Philadelphia & Lehigh Valley Traction Co.; battery to be located near Quakertown, Pa.; 196 cells 0-511 in glass jars, and switchboard; discharge capacity 200 amperes.

Warren Electric Street Railway Co.; battery located at Warren, Pa.; 240 cells 0-509 in glass jars, switchboard and Gould C. E. M. F. regulating booster; discharge capacity 160 amperes.

Dayton & Muncie Traction Co.; four plants, located respectively at Winchester, Ind., Selma, Ind., Union City, O., and Greenville, O., each battery consisting of 305 cells, Type S-609, in lead-lined tanks, Type S-611; plate capacity, 320 amperes; tank capacity, 400 amperes; switchboard and 44 kw. regulating Gould C. E. M. F. booster.

Odell Illuminating Co.; battery located at Odell, Ill.; 124 cells, N-411, in N-413 jars; capacity, 240 ampere hours, at 240 volts for three wire lighting system.

Manhattan Heat, Light & Power Co.; battery located at St. Paul, Minn.; 56 cells, S-627, in lead-lined tanks; capacity, 2,080 ampere-hours; switchboard and automatic Gould C. E. M. F. booster for block lighting and regulation.

ADVERTISING LITERATURE.

THE AMERICAN BRAKE SHOE & FOUNDRY CO., New York, N. Y., has issued a natty booklet, replete with half-tone engravings, setting forth the merits of the "Tropenas" process steel castings. Accompanying the pamphlet are a price list of cast steel wrenches and a folder illustrating the "Tropenas Diamond S" oil cups.

THE OHIO BRASS CO., of Mansfield, O., is sending out a little treatise on motor bearings in which the good qualities, genuine bell metal and babitted products of the company are especially emphasized. Stress is also laid upon the company's increased facilities since new milling machines, lathes and other apparatus have been installed.

THE DULUTH STOKER CO., of Duluth, Minn., has issued an interesting little pamphlet on "smokeless combustion," containing a description of the Duluth stoker, illustrated in detail, together with testimonials from users of the device. In the same connection it is announced that the company is equipping 10 steamships with the apparatus and is also building several large stationary stokers.

THE MECHANICAL BOILER CLEANER CO., Chicago, Ill., issues a 30-page, 6 x 9-in. pamphlet devoted to the Garrigus mechanical boiler cleaner, in which the claims for this well-known device are concisely and interestingly set forth and illustrated. It also contains fac simile letters of testimonials from several of the largest power plant proprietors, including a number of street railway companies.

THE CROUSE-HINDS ELECTRIC CO., of Syracuse, N. Y., has issued a 52-page booklet descriptive of the "Norhitt Specialties," or porcelain electrical appliances from which exposed contacts are

entirely eliminated. The numerous illustrations that accompany the work are actual size and consequently very explicit. For quality of composition, typography and illustration the booklet is the acme of the printer's art.

THE DUFF MANUFACTURING CO., Pittsburg, Pa., is sending out its "Barrett Jacks" catalog D, for February, 1903, illustrating track jacks, automatic lowering jacks, car and car box jacks, differential screw jacks, oil well jacks, pipe forcing jacks, automobile jacks, motor armature lifts and traversing jack bases. It is a 50-page catalog, 6 x 9 in., replete with detailed information, and well worth placing on file.

STEEL ROLLING DOORS, SHUTTERS AND PARTITIONS. This is a 20-page pamphlet describing the product of the Columbus Steel Rolling Shutter Co., of Columbus, O. Illustrations are included showing the adaptability of the company's steel rolling doors for various purposes; freight and warehouse buildings, shops, factories, car barns and power houses. The construction is illustrated in detail.

THE AJAX METAL CO., Philadelphia, Pa., issues a 70-page catalog of its well-known products that contains a fund of valuable reading matter, including a paper on "The Microstructure of Bearing Metals," read before the mining and metallurgical section of the Franklin Institute. The catalog is handsomely and ingeniously illustrated, copper bronze ink being used for the cuts on the covers and the figures illustrating the white metal products being in silver bronze.

THE INDUSTRIAL WATER CO., 126 Liberty St., New York, has published a 22-page pamphlet, 6 x 9-in., entitled "Hard Water Made Soft," illustrating and describing several of the recent installations made by this company, including those for the Laidlaw-Dunn-Gordon Co., Cincinnati, O., 2,000 gallons per hour; American Beet Sugar Co., Oxnard, Cal., 42,000 gallons per hour; J. B. King & Co., New Brighton, N. Y., 10,000 gallons per hour; Plainfield Gas & Electric Light Co., Plainfield, N. J., 3,000 gallons per hour, and others.

THE STANDARD VITRIFIED CONDUIT CO., of New York City, sends out a most attractive "advance circular" presenting the meritorious features of its vitrified clay, salt-glazed, under-ground conduits and third rail insulators very effectively. In addition, the results of recent tests of insulators made by this company are given, as well as an invitation to send for one of its illustrated catalogs, just issued, which are among the most complete ever offered to the electrical trade. The "advance circular" is handsomely printed on highly-embossed paper, generously illustrated with tinted half-tones, and bound in red, the front cover being highly illumined by an unique design.

TRADE NOTES.

C. C. MURRAY will be connected with the Railway Appliances Co. with headquarters at Pittsburg, giving his time more particularly to the sale of the Q. & C. pneumatic tools.

BINGHAM & CO., of Camden, N. J., manufacturers of sheet metal specialties for steam and electric plants, has removed to the old Camden Machine Works plant in Camden, where there are more room and better facilities.

THE STAR BRASS WORKS, Kalamazoo, Mich., has several large orders booked for its trolley wheels and harps, and advises us that many construction companies now specify the Kalamazoo products in the contracts for new work.

THE BURT MANUFACTURING CO., Akron, O., has just made a shipment of 11 exhaust heads to one firm in Philadelphia. It has also received the fifth order from the American Locomotive Co. for oil filters to be used in its works in Schenectady, N. Y.

THE H. W. JOHNS-MANVILLE CO., 100 William St., New York City, has had to practically duplicate its factory to take care of the increased demand for its "Noark" enclosed fuse protective device, which enters into railway work as well as all other electrical work requiring protective devices. In all other lines of street railway material, the company's business during the past year has been

far in excess of any preceding year. The outlook for the coming year is reported to be fully as gratifying.

THE JOHN DAVIS CO., Chicago, Ill., has just completed and furnished the entire steam connection for the plant of the Illinois Valley Traction Co., at La Salle, Ind. It is stated that negotiations are pending for the equipment of several other large plants by this firm.

THE UNDERFEED STOKER CO. of America, has recently received contracts for stokers from the National Pin Co., Detroit, Mich.; Hotel Cadillac, Detroit, Mich.; La Fayette Hominy Mills, La Fayette, Ind.; Standard Welding Co., Cleveland, O.; Portland Street Railway Co., Portland, Me.

C. J. HARRINGTON, New York City, is calling attention to a "never break" electric light guard, known as the "H. & R." It is made of steel wire with silver luster finish, the wires being corrugated near the top to avoid danger of breaking. It has an adjustable clamp socket and holds all sizes of incandescent lamps securely.

THE STANDARD UNDERGROUND CABLE CO., Pittsburg, Pa., started its new copper rod and wire mill about two months ago, since which time it has received exceptionally large orders for copper rods, trolley wire, waterproof cable and feeder cables. In the direction of street railway construction, especially, the orders have far exceeded the most sanguine anticipations.

BROWN CORLISS ENGINE CO., Corliss, Wis., has recently received orders for the following engines: Monticello Brick Co., Reading, Pa., two 26 x 54-in. simple engines; The Sheffield Co., Sheffield, Tenn., one 14 and 26 x 42-in. tandem compound, and one 16 and 30 x 42-in. tandem compound; Louisville Gas Co., Louisville, Ky., one 18 and 36 x 42-in. vertical cross compound.

F. E. HOOK, Hudson, Mich., manufacturer of coating and painting machines, and paint, has recently made sales to the following railway companies: British Columbia Railway Co., Vancouver, B. C.; Union Terminal Railway Co., Sioux City; Boston Elevated Railway Co., Boston, Mass.; St. Louis, Iron Mountain & Southern Railway, St. Louis, Mo.; New York & Ohio Co., Warren, O.

THE GREEN ENGINEERING CO., Chicago, Ill., found its sales very heavy in the street railway field during the past year, its recent customers including the East St. Louis, Belleville & Suburban Railway Co., St. Joseph Railway, Light, Heat & Power Co., Cleveland City Railway Co., and Danville Street Railway Co., aggregating 25,000 h. p. The outlook for the coming year is still more flattering.

THE AMERICAN BRAKE SHOE FOUNDRY CO., 170 Broadway, New York City, reports that business is constantly increasing in brake shoes for street railway service, thanks to judicious advertising, coupled with the efforts of its large staff of salesmen. Among the well-known shoes manufactured by this company are the Sargent, "Diamond S", Lappin, Corning, Streeter, Herron and Cardwell.

THE PETTIBONE BROTHERS MANUFACTURING CO., Cincinnati, O., has furnished uniforms to railway men in all parts of the country during the past 31 years, and it reports that 1902 was the banner year in its history. Notwithstanding, indications point to 1903 surpassing 1902, and already orders are coming in for the spring bargains advertised by this house. A special run is being made on straw caps. The 1903 catalog, in colors, will be sent upon application.

ENGINEERS AND MANAGERS who are planning to overhaul their boiler plants this spring will do well to remember that the McLeod & Henry Co., of Troy, N. Y., makes a specialty of supplying boiler door arches and jambs. This house has been established since 1825. Its engineers and experts know all about the furnace and the fire box and the company is glad to learn of particularly troublesome cases. Its business is to remedy furnace and fire box troubles.

THE FITCHBURG ENGINE CO., of Fitchburg, Mass., reports among other important recent contracts the following, all of which were taken through Edwin H. Ludeman, 39 Cortlandt St., New York, manager of the New York branch: Three 300-h. p. medium-speed tandem compound, four-valve engines, and one 25-h. p. engine, to be installed in the new Hotel Belmont, now under construction on 42d St., New York City; these engines will be direct converted in each case to Western Electric generators. A contract has also been closed for a 475-h. p. Fitchburg engine to be installed

in the shops of the John Stephenson Car Co., of Elizabeth, N. J.; this engine will be direct connected to a 300-kw. General Electric generator. The list also includes two 300-h. p. Fitchburg compound engines for an important hat factory at Orange Valley, N. J.

THE IRONSIDES CO., Columbus, O., manufacturer of special lubricants and preservatives for a variety of operating departments, recently held a convention at the Hartman Hotel of that city, at which the greater portion of its sales agents were present. The several days' sessions, which were given to matters pertaining to the various fields, culminated in a banquet. All attendants were greatly benefitted through the interchange of ideas and further enjoyed all the social features.

EUGENE MUNSELL & CO., 218 Water St., Chicago, and 332 Wellington St., Ottawa, has recently added to its business the manufacture of mica specialties, including lamp chimneys, canopies, candle-shaped protectors, etc. In its 1903 catalog and price list, just issued, is shown a line of reflectors for incandescent lamps, which is absolutely new. These reflectors are made of the best clear mica, casting no shadow, and it is claimed that they intensify the light four-fold. Some of the shapes form a flower-like effect and are to be used with colored lamps for decorative purposes. Application has been made for a patent, and all of Messrs. Munsell & Co.'s specialties will be distinguished by the copyrighted name, "Micalite."

THE WASHINGTON CO. with offices at 39 Cortlandt St., New York City, has recently made arrangements with the Phoenix Iron Works Co. of Meadville, Pa., to handle the Phoenix engines and horizontal return tubular boilers in the Eastern States. The Phoenix Iron Works Co.'s New York office at 15 Cortlandt St., has been in charge of C. A. White for a number of years, and through his efforts a large number of Phoenix engines have been installed in the vicinity of New York. Some of the important buildings where these engines are giving uniform satisfaction are, the Park Row Building, Maritime Building, Broad Exchange, Lying-in Hospital, R. H. Macy & Co. new store, Hallenbeck Building, Corn Exchange Bank, etc. Mr. White has associated himself with the Washington Co. to take charge of the Phoenix engine and horizontal return tubular boiler department, and the Washington Co. thereby increases its importance in the steam plant field where it is already well and favorably known as agent of the Franklin water tube boiler and as contractor for complete steam plants.

THE UNDER-FEED STOKER CO. OF AMERICA recently closed contracts for installing the Jones underfeed stokers with the following: John J. Bagley Co., Detroit, Mich.; New Prague Milling Co., New Prague, Minn.; Eagle Roller Mills, New Ulm, Minn.; Jefferson & Clearfield Coal & Iron Co., Punxsutawney, Pa.; Kelley Milling Co., Kansas City, Mo.; Michigan Salt Manufacturing Co. (2d order), Marine City, Mich.; Bureau of Public Lighting (4th order), Allegheny, Pa.; Buhl Stamping Co., Detroit, Mich.; Gray, Toynton & Fox Factory; National Candy Co., Detroit, Mich.; The Rathbun Company (4th order), Deseronto, Ont.; The E. B. Eddy Co. (3d order), Hull, Ont.; The Ontario Portland Cement Co., Brantford, Ont.; The Truro Condensed Milk & Canning Co. (2d order), Truro, N. S.; The T. Eaton Co. (2d order), Toronto, Ont.; J. A. Paquet (2d order), Quebec City, Que. The company's business in Japan has grown to such an extent as to require the presence of one of its erecting engineers to supervise the installation of its apparatus in plants located in Yokohama and Osaka. Its Mr. Louis J. Boyd sailed for Yokohama March 11th, and will remain in Japan four months.

THE LUDLOW SUPPLY CO., Cleveland, O., reports many orders for ties, poles, cross arms and pins this spring, in addition to railway supplies in general. During the past three months it has established several new agencies. It represents the following manu-

facturers: Chisholm & Moore Manufacturing Co., Cleveland, O., rail joints and braces and chain hoists; Garry Iron & Steel Co., Cleveland, O., pneumatic jacks and cranes; Johnson Wrecking Frog Co., Cleveland, O., car replacers; Federal Manufacturing Co., Cleveland, O., Johnson trolley retractors; Shelby Steel Tube Co., Shelby, O., trolley poles; Nichols-Lintern Co., Cleveland, O., pneumatic track sanders; Wilson Trolley Catcher Co., Boston, trolley catchers; Garton-Daniels Co., Keokuk, Ia., lightning arresters, trolley pick-ups and automotoneers; Duff Manufacturing Co., Allegheny, Pa., Barrett jacks; Dorner Truck & Foundry Co., Logansport, Ind., track scrapers; Le Valley-Vitae Carbon Brush Co., New York, carbon brushes; Wheel Truing Brake Shoe Co., Detroit, Mich., brake shoes; Kisinger-Ison Co., Cincinnati, O., trolley splicers; Crouse-Hinds Electric Co., Syracuse, N. Y., head lights; R. Bliss Manufacturing Co., Pawtucket, R. I., car gates; Parrish Signal Co., Jackson, Mich., crossing signals; Lumen Bearing Co., Buffalo, N. Y., journal bearings.

STREET RAILWAY PATENTS.

This list of patents furnished by T. Reed Clift, Patent Attorney, from whom all desired information can be obtained.

No. 717,542. Jan. 6, 1903. F. J. Caswell, Woodville, Mass. Trolley harp.

No. 717,561. Jan. 6, 1903. Michael Ferguson, Munising, Mich. Snow plow and road icer.

No. 717,620. Jan. 6, 1903. Donald Raestrom, Chicago, Ill. Brake shoe.

No. 717,689. Jan. 6, 1903. James R. Klippelt et al., Pittsburg, Pa. Automatic street railway switch.

No. 717,728. Jan. 6, 1903. A. C. Wells, Whittier, Cal. Street railway curve.

No. 717,758. Jan. 6, 1903. John H. McMullin, Worcester, Mass. Sign illuminator.

No. 717,811. Jan. 6, 1903. Geo. F. Chapman, Marlboro, Mass. Adjustable headlight for street cars.

No. 717,821. Jan. 6, 1903. Wm. A. Daggett, Vineland, N. J. Trolley for electric cars.

No. 717,862. Jan. 6, 1903. O. W. Johnson, Oakharbor, O. Car replacer.

No. 718,024. Jan. 6, 1903. J. T. Rice, Hot Springs, Ark. Trolley fender.

No. 718,025. Jan. 6, 1903. J. B. Robidon, St. Louis, Mo. Car fender.

No. 718,237. Jan. 13, 1903. Casper Ziemerman, Vienna, S. D. Elevated railway structure.

No. 718,292. Jan. 13, 1903. J. F. Verner, New York, N. Y. Car fender.

No. 718,448. Jan. 13, 1903. Henry Fresh, Cumberland, Md. Emergency car brake.

No. 718,456. Jan. 13, 1903. F. L. Hawkins, Gardner, Mass. Lubricating device.

No. 718,520. Jan. 13, 1903. Geo. T. Osborn, Atlanta, Ga. Street railway switch.

No. 718,551. Jan. 13, 1903. John W. Wainwright, Hale, England. Brake for tram cars or other rolling stock.

No. 718,674. Jan. 20, 1903. John E. Swanson, Des Moines, Iowa. Car switching.

No. 718,678. Jan. 20, 1903. Geo. R. Tomb, Lorain, O. Trolley.

No. 718,799. Jan. 20, 1903. Wm. H. Savage, Denver, Colo. Slack adjuster.

No. 718,888. Jan. 20, 1903. Chas. A. Taylor, Winchester, Ill. Car fender.

No. 718,993. Jan. 27, 1903. Thomas A. Ennis, Albread, Ark. Car switching mechanism.

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Dovenhof 93 20 Rue St. Georges 59 City Road, E. C.

No. 719,010. Jan. 27, 1903. John Jones, Denver, Colo. Rail joint for street car tracks.

No. 719,029. Jan. 27, 1903. John McGuire, St. Louis, Mo. Fender.

No. 719,148. Jan. 27, 1903. John Shelton, Denver, Colo. Car brake mechanism.

No. 719,256. Jan. 27, 1903. John Quern, Brooklyn, N. Y. Car fender.

No. 719,452. Feb. 3, 1903. James S. Fox, Jackson, Mich. Trolley system for electric railways.

No. 719,453. Feb. 3, 1903. James S. Fox, Jackson, Mich. Railway rail.

No. 717,492. Feb. 3, 1903. Ira A. McCormack, Cleveland, O. Street switching device for attachment to cars.

No. 719,512. Feb. 3, 1903. John Scanlan, Chicago, Ill. Street railway track.

No. 719,557. Feb. 3, 1903. Walter Blanchard, Boston, Mass. Railway switch.

No. 719,566. Feb. 3, 1903. Frank E. Case, Schenectady, N. Y. Electric brake.

No. 719,699. Feb. 3, 1903. W. T. Sears, Boston, Mass. Safety emergency brake.

No. 719,813. Feb. 3, 1903. John Kenny, Detroit, Mich. Brake mechanism.

No. 719,940. Feb. 3, 1903. H. S. Haight and James Taylor, Manchester, Eng. Tram seat.

No. 720,001. Feb. 10, 1903. A. J. Cooper, Osborn, O. Adjustable car step.

No. 720,006. Feb. 10, 1903. Leroy Devers, Dayton, O. Automatic street car switch.

No. 720,208. Feb. 10, 1903. F. V. Winters, New York, N. Y. Mechanism for removing ice and snow from conducting or third rail electric railways.

No. 720,325. Feb. 10, 1903. L. C. Cary, St. Louis, Mo. Combined street car and air brake coupling.

No. 720,359. Feb. 10, 1903. Robert E. Kimball, Akron, O. Car brake.

No. 720,377. Feb. 10, 1903. Algie Perry, St. Louis, Mo. Emergency car brake.

No. 720,502. Feb. 10, 1903. Thomas P. Thom, New Orleans, La. Car Fender.

No. 720,633. Feb. 17, 1903. Jos. Spena, Lilley, Pa. Trolley.

No. 720,777. Feb. 17, 1903. J. E. Berry, Cartersville, Mo. Brake.

No. 720,951. Feb. 17, 1903. Frank A. Newell, Williamsburg, Pa. Electric brake.

No. 720,978. Feb. 17, 1903. Chas. J. Specht, New York, N. Y. Electric vehicle brake.

No. 721,000. Feb. 17, 1903. W. J. Beil, Los Angeles, Cal. Street railway switch.

No. 721,163. Feb. 24, 1903. Leroy Devers, Dayton, O. Car fender.

No. 721,279. Feb. 24, 1903. R. A. Brock, Springfield, O. Street car switch opening mechanism.

No. 721,350. Feb. 24, 1903. Geo. E. Wright, East Fairfield, Vt. Car fender.

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No. 721,416. Feb. 24, 1903. W. J. Bell, Los Angeles, Cal. Street railway switch.

No. 721,484. Feb. 24, 1903. P. F. Werner, Williamsett, Mass. Switch for overhead trolley tracks.

No. 721,607. Feb. 24, 1903. John Rochandt, New York, N. Y. Car fender.

THE FOUR TRACK NEWS.

When the different members of the editor's family ask, "Why don't The Four-Track News come?" it is getting to be like Castoria, even "the children cry for it," and this tells the story. It is the most interesting publication that comes in our exchanges, and the reason is easily told. Mr. Geo. H. Daniels, the General Passenger Agent, who has charge of it, has the "Carnegie faculty" of getting good men around him, who know their business, and the result is that in everything the publication department of the New York Central distributes, it is "all right."—Brooklyn, N. Y., Journal.

The subscription price of "The Four-Track News" is 50 cents per year. A sample copy will be sent free, for 5 cents, by Geo. H. Daniels, General Passenger Agent New York Central & Hudson River Railroad, Grand Central Station, New York.

The Omaha & Council Bluffs Railway Co. on March 1st revised its method of time keeping so that employees will now be paid for the number of hours and minutes worked each day instead of counting to the nearest quarter hour, only.

A bill has been introduced in the Minnesota Legislature which has as its object a partial revocation of the exclusive franchises held by the street railway companies and providing that such roads shall permit interurban lines to use their tracks when authorized by the municipality, for compensation to be determined by the courts where mutual agreement is not possible.

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|--|-------------------|
| 300 H.P. Edw. Ford Plate Glass Works, Toledo, Ohio. | 4000 H.P. |
| 1500 " Toledo & Western Electric Railway, Toledo, Ohio. | 1000 " |
| 1500 " Cleveland & Eastern Railway, Cleveland, Ohio. | 1200 " |
| 1500 " Bay Cities Consolidated St. Ry., Bay City, Mich. | 1050 " |
| 1200 " Sandusky Interurban St. Ry., Sandusky, Ohio. | 1200 " |
| 1200 " Indianapolis & Greenfield, Indianapolis, Ind. | 1000 " |
| 500 " Mississippi Valley Transit Co., St. Louis, Mo. | 550 " |
| 500 " Wichita Railroad & Light Co., Wichita, Kan. | 1000 " |
| 500 " Kokomo Railroad & Light Co., Kokomo, Ind. | 600 " |
| 800 " Toledo, Easton & Findlay Ry., Findlay, Ohio. | 800 " |
| 1000 " Stark Electric Co., Alliance, Ohio. | 1400 " |
| 1200 " Detroit Portland Cement Co., Frenon, Mich. | 1000 " |

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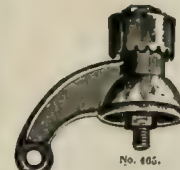
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CINCINNATI,
OHIO.

NEWS NOTES.

FRANCHISES ASKED OR OBTAINED

CLINTON, IA.—The proposed east and west electric line between Sterling and Clinton will soon ask for a franchise and will connect at Clinton with the Iowa & Illinois Interurban Railway Co., which has been granted a franchise between this city and Davenport.

DAVENPORT, IA.—The Iowa & Illinois Interurban Railway Co. has been granted a franchise from Davenport to Clinton on the Iowa bank of the river. The new company has an arrangement with the Tri-City Railway Co. by which it may use the latter's tracks from Bettendorf to the corner of Third and Brady streets, Davenport. It is not unlikely that the new company may extend its line into Illinois. Its officers are George D. McDani, president; George W. Hawden, vice-president; Frank Ellis, secretary; Garrett E. Lamb, treasurer. Those with R. B. McCoy, Thomas J. Wilcox and E. A. Ferrin, are the directors.

CHICAGO, ILL.—The Chicago & Illinois Western Electric R. R., capital stock \$25,000, has been granted a franchise to construct an electric line from the north line of Cook county in a southerly direction through the counties of Cook, Will and Kankakee to the south boundary line of Kankakee county. The incorporators and first board of directors are John T. Evans, Herbert S. Dunscombe, Dave Plummer, A. V. Kosberg and W. E. Phillips, of Chicago.

CLEVELAND, O.—Charles H. Hubbell and A. E. Williams have applied for a franchise for a new electric suburban railroad from Cleveland to Berea, beginning at the southerly boundary line of the village of South Brooklyn, thence along the Wooster pike and Bagley road to the northeast limits of Berea. The proposed route will shorten the distance about three miles.

MORRISTOWN, IND.—The Indianapolis, Morristown & Rushville Electric Railway Co. mentioned in the "Bulletin" for Jan. 1, 1903, is securing options along the line of the Cincinnati, Hamilton & Dayton railway for a 50-ft. strip on the north side of that road. The options give until July 1, 1905, for the completion of the work.

CINCINNATI, O.—The Milford city council has granted a franchise to the Cincinnati, Milford, Loveland & Goshen Traction Co. mentioned in the "Bulletin" for Jan. 1, 1903. This completes the company's right of way with the exception of one or two small private claims. Contracts are being let for the 3½ miles of road.

BLOOMINGTON, ILL.—The Bloomington, Pontiac & Joliet Interurban Railway Co. mentioned in the "Bulletin" for Jan. 15, 1903, has been granted franchises in Lexington, Odell and Godley similar to that obtained in Pontiac. Gardner's city council has refused a franchise and it has been decided to go around that town. Construction will be pushed aggressively this season.

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...CHICAGO

STREET RAILWAY REVIEW

Vol. XIII

APRIL 20, 1903

No. 4

The Street Railway System of Pittsburg, Pa.

As an introduction to an article on the street railways of Pittsburg something should be said concerning the real owner of the property—the Philadelphia Co. This company was chartered by special act of the Pennsylvania Legislature Mar. 22, 1871, as the Empire Contract Co.; the name was changed to Mexican National Railway Co., June 17, 1873; to Commonwealth Contract Co., Nov. 5, 1875; Philadelphia Co., June 11, 1884.

The Philadelphia Co. is both an operating company and a stockholding company, being the latter as regards the street railway properties of Pittsburg and Allegheny County. As an operating company it controls approximately 80 per cent of the natural gas

Co., and owns all of the stock of the Braddock Gas & Light Co. These companies have exclusive rights under a perpetual franchise to manufacture illuminating gas in Pittsburg and Allegheny.

Electric Lighting and Power. The Philadelphia Co. owns all of the capital stock of the Allegheny County Light Co., which leases the property of the Monongahela Light & Power Co.; and owns all of the stock of the Southern Heat, Light & Power Co., which controls the Ohio Valley Electric Co. These are the only public organizations furnishing electric current for light and power in Pittsburg, Allegheny and surrounding territory.

Street Railways. The Philadelphia Co. owns all of the stock of



SCENE IN DUQUESNE GARDEN IN WINTER.

business in Pittsburg and contiguous territory; it owns all of the stock of the Union Gas Co. of McKeesport, and of the Chartiers Valley Gas Co., and owns a controlling interest in the Equitable Gas Co., the Allegheny Heating Co. and the Pennsylvania Natural Gas Co., which five constitute all of the subsidiary natural gas corporations.

The Philadelphia Co., as a stockholding corporation, controls three other classes of business—illuminating gas, electric lighting, and street railway:

Illuminating Gas. The Philadelphia Co. owns all of the stock of the Consolidated Gas Co., which in turn owns all of the stock of the Allegheny Illuminating Co. (this company has exclusive rights in Allegheny); owns a controlling interest in the South Side Gas

the Pittsburg Railways Co., which operates all the electric railways in Allegheny County. The relations of the Pittsburg Railways Co. to its subsidiary companies are exhibited in the tabulated statement on page 189. The franchises for all the railway lines are perpetual.

FINANCIAL.

An enumeration of the authorized capital stocks and bonded debts of the many companies underlying the Philadelphia and the Pittsburg Railways companies would give no idea of the actual capital liabilities of the principal companies because many of the underlying stock and bond issues are owned, wholly or partly, by lessee companies and are held in the treasuries of the latter or have been retired.



PANORAMIC VIEW OF THE CITY OF PITTSBURGH, 1903. PHOTOGRAPH
The photograph from which this engraving was made is quite unique because of the rare occasions when the

The Philadelphia Co. has outstanding:

| | |
|---|-----------------|
| Common stock | \$28,953,029.10 |
| Preferred stock | 5,744,812.50 |
| 5 per cent first mortgage bonds..... | 5,500,000.00 |
| 5 per cent consolidated mortgage bonds..... | 12,312,850.00 |

The Pittsburg Railways Co. has \$5,000,000 of capital stock (half common and half preferred) all of which is owned by the Philadelphia Co. Aside from this the liabilities of the Pittsburg Railways Co. are:

| | |
|--|--------------|
| 5 per cent bonds | \$ 3,100,000 |
| Bond issues of underlying companies of Southern Traction Co. guaranteed | 1,479,000 |
| Common stock of United Traction Co. (owned by Philadelphia Co.) on which 1 per cent is guaranteed..... | 17,000,000 |
| Preferred stock of United Traction Co. on which 5 per cent is guaranteed | 3,000,000 |
| United Traction bonds | 4,750,000 |
| United Traction guarantees of underlying bond issues.... | 5,250,000 |
| Pleasant Valley company's stock not owned by Pittsburg Rys., 5 per cent guarantee..... | 647,350 |
| Common stock of Consolidated Traction Co. (\$14,212,450 owned by the Philadelphia Co.) on which 2 per cent is guaranteed | 15,000,000 |
| Preferred stock of Consolidated Traction Co. (\$11,637,850 owned by Philadelphia Co.) on which 6 per cent is guaranteed | 12,000,000 |
| Duquesne Traction Co. stock not owned by Consolidated, on which 4 per cent is guaranteed..... | 373,250 |
| Central Traction Co. stock not owned by Consolidated, on which 3 per cent is guaranteed | 43,350 |
| Pittsburg Traction Co. stock on which 7 per cent is guaranteed | 25,000 |
| East McKeesport St. Ry. 5 per cent bonds..... | 250,000 |
| Pittsburg & Birmingham Traction Co. stock on which 5 per cent is guaranteed..... | 3,000,000 |
| Pittsburg & Birmingham Traction 5 per cent bonds..... | 1,500,000 |
| Underlying bonds for Pittsburg & Birmingham..... | 1,504,500 |
| Bonds guaranteed by Monongahela Traction Co..... | 3,135,000 |

There are also annual charges as follows on properties not listed in the foregoing:

| | |
|--|-----------|
| Rental of Citizens Traction property..... | \$180,000 |
| Rental of Allegheny Traction property..... | 25,000 |
| Rental of Suburban Rapid Transit property..... | 56,000 |
| Rental of Monongahela Traction property (to be increased \$18,750 per annum till the amount paid is \$315,000 per year | 183,750 |

In the statement of capital liabilities of the Railways company it should be noted that of four of the largest items, the stocks of the Consolidated and United companies, an amount aggregating

\$42,850,300, is owned by the Philadelphia Co., and the payment of dividends guaranteed thereon is merely a matter of bookkeeping. To avoid misapprehension the form of the Philadelphia Co.'s statement has been changed recently so that only the net charges for rentals of leased companies appear.

Under the old form of report the statement for the year 1902 for the Philadelphia Co. and affiliated corporations was as follows:

| | |
|---|--------------|
| Gross earnings from operation..... | \$13,795,954 |
| Operating expenses and taxes | 7,759,029 |
| Net earnings from operation..... | \$ 6,036,924 |
| Other income (including \$1,338,588 from dividends on stocks owned) | 1,607,649 |
| Total | 7,643,573 |
| Deductions from income (including \$1,039,398 rental of leased companies) | 1,100,513 |
| Total income | \$ 6,477,161 |
| Interest and dividend on preferred stock..... | 4,020,632 |
| Net income | 2,456,529 |
| Less proportion credited to owners of capital stock of affiliated corporations other than Philadelphia Co.... | 5,964 |
| Interest of Philadelphia Co. in net income..... | \$2,450,565 |

The statement in its new form for the first two months of 1903 shows:

Philadelphia Co.:

| | |
|------------------------------------|------------|
| Gross earnings from operation..... | \$ 992,419 |
| Operating expenses and taxes..... | 335,242 |
| Net earnings from operation | \$ 657,178 |
| Other income | 157,830 |

| | |
|------------------------------|------------|
| Total earnings | \$ 815,017 |
| Deductions from income | 14,518 |

| | |
|-----------|------------|
| Net | \$ 800,499 |
|-----------|------------|

Affiliated Companies:

| | |
|------------------------------------|-------------|
| Gross earnings from operation..... | \$1,725,319 |
| Operating expenses and taxes..... | \$1,033,352 |

| | |
|-----------------------------------|------------|
| Net earnings from operation | \$ 691,967 |
| Other income | 24,254 |

| | |
|------------------------------|------------|
| Total earnings | \$ 716,221 |
| Deductions from income | 498,794 |

| | |
|------------------------------------|------------|
| Net from affiliated companies..... | \$ 217,427 |
|------------------------------------|------------|



FURNISHED BY COURTESY OF WILLIAM CAMPBELL, PITTSBURG.
conditions are suitable for such successful photography, the city being usually overhung with smoke and clouds.

| | |
|--|-------------|
| Total available income | \$1,017,920 |
| Interest and dividend on preferred stock of Philadel- phia Co. | 210,439 |
| Net available income—surplus..... | \$ 807,487 |

Compared with the first two months of 1902 the net earnings from operation for the Philadelphia Co. show an increase of \$66,160, and the net earnings from operation for the affiliated companies an increase of \$24,100.

RAILWAY LINES.

The system now operated by the Pittsburgh Railways Co. is the result of successive consolidations and many of the underlying companies were organized with the avowed purpose of competing with then existing lines, yet there is not today a foot of superfluous street railway track in the territory served. This condition, so much in contrast to that obtaining in other cities where consolidations have been similarly effected, is due very largely to the unfavorable topography. The urban territory is divided on a line from southeast to northeast by the Monongahela River and the Ohio River; and the Allegheny River joining the Monongahela at an angle of about 60 degrees divides the district north of the rivers into two positions. Pittsburgh is on the narrow peninsula thus formed, Allegheny lies in the obtuse angle and south of the Ohio and Monongahela are a series of manufacturing towns, all properly included in Greater Pittsburgh.

The commercial heart of this population of about 700,000 persons is located at the point of the Pittsburgh peninsula, in a district that is very nearly an equilateral triangle, with each side a half-mile in length. For access to this limited district there are three bridges across the Allegheny and two across the Monongahela to accommodate trans-river traffic, while for cars serving the city of Pittsburgh and its eastern suburbs there are five streets entering the point that are available. In the center of the peninsula are steep hills covering a diamond-shaped area something over two miles long, over which it is not practicable to operate more cars than are absolutely needed to serve the residents of this territory. To the north of the hills lie two, and to the south three streets on which are operated trunk lines. The topography is such that east of the "diamond back", and about four miles from the center of the business district, these lines all converge and from this point suburban roads radiate to the north, east and south.

The business district itself is divided by a track of the Pennsylvania R. R. on Liberty St., connecting the Union Passenger Station with the Pennsylvania freight station which is located at the point of the peninsula. Liberty St. was crossed once or twice by practically every street car line entering the business district, and when the Pittsburgh Railways Co. assumed charge of the consolidated system Jan. 1, 1902, one of the first undertakings was to design a rearrangement of downtown tracks that would avoid the almost unsupportable delay caused by the passage of freight

trains through Liberty St. during the rush hours night and morning, when street railway traffic was heaviest. The changes made were to locate the terminal loops for the Allegheny and north side routes entirely north of the center of Liberty St. and those for the Birmingham and south side lines south of the Pennsylvania track; this leaves but two lines of cars crossing the steam railroad, these being two loop routes that encircle the "diamond back" in Pittsburgh.

The congestion in the business district is now so great that a plan for building elevated lines in some of the downtown streets for use as terminals is being given serious consideration by the company. The topography of the city makes the use of subways practically out of the question.

For operating purposes the system is divided into eleven divisions which may be briefly described as follows (see map):

No. 1, Allegheny Division. These lines serve the territory north of the Ohio and Allegheny Rivers and the cars all enter Pittsburgh over two trunk lines which cross the 6th St. and 9th St. bridges and terminate in two loops lying north of Liberty St. in the business district. This division includes 18 routes, which vary in length from 1.24 to 14.16 miles. Route distances given are all for round trips.

No. 2, West End Division. These lines are the ones formerly operated by the Southern Traction Co. and serve the territory to the southwest and west of Pittsburgh, including the towns of Carnegie, Crafton, McKees Rocks and Coraopolis. Entrance to the business district is by a bridge over the Ohio River at the Point. The division has 11 routes, of from 1.64 to 24.66 miles.

No. 3, Birmingham Division. This includes the lines of the old Pittsburgh & Birmingham Traction Co. and serves the territory south of the Monongahela River, but lying west of Homestead. This division has 13 routes of from 3.01 to 22.28 miles, except the Pittsburgh incline which is one mile. Entrance to Pittsburgh is over the Monongahela River bridge.

No. 4, Second Avenue Division. This division comprises principally the lines of the old Second Avenue system, later the United Traction, and serves the north bank of the Monongahela River as far as Wilmerding, with some routes crossing the river to Homestead, Dravosburg and McKeesport. In this division there are 11 routes of from 1.74 to 34.86 miles.

No. 5, Monongahela Division. This division includes what was formerly the Monongahela Street Railway Co. and comprises lines to Duquesne, East Pittsburgh, Braddock and McKeesport, and the other towns in that territory. The division has 18 routes of from .96 to 34.86 miles.

No. 6, Oakland Division. 2 routes, 7.40 and 8.15 miles.

No. 7, Homewood Division. 9 routes, 2.34 to 18.50 miles.

No. 8, Highland Division. 7 routes, 11.75 to 14.15 miles.

No. 9, Herron Hill Division. 3 routes, 3.29 to 11.08 miles.

No. 10, Sharpsburg Division. 3 routes, 9.70 to 14.70 miles.

Divisions 6, 7, 8, 9 and 10 comprise the greater part of what was operated by the Consolidated Traction Co., and serve the residential



PITTSBURG RAILWAYS CO.

Incorporated by special act of Pennsylvania Legislature May 25, 1871, as Surety Contract Co.; name changed to Philadelphia Rapid Transit Co., Dec. 27, 1879; to Surety Contract Co. July 14, 1892; to Union Surety Co., Dec. 14, 1897; to Southern Traction Co., Oct. 12, 1900; to Pittsburgh Railways Co., Dec. 31, 1901. The subordinate companies are:

I. Properties operated by the company when it was the Southern Traction Co., which were:

1. West End Traction Co. Organized Nov. 15, 1897. Capital stock purchased by Southern Traction Co. August, 1900. Began operating Jan. 1, 1898.
 - A. Pittsburgh & West End Passenger Ry. Co. Chartered March 26, 1879. Stock bought by West End Traction Co.
 - B. Pittsburgh, Crafton & Mansfield St. Ry. Co. Chartered Oct. 30, 1894.
 - C. Pittsburgh, Neville Island & Coraopolis Ry. Co. Chartered April 4, 1893.
 - D. Carnegie, Heidelberg & Bridgeville St. Ry. Co. Chartered May 20, 1897.
 - E. West End, Mt. Washington & Banksville Ry. Co. Chartered May 20, 1897.
 - F. Coraopolis & Neville Bridge Co. Chartered Jan. 15, 1892.
2. Virginia Avenue St. Ry. Co. Chartered Apr. 18, 1898.
3. McKees Rocks & Ingram St. Ry. Co. Chartered Feb. 21, 1900.
4. McKees Rocks & Neville Island St. Ry. Co. Chartered Jan. 28, 1898.
5. Crafton & Chartiers Valley Traction Co. Chartered Sept. 6, 1898.
6. Pittsburgh, Banksville & Mt. Lebanon St. Ry. Co. Chartered Apr. 12, 1900.
7. Carnegie Bridge Co. Chartered June 15, 1900.

II. East McKeesport Street Railway Co. Chartered June 26, 1899. Entire capital stock owned by Philadelphia Co. Leased to Pittsburgh Railways Co. in 1902.

III. Consolidated Traction Co. Chartered July 23, 1895. The purchase of the stock of this company by the Philadelphia Co. was agreed upon Dec. 4, 1901, and the latter now owns 232,757 of the 240,000 preferred and 284,249 of the 300,000 common shares of the Consolidated company. By an operating agreement the system of the Consolidated Traction Co. has been operated by the Pittsburgh Railways Co. since Jan. 1, 1902. The underlying companies are:

1. Central Traction Co. Incorporated Dec. 31, 1888; opened cable road March, 1890; opened electric line March 3, 1892. April 2, 1896, leased to Consolidated Traction Co. for 950 years.
 - A. Central Passenger Ry. Co. Control of stock owned by Central Traction Co.
2. Pittsburgh Traction Co. Chartered April 30, 1887. April 2, 1896, leased property to Consolidated Traction Co. for 950 years. Control of stock owned by Consolidated.
 - A. Central Transit Co. Consolidated with (2) June 17, 1887.
 - B. Bloomfield Street Railway Co. Chartered May 9, 1892. Road opened April 15, 1894. Aug. 1, 1893, leased to Pittsburgh Traction Co. for 999 years. Entire capital stock owned by Pittsburgh Traction Co.
 - C. Pittsburgh, Oakland & East Liberty Passenger Ry. Chartered April 8, 1859. June 17, 1887, leased to Pittsburgh Traction Co. for 999 years.
3. Duquesne Traction Co. Leased to Consolidated Traction Co. Aug. 1, 1896. Chartered Jan. 25, 1890. Dec. 17, 1891, an operating contract effective Jan. 1, 1892, was made for the operation of this system by the Pittsburgh Traction Co. The Duquesne Traction Co. operated:
 - A. Duquesne Street Railway Co.
 - B. Bellefield Street Ry. Co. Chartered Sept. 6, 1892.
 - C. Boyd Street Railway Co.
 - D. Craig Street Passenger Railway Co.
 - E. East End Street Railway Co.
 - F. Grant Street Railway Co.
 - G. Highland Street Railway Co.
 - H. Howe Street Railway Co.
 - I. Larimer Street Railway Co.
 - J. Market Street Railway Co.
 - K. People's Street Railway Co.
 - L. Wilkensburg & East Liberty Railway Co.
 - M. Wilkensburg Street Railway Co.
 - N. Larimer & Lincoln Street Railway Co.
4. Ft. Pitt Traction Co. Chartered 1895. Entire capital stock owned by Consolidated company. Leased to Consolidated Traction Co. April 2, 1896, for 950 years.
 - A. Citizens' Traction Co. Chartered July 6, 1887. Nov. 1, 1895, leased to Ft. Pitt Traction Co. for 950 years; lease assumed by Consolidated Traction Co.
 - a. Citizens' Passenger Ry. Co. Incorporated March 22, 1859. Sept. 1, 1887, entire capital stock purchased by Citizens' Traction Co., which leased the property for 98 years and changed the motive power to electricity.
 - b. Transverse Passenger Ry. Co. Entire capital stock owned by Citizens' Traction Co. (Part of road leased to Allegheny Traction Co.)
 - c. Aspinwall St. Ry. Co. Chartered Aug. 26, 1892. Road opened Dec. 12, 1894. Stock owned and property leased to Citizens' Traction Co.
 - d. Penn Street Passenger Ry. Co. Chartered May 19, 1892. Capital stock owned by Citizens' Traction Co., which has operated the road since March 31, 1893.
 - B. Allegheny Traction Co. Incorporated July 23, 1890. April 2, 1896, leased to Ft. Pitt Traction Co. for 950 years. Lease assumed by Consolidated Traction Co.
 - a. Millvale, Etna & Sharpsburg St. Ry. Chartered March 1, 1890. Road opened Oct. 1, 1891. Leased April 19, 1891, to Allegheny Traction Co.
 - b. Part of line of Transverse Passenger Ry. Co. leased from Citizens' Traction Co.
 - c. Noble Street Railway Co. Stock bought by (d) and company merged 1896.
 - d. Fort Pitt Street Passenger Ry. Co. Stock bought by (d) and company merged 1896.
 - e. Green Point Street Ry. Co. Stock bought by (d) and company merged 1896.
 - f. Highland Park Passenger Ry. Co. Chartered Nov. 26, 1891. Stock bought by (d) and company merged 1896.
 - Monsieur Street Railway Co. Chartered April 13, 1896. Leased to Consolidated Traction Co. December, 1901.

A. Homestead & Highlands Street Ry. Co. Chartered Sept. 6, 1892. Consolidated with (5).

B. Braddock & Duquesne Street Railway Co. Consolidated with (5) May, 1898.

C. Braddock & Homestead Street Railway Co. Chartered Jan. 17, 1894. Consolidated with (5) May, 1898.

D. Schenley Park & Highlands Ry. Co.

E. Wilkensburg & East Pittsburgh St. Ry. Co. Chartered Sept. 27, 1898. Merged with (5) December, 1901. Was successor to—

a. Braddock Electric Passenger Ry. Co., the property of which was sold under foreclosure June 20, 1888.

F. Wilkensburg & Verona Street Ry. Co. Chartered Apr. 9, 1901. Merged with (5) December, 1901.

G. Pitcairn & Wilmerding Street Ry. Co. Chartered June 14, 1901. Merged with (5) December, 1901.

H. Pitcairn, Wilmerding & Braddock St. R. R. Co. Chartered July, 1894.

6. Suburban Rapid Transit Street Railway Co. Organized September, 1886. Road opened in 1887. Leased Jan. 1, 1902, to Consolidated Traction Co. for 900 years.

A. Suburban Rapid Transit Street Ry. Consolidated Aug. 11, 1899, with—

B. South Twenty-second Street Ry. Co.

IV. United Traction Co. Chartered July 27, 1896. Capital stock purchased by Philadelphia Co. in 1899. Property operated by Pittsburgh Railways Co. under an agreement effective Jan. 1, 1902.

1. The Second Avenue Traction Co. Chartered Nov. 14, 1894. A. "Second Avenue Traction Co." Chartered April 27, 1893, and leased the—

a. Second Avenue Passenger Railway Co. (chartered July, 1881), with which were consolidated in 1894, the—

i. Braddock & Turtle Creek Electric Ry. Co.

ii. Hazlewood, Homestead & Braddock Passenger Railway Co. and

iii. Greenfield Avenue Passenger Railway Co.

B. Glenwood & Dravosburg Electric Street Ry. Co., with which were consolidated in 1894—

a. Dravosburg Passenger Ry. Co., and

b. Pittsburgh & Homestead Passenger Ry. Co.

c. McKeesport & Reynoldton Passenger Ry. Co. Leased to Glenwood & Dravosburg company.

i. McKeesport Passenger Ry. Co.

ii. Dravosburg, Reynoldton & McKeesport Passenger Ry. Co.

C. North Side Traction Co. Chartered June 29, 1896. Property of this company and subordinate companies leased to The Second Avenue Traction Co., February, 1897.

a. Federal Street & Pleasant Valley Passenger Ry. Co. Chartered Feb. 20, 1868. Leased to North Side Traction Co. for 950 years from July 20, 1896. Majority of stock owned by (IV.)

i. Observatory Hill Railway Co., merged with (a) July 12, 1889.

ii. People's Park Passenger Railway Co., merged with (a) July 12, 1889.

iii. Allegheny & Bellevue Street Railway Co., consolidated with (a) April 19, 1892.

iv. Allegheny Street Railway Co., consolidated with (a) April 19, 1892.

v. Perry Street Railway Co., consolidated with (a) April 19, 1892.

vi. Troy Hill Railway Co., consolidated with (a) April 19, 1892.

vii. North End Passenger Ry. Co. Chartered Sept. 15, 1891. Only partly built, no equipment; operated by (a).

D. Pittsburgh, Glenwood & Homestead Passenger Street Ry. Co. Chartered Dec. 15, 1890. Property bought by (I) in 1894.

E. The Homestead Street Ry. Co. Chartered Nov. 29, 1893.

F. Turtle Creek Valley Electric St. Ry. Co. Chartered Jan. 10, 1891.

2. Pittsburgh, Allegheny & Manchester Traction Co. Chartered Dec. 14, 1889. Capital stock owned by United Traction Co., to which leases of subordinate properties were assigned July 9, 1897.

A. Pittsburgh, Allegheny & Manchester Passenger Railway Co. Chartered April 12, 1859. Leased to (2) for 999 years from July 25, 1890.

B. Pittsburgh Union Passenger Railway Co. Chartered Nov. 2, 1878. Leased to (2) for 985 years from July 25, 1890.

a. Union Passenger Railway Co. Chartered Aug. 30, 1879. Consolidated with (B) Aug. 26, 1881.

3. Pittsburgh & Birmingham Traction Co. Chartered Aug. 15, 1889. Owns or leases:

A. Pittsburgh & Birmingham Passenger Railway Co. Chartered July 5, 1859. Leased to (3).

B. South Side Passenger Railway Co. Chartered June, 1874.

C. Pittsburgh Incline Plane Co. Chartered Dec. 1, 1891. Leased to (3) for 999 years.

D. Birmingham Street Ry. Co., which leases—

a. Mt. Oliver Incline Plane Co.

E. Brownsville Avenue Street Ry. Co. Chartered April 18, 1896. Stock owned by (3).

F. Pittsburgh & Arlington Avenue St. Ry. Co.

G. Bingham Street Railway Co.

H. Birmingham, Knoxville & Allentown Traction Co. Chartered July 6, 1890.

I. Bradford & South Ninth Street Ry. Co.

J. Hill-Top Railway Co.

K. June Street Railway Co.

L. Knoxville Street Railway Co.

M. Lower St. Clair Street Ry. Co.

N. McKean Street Ry. Co.

O. Pittsburgh, Hill-Top & Castle Shannon St. Ry. Co. Chartered June 6, 1899.

P. Pittsburgh & Hill-Top St. Ry. Co.

Q. Pittsburgh, Homestead & Minhill St. Ry. Co.

R. Pittsburgh & Knoxville St. Ry. Co.

S. Pittsburgh, Knoxville & St. Clair St. Ry. Co.

T. Pittsburgh & Ormsby Passenger R. R. Co.

U. Rural Street Ry. Co.

V. West Liberty Street Railway Co. Chartered Oct. 19, 1899.

4. Tustin Street Railway Co., Chartered May 26, 1899. Short line connecting Consolidated and United systems.

5. Pittsburgh & Charleroi Street Railway Co. Entire capital stock owned by Philadelphia Co. and road is leased to United Traction Co.

and suburban district of the peninsula on which Pittsburg proper is located. Two of the roads are belt lines, Highland Ave. and Shady Ave. cars being operated in both directions on each.

No. 11. Charleroi & West Side Division. This is the Pittsburg & Charleroi Ry. and is now under construction though practically completed. The line extends south from Pittsburg to Monongahela City and Allentown. To Monongahela City is 28 miles and to Charleroi is 35 miles.

A statement of the car miles run and revenue passengers carried in 1902 is given in the accompanying table.

CAR MILEAGE AND PASSENGERS REGISTERED 1902.

(Transfer passengers are not registered.)

| Month. | Car-Miles. | Passengers. |
|-----------|--------------|-------------|
| January | 2,068,142.04 | 11,812,499 |
| February | 2,417,399.10 | 10,407,270 |
| March | 2,632,735.95 | 12,044,178 |
| April | 2,673,748.22 | 12,265,738 |
| May | 2,847,299.25 | 14,198,000 |
| June | 2,754,818.40 | 13,893,030 |
| July | 2,919,749.93 | 15,133,152 |
| August | 2,931,169.21 | 14,284,018 |
| September | 2,759,343.62 | 14,002,248 |
| October | 2,862,004.58 | 14,271,524 |
| November | 2,758,307.57 | 13,000,321 |
| December | 2,841,051.60 | 13,859,296 |

Total 33,065,754.89 159,772,540

The rates of fare are 5 cents on the old Consolidated lines, two transfers being allowed, and 5 cents in Allegheny, with one trans-

it was found desirable to build additional tracks, and during 1902, new tracks aggregating 24½ miles were put in. In 1902 new special work furnished by the Lorain Steel Co. was installed by contract to the extent of 11,882 ft., and the maintenance of way department also installed 656 ft. of special work. In the maintenance of old work 36 "guaranteed" steel plates were renewed at intersections and 12 in frogs and mates.

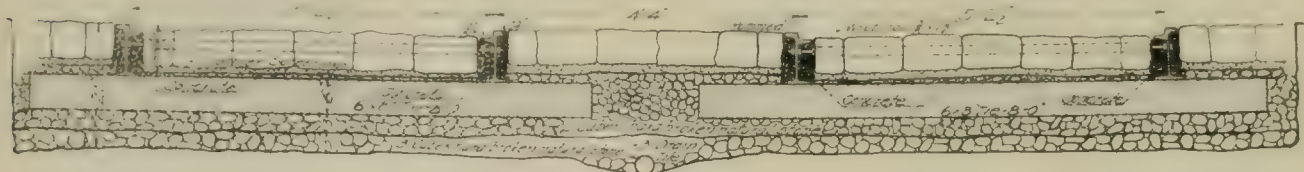
TRACK AND OVERHEAD CONSTRUCTION.

The standard track construction is shown in section in one of the drawings. Girder tram rails are laid on 6 x 8 in. x 8 ft. ties.

The present standard trolley wire is No. 00, and this size is used for all renewals, but considerable of the old No. 0 wire is still in place. Iron poles are used, and are set 125 ft. apart with a rake of about 7 in.; these are made of three sections 5, 6 and 7-in. or 4, 5 and 6-in. with swedged joints 18 in. long, and capped on top. The poles carrying feeder lines are 31 ft. long set 5 ft. deep, and are provided with cast iron brackets for the feeders. The other poles are 28 ft. 6 in. long. Span construction with Ohio Brass overhead material is the standard. In 1902 new trolley wires aggregating 20 miles of No. 0 and 43 miles of No. 00 were erected.

The feeder system comprises both copper and aluminum. Of copper there are 6,700 ft. 1,000,000-c. m.; 16,000 ft. 800,000-c.m.; 7,000 ft. 750,000-c.m.; 4,650 ft. 650,000-c.m.; 41,800 ft. 600,000-c.m.; 1,126,827 ft. 500,000-c.m.; 18,000 ft. 250,000-c.m.; 204,390 ft. No. 00000000; 452,855 ft. No. 0000; 42,500 ft. No. 000; 98,180 ft. No. 00. Of aluminum: 2,000 ft. 342,000-c.m.; 27,700 ft. 800,000-c.m.; 23,000 ft. 1,500,000-c.m.

The feeder lines are practically all overhead, excepting that from the 20th St. power plant a tunnel is extended under the Pennsyl-



SECTION OF TRACK

fer To Coraopolis, Carnegie, Kennywood, Castle Shannon, Duquesne or Braddock the rate is 10 cents; and to McKeesport 15 cents.

The number of cars operated is given in the following schedule:

| Division. | Regular. | Frippers. | Trailers. | Night. |
|-----------|----------|-----------|-----------|--------|
| 1 | 113 | 9 | 14 | 10 |
| 2 | 52 | 2 | 0 | 3 |
| 3 | 50 | 5 | 0 | 4 |
| 4 | 55 | 2 | 13 | 2 |
| 5 | 76 | 0 | 0 | 5 |
| 6 | 17 | 17 | 0 | 0 |
| 7 | 85 | 10 | 0 | 6 |
| 8 | 51 | 9 | 16 | 2 |
| 9 | 17 | 5 | 0 | 2 |
| 10 | 25 | 3 | 18 | 3 |
| 11 | 2 | 1 | 0 | 0 |
| Total | 552 | 63 | 61 | 37 |

The company has 403.36 miles of track (measured as single) which was distributed among the various old companies and systems as follows:

| | |
|--------------------------|---------------|
| Consolidated | 126.10 miles. |
| United | 126.07 " |
| Monongahela | 75.90 " |
| Southern | 48.51 " |
| Suburban | 11.08 " |
| Verona Extension | 8.00 " |
| Castle Shannon Extension | 2.00 " |
| Pittsburgh Extension | 0.00 " |
| Total | 403.36 " |

As already mentioned there are no duplications of tracks, but on the contrary when the present operating company assumed charge

vania R. R. tracks to Liberty St. and thence to Penn Ave. The feeders are in conduits.

The most important improvement in connection with the track system now contemplated is the cast-welding of the rails. A contract has been let to the Heil Railjoint Welding Co., of Milwaukee; work has already been commenced and will probably continue during the entire season.

POWER PLANTS.

Current for the railways is at present furnished from the power plants in use before the consolidation; a number of these are not well located for economical operation and the company is now building a new power station on Brunot Island which is in the Ohio River, two miles below the Point, and upon the completion of this station the more wasteful of the old ones can be abandoned.

The stations now operated are indicated on the map by single circles and are eight in number:

Manchester Station located at Juniata St. and the Ohio River and supplying the Allegheny Division. The equipment comprises eight water-tube boilers with Murphy automatic stokers, four 500-kw. railway generators driven by Greene tandem compound engines, and one 300-kw. railway generator driven by a Buckeye tandem compound engine.

West End Station is at the southern terminus of Point Bridge. Its equipment includes two 500-kw. generators direct connected to Greene tandem compound engines, three 150-kw. generators belted to Russell engines, and two 150-kw. boosters belt-driven from the main engines, and one 175-kw. motor-driven booster. This station supplies current to the West End Division.

The Birmingham Station is located at Carson and 30th Sts. in Birmingham. It has one 800-kw. railway generator direct connected to an Allis cross-compound engine, and three 500-kw. belted units driven by single cylinder corliss engines.

Suburban station is at Brownville Road, Knoxville. It has one

325-kw. generator direct connected to a tandem compound engine and one 225-kw. machine belted to an engine of the same type.

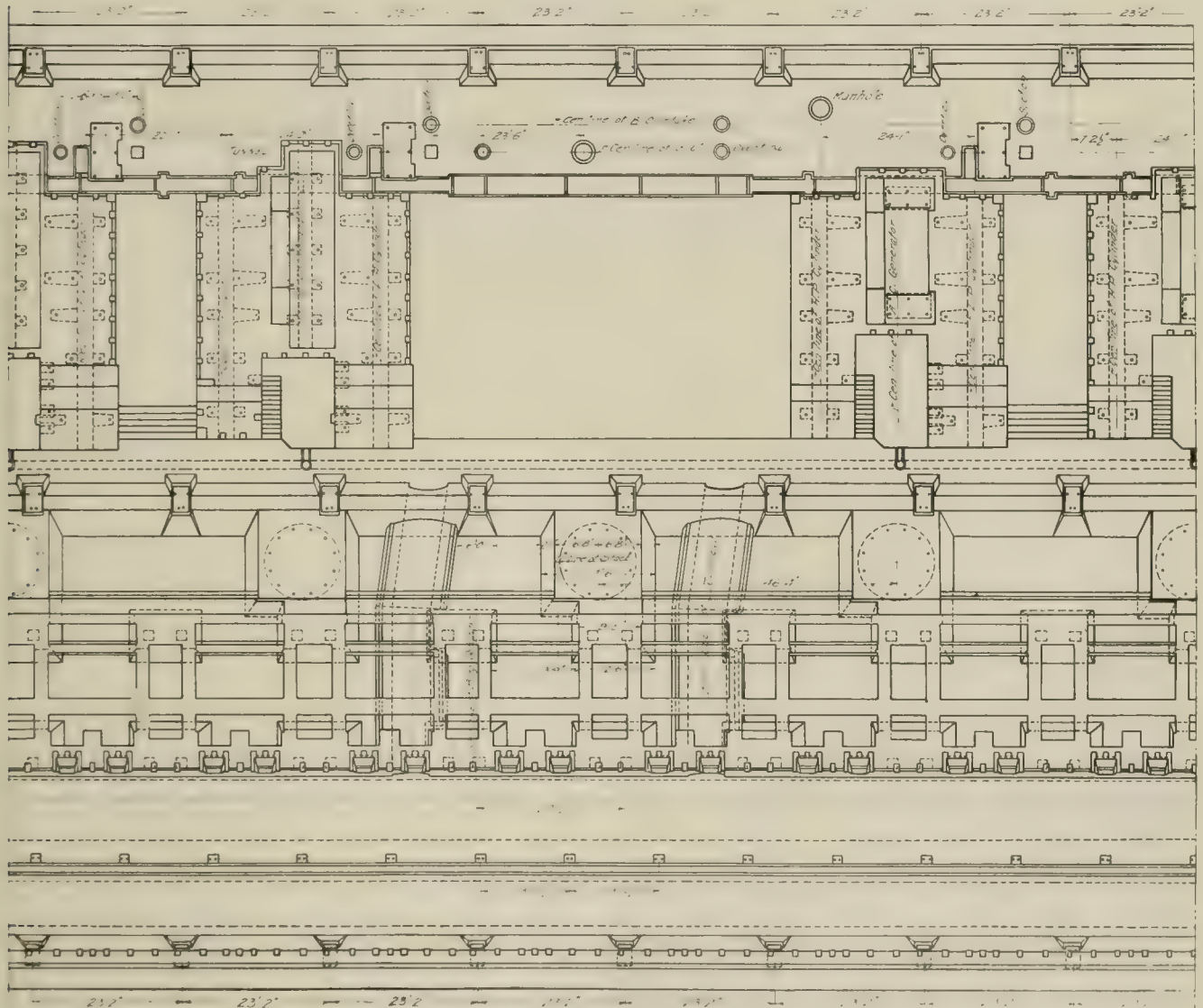
The Birmingham and Suburban Station supply the Birmingham Division.

Glenwood Station, located at Glenwood on the north bank of the Monongahela River, supplies the Second Ave. Division. The equipment at this station comprises two 500-kw. railway generators direct connected to Rice & Sargent cross-compound engines, two 500-kw. railway generators belted to Russell cross-compound engines, two 300-kw. engine driven boosters, and two 900-kw. 2200-volt three-phase lighting units driven by Rice & Sargent cross-compound engines.

Rankin Station, at Rankin on the Monongahela River, seven miles

Roney stokers, and eight 800-kw. railway units direct connected to 30 and 54 by 48-in. horizontal cross-compound engines built by the Pennsylvania Iron Works. Coal is handled by a Mead conveyor and the engine room is served by a 40-ton Pawling & Harnischfeger crane.

Power plants drawing their water supply from the rivers at Pittsburg have to contend with difficulties which are not appreciated by those who do not have to operate under similar conditions. The United States Government requires that all intake pipes entering the river shall be placed about 8 ft. below the pool level; that is, 8 ft. below surface of the river at its lowest stage when the heights of the various dams determine the level in the pools above them. At Pittsburg floods often cause a rise in the Ohio River of



CENTRAL PORTION OF FOUNDATION PLAN, BRUNOT ISLAND STATION.

from the business district is the property of the Allegheny County Light Co. and supplies the Monongahela Division. At this station are four 500-volt railway generators direct connected to cross-compound engines built by the Pennsylvania Iron Works, and five 750-kw. 1100-volt two-phase alternators driven by engines of the same type and make. The boilers at the station are Stirling, with Roney stokers.

Divisions 6, 7, 8, 9 and 10, comprising the greater part of the old Consolidated lines are served by two power plants, 20th St. and Ben Venue.

Twentieth St. Station is on the Allegheny River, at the foot of 20th St., Pittsburg. This plant was described at length in the "Review" for February, 1899, page 145. There are at this station 16 Babcock & Wilcox boilers rated at 375 h. p. each, fitted with

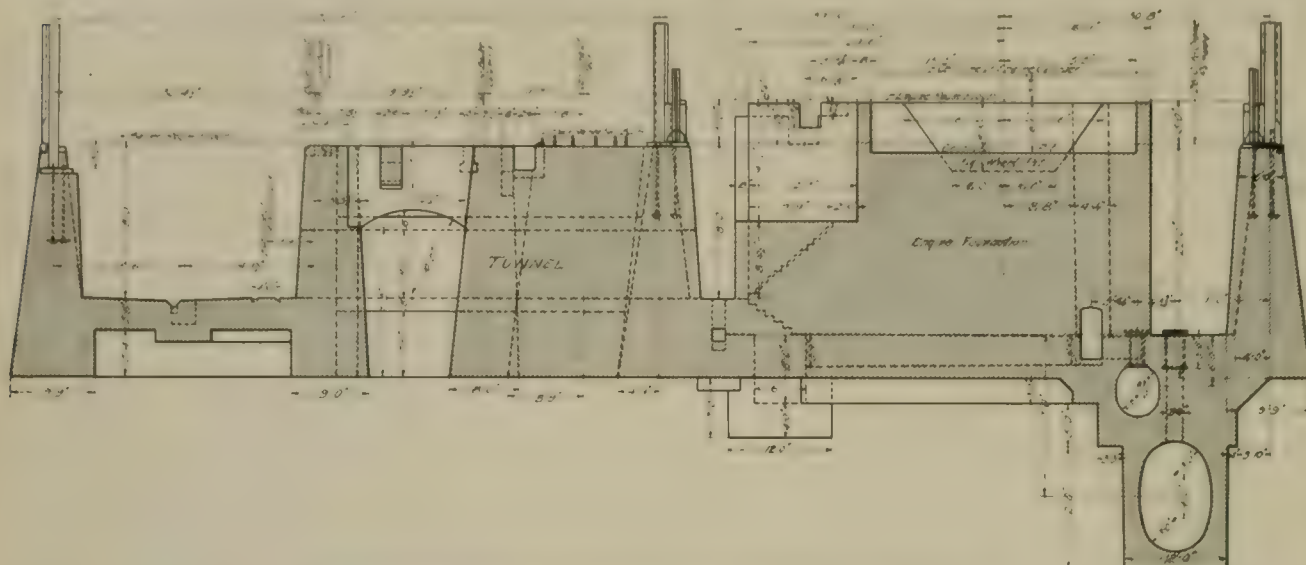
30 ft. within so short a time as three days. When the water thus rises there is so much foreign matter carried in suspension that water at the level of the intakes located in accordance with the government requirements is not suitable for power plant use.

At the 20th St. Station this difficulty was overcome by providing a wet well with two apertures for admitting from the river, the lower one for use under normal conditions and the upper one for use at times of high water. This well is built of brick with walls 36 in. thick at the bottom, stepped off to 18 in. thick at the top. The interior, circular in form, is 24 ft. in diameter. The bottom is of concrete 36 in. thick and is about 4½ ft. below the river bottom at this point. The well is located at the river's edge and the flanks of the side exposed to the water are protected by piling and oak sheathing. For a distance of 23½ ft. from the bottom the

well is divided transversely by a 24 in. wall, a floor of 3 in. oak planks on 10 in. I-beams being placed across the well at this height. The total height of the well walls is 46 ft. 6 in. In each of two chambers thus formed in the lower part of the well are screens. In each compartment is a 42 x 42 in. opening, with the center 7 ft. 9 in. below the pool level. Sluice gates are provided for both openings so that either compartment may be pumped out for cleaning. The water thus entering the well passes through the screens to the station intakes which are 42 in. in diameter and provided with gate valves. The two intake pipes, one for each com-

SUMMARY OF STATION EQUIPMENT.

| Station. | D. C. kw. | Belted. kw. | Booster. kw. | Lighting. kw. | Total kw. |
|------------|--------------|----------------|-----------------|------------------|--------------|
| Manchester | 2,300 | .. | .. | .. | 2,300 |
| West End | 1,000 | 450 | 475 | .. | 1,925 |
| Birmingham | 800 | 1,500 | .. | .. | 2,300 |
| Suburban | 325 | 225 | .. | .. | 550 |
| Glenwood | 1,000 | 1,000 | 600 | 1,800 | 4,400 |
| Rankin | 2,000 | .. | .. | 3,750 | 5,750 |



TRANSVERSE SECTION OF FOUNDATIONS, BRUNOT ISLAND STATION.

partment, lead out and connect with a 60-in. pipe running into the station. To admit water when the river is at the high stages similar 42 x 42-in. openings suitably protected by iron gratings, are provided in the river wall of the well at a height of 8 ft. 9 in. above the pool level or 16 ft. above the openings normally used. In time of high water the lower openings to the river are closed and the water then flows into the well above the transverse floor in which are openings covered with gratings, through which the water readily enters the screen chambers.

Ben Venue Station is three miles from the Point and about midway between the two rivers, being at the east end of the "diamond back". Here there are three 375-kw. belted railway units. This and the Suburban Station are the only ones not operated condensing.

The power station of the Allegheny County Light Co., which

| | | | | | |
|------------------------|--------|-------|-------|--------|--------|
| 20th St. | 6,400 | ..... | ..... | ..... | 6,400 |
| Ben Venue | 1,125 | ..... | ..... | ..... | 1,125 |
| Allegheny L. & P. .... | ..... | ..... | ..... | 7,500 | 7,500 |
| Total | 13,825 | 4,300 | 1,075 | 13,050 | 32,250 |

The cost of power at the various stations based on data taken in 1901 was as follows:

| Station. | Annual output. | per kw. h. | Cost |
|--|----------------|------------|------|
| | Kw. h. | in cents. | |
| Manchester | 10,120,840 | ..... | .496 |
| Birmingham and Suburban..... | 11,877,300 | ..... | .680 |
| Glenwood | 8,100,230 | ..... | .656 |
| 20th St. | 33,183,432 | ..... | .676 |
| Allegheny and Glenwood (lighting)..... | 17,138,437 | ..... | .882 |

COST OF POWER FOR THE PITTSBURG RAILWAYS CO.—1902.

| MONTH | Wages | Supplies Bought | Fuel and Water | Repairs | Total Cost | Output, Kw. h. | Cost per Kw. h., Cents | Kw. h. per Car-Mile | Cost per Car-Mile |
|------------|--------------|-----------------|----------------|--------------|--------------|----------------|------------------------|---------------------|-------------------|
| Jan | \$9,591.38 | \$2,005.35 | \$24,177.61 | \$ 8,307.96 | \$44,082.30 | 6,854,150 | .643 | 2.96 | 01.8 |
| Feb..... | 9,245.27 | 2,326.55 | 19,074.98 | 9,877.45 | 40,524.25 | 6,454,601 | .627 | 3.06 | 1.9 |
| Mar..... | 9,970.74 | 4,218.79 | 27,327.75 | 12,371.74 | 53,889.02 | 6,644,015 | .811 | 2.99 | 2.6 |
| Apr..... | 9,837.96 | 2,871.29 | 23,483.60 | 5,128.99 | 41,321.84 | 6,533,525 | .623 | 2.80 | 1.7 |
| May..... | 9,554.33 | 3,000.98 | 16,760.80 | 5,431.62 | 34,747.73 | 6,592,338 | .527 | 2.23 | 1.4 |
| June..... | 9,342.14 | 2,694.99 | 20,852.08 | 8,035.21 | 40,924.42 | 6,200,573 | .660 | 2.62 | 1.7 |
| July..... | 9,308.75 | 2,918.07 | 19,789.14 | 9,631.34 | 41,647.30 | 6,651,339 | .626 | 2.64 | 1.6 |
| Aug..... | 8,777.05 | 2,602.84 | 20,006.91 | 7,853.25 | 39,240.05 | 6,670,013 | .588 | 2.58 | 1.5 |
| Sept..... | 8,253.58 | 1,764.44 | 20,291.53 | 7,520.80 | 37,830.35 | 6,640,373 | .569 | 2.57 | 1.6 |
| Oct..... | 8,452.47 | 3,644.96 | 23,152.34 | 6,889.03 | 42,138.80 | 6,987,209 | .604 | 2.71 | 1.6 |
| Nov..... | 8,296.40 | 1,884.92 | 20,435.65 | 11,375.27 | 41,992.24 | 6,944,808 | .604 | 2.80 | 1.5 |
| Dec..... | 9,144.55 | 2,721.19 | 21,395.94 | 8,405.44 | 41,667.12 | 6,652,091 | .626 | 2.72 | 1.7 |
| TOTAL..... | \$109,774.62 | \$32,654.37 | \$256,748.33 | \$100,828.10 | \$500,005.42 | 79,825,095 | .626 | 2.72 | 1.7 |

NOTE: The Monongahela Light & Power Co. billed the Pittsburgh Railways Co. for power from Rankin plant \$85,571, for 8,556,000 kilowatt-hours.

in 1902 furnished 8,556,000-kw.h. to the Railways company, is at 13th and Etna Sts., Pittsburg, and is not indicated on the map. At this plant there are five 1,500-kw. direct connected units; the generators are 2,200 volt two-phase machines and are driven by cross-compound engines, four Westinghouse vertical and one Rice & Sargent horizontal.

All of the generators in the various plants of the company are of the Westinghouse make.

The cost of power for the Railways company in 1902 is shown in the large table.

Besides the generating stations there are nine storage batteries which on the map of the system have been indicated by double circles. These batteries were supplied by the Electric Storage Battery Co., of Philadelphia. The stations are of three sizes indicated by the letters a, b, and c, in the table which also shows the number and capacity of rotary converters in each station. The "a"

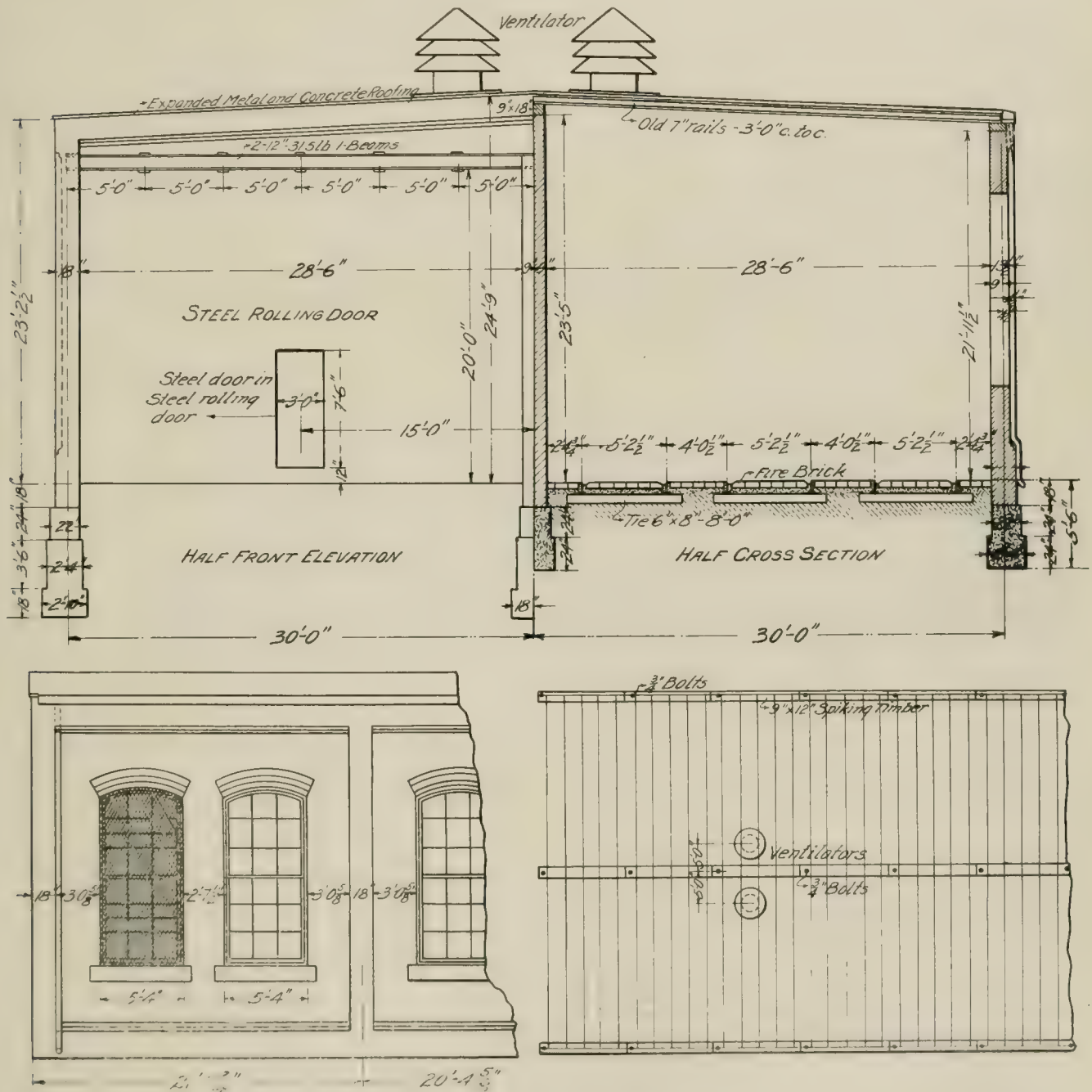
batteries have 288 cells and are of 380 ampere-hours capacity; "b" have 264 cells of 2,000 ampere-hours; "c" batteries have 264 cells (ultimately to be 288) and are of 1,000 ampere-hours capacity.

Storage Battery Stations.

| Name. | Class. | Converters. |
|--------------------|--------|--------------|
| Oakland | c | Line battery |
| East Liberty | b | Line battery |
| Coraopolis | a | 2 200-kw. |
| Carnegie | a | 2 200-kw. |

either side of the river. The design for the new power station is in charge of the company's engineer, Mr. F. Uhlenhaut, jr., and the main features have been decided upon though many of the details have not been determined.

The building will be on the upper end of the island and is to be of brick with stone trimmings with the roof of expanded metal and concrete. The foundations, which are shown in plan and section by the line drawings, are of cement concrete and are carried down to a gravel bottom; the concrete is in the proportion of one part



CAR HOUSE AT BRUNOT ISLAND.

| | | |
|-------------------|---|--------------|
| McKeesport | c | 4 200-kw. |
| Riverside | a | 2 200-kw. |
| Charleston | a | 2 200-kw. |
| Dracoberg | a | Line battery |
| Sandy Creek | a | 2 200-kw. |

Soon after the present company began operating the entire system the need of larger power stations became apparent and Brunot Island in the Ohio River two miles south of the Point was purchased. This island is about 5,000 ft. long by 1,800 ft. wide and is connected with both shores by a bridge making access easy from

either side of the river. The design for the new power station is in charge of the company's engineer, Mr. F. Uhlenhaut, jr., and the main features have been decided upon though many of the details have not been determined.

The station is designed for nine units of 1,500 kw. capacity each. Contracts have been let to the Providence Engineering Works for six horizontal cross compound engines with cylinder 32 and 62 by 54 in.; to the Babcock & Wilcox Co. for twenty 500-h. p. water tube boilers, and to the Westinghouse company for four direct current 1,500 kw., 550-volt generators and two 1,500 kw., 2,500-volt

two-phase alternator. The coal conveyor and the minor equipment have not been ordered as yet.

The station is designed on the unit system, there being two batteries of two boilers for each engine and each group of four boilers being served by a separate stack 130 ft. high. Beginning at the bridge end of the building (the left hand in the drawing) there are to be four direct-current units, then the auxiliary steam apparatus occupying the same space as an engine and its generator, and then two alternating current units with room beyond these for three more alternating current units. The plan view shows the foundations for a section of the building near the center, including one direct-current and one alternating-current unit. This gives the relative position of the boilers, stack, engine and condenser for each unit. Reference to the sectional view shows the different floor levels and the location of the intake and discharge tunnels for condensing water. It will be noted that at each unit a tunnel is provided for communication between the boiler and engine basement.

MECHANICAL DEPARTMENT.

Mr. H. P. Clarke, formerly master mechanic for the Capital Traction Co., Washington, D. C., has been superintendent of the mechanical department of the Pittsburg company since Jan. 1, 1902. His headquarters are at the Homewood (otherwise called Franks-town Ave.) shops, located in the eastern part of Pittsburg. These are the main shops of the company and were built by the Consolidated Traction Co. in 1898. A very complete description of these shops appeared in the "Review" for July, 1899, page 445.

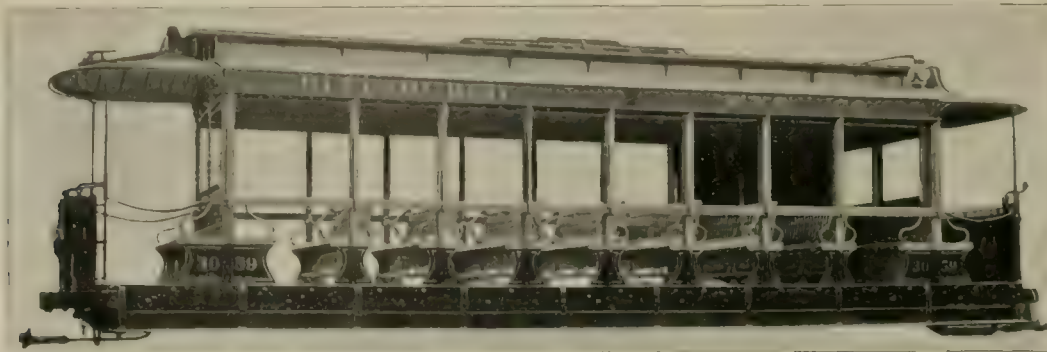
At Rankin is located a shop built in 1901; this is not large but is well equipped. There are a 56-in. lathe, three smaller lathes, a 24-in. drill press, smaller drills, a bolt cutter, a power hammer, a car wheel boring machine, a hydraulic wheel press, and two car dismantlers in the machine shop. There is also a carpenter shop with woodworking tools.

The Manchester shops are in Allegheny near the Pittsburg Locomotive Works. This plant is fitted for making necessary repairs on the cars of the Allegheny division and some of those on the south side, and also for the power house on the north side of the river. Last year the plant was remodeled and the capacity doubled, a car wheel borer, straightening machine, lathes, wood working tools and smaller tools being installed.

At Taggart and Charles Sts., Allegheny, there is also a small shop with capacity to make the repairs for the electrical equipment of 60 or 70 cars. There are two other small shops at the car houses which it is expected will be abandoned and the equipment removed to the larger plants.

The company has 16 car houses, the largest being that at Homewood in conjunction with the Homewood shops, where the operating building has a capacity for 50 cars (30-ft. cars) and the storage building for 120 cars, with yard tracks for 125 cars additional.

There is now under construction at McKees Rocks a car house to be used for storage purposes the essential features of which are shown in the accompanying line drawings. The building is 451 ft. long by 61 ft. 6 in. wide; the side walls and rear end walls are of



ST. LOUIS CAR FOR PITTSBURG.

including the details of a number of special machines and devices which had been designed by the general foreman, Mr. John Rogan. During the last year some new tools have been added at this plant including a power hammer, punch and shears, five lathes, a 10-ft. planer, an axle straightening machine, and an air compressing plant furnished by the Chicago Pneumatic Tool Co., drill presses, two Bryan car dismantlers, eight coil winding machines, and small tools. The air compressor was installed to supply air to a number of hoists which handle lighter pieces such as armatures. For heavy lifting the shop has a 10-ton Pawling & Harnischfeger crane.

A new building 125 x 48 ft. was built this winter for the coil making and armature winding department. At one end of this room is a space 12 x 48 ft. for the dipping room and armature oven. This oven differs from the usual construction in having the heating coils placed on the floor and covered by an iron grating; the doors are 6 ft. wide and 6 ft. 6 in. high so that buggies can be run into the oven and allowed to stand with armatures in place on them. It is the practice to bake the armatures for 12 hours at a temperature between 160 and 170° F.

The Birmingham shops of the company which last year had been remodeled and fitted with new tools for making repairs for 100 cars were destroyed by fire Feb. 2, 1903, seriously crippling the company in caring for the cars on the south side division. While this fire was burning Mr. Clarke made arrangements for converting an adjoining building for shop purposes and ordered the necessary equipment from the stock of local tool dealers; the new shop was in operation by March 1st and only the severe weather prevented an earlier opening. The equipment here comprises two lathes, two drill presses, one bolt cutter, one 24-in. shaper, one car wheel boring machine and one hydraulic press.

brick 13½ in. thick and 22 ft. 8 in. high above the floor line, and the building is divided longitudinally by an 18-in. brick fire wall into two sections each containing three tracks. The roof is of expanded metal and concrete laid on rafters spaced 3 ft. between centers. These rafters are old 7-in. girder rails; these rails are 30 ft. long and the corresponding rafters on opposite sides of the roof barn are joined by standard splice bars bent to allow for the slope of the rafters. On top of the side and center walls are spiking timbers 9 x 12 in. in 15 ft. lengths which are lap jointed and secured by a ¾-in. bolt 21 in. long at each joint. Every third rafter has a ¾-in. hole drilled in the flange at each end through which a 5 x 9-16-in. spike is driven into the spiking timber.

The exterior surface of the barn is broken into 20-ft. bays by pilasters. Each bay contains two windows 5 ft. 4 in. by 11 ft. 7 in., the glass being protected by screens made of No. 11 wire woven to 1-in. mesh. The window sills and other trimmings are of Beaver sand stone. The front end of the barn is closed by two rolling steel doors, one to each section, which are 28 ft. 6 in. wide.

The six tracks, three in each section, are of 9-in. girder rails laid to 5 ft. 2½ in. gage and 9 ft. 3 in. between centers. They are placed on 6 x 8 in. 8 ft. ties covered with sand and the entire space paved with fire brick set on edge. Six pairs of sheet iron ventilators are placed in the roof at intervals of 75 ft.

ROLLING STOCK.

When the Pittsburg Railways Co. took over the Consolidated, Birmingham, Suburban and Monongahela systems it was found that a considerable portion of the rolling stock and equipment was in need of repairs, and there was also a shortage of motors, controllers, and other car equipment. A standing order for 1,000 car

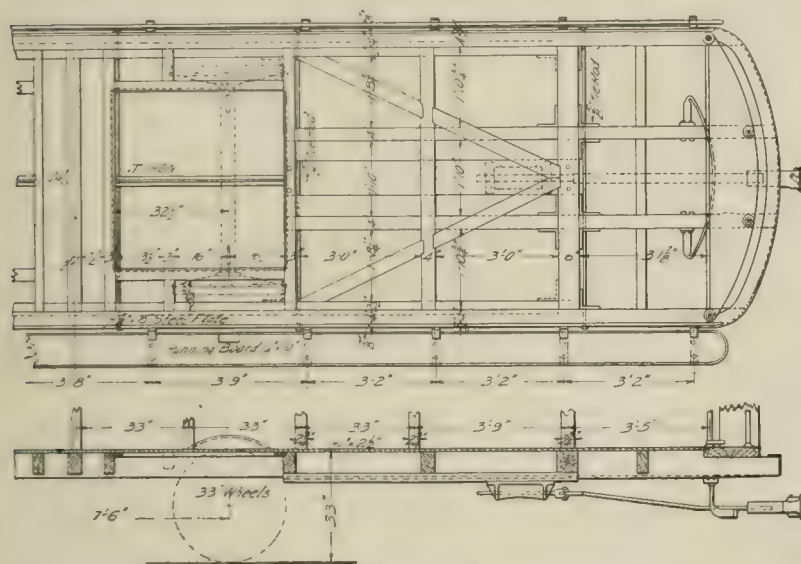
wheels per month was placed, and five wheel grinding machines put at work dressing old wheels, and as fast as practicable, antiquated rolling stock was replaced with new cars. On lines where heavy grades predominated the light motors formerly used were replaced by others of greater capacity. The cars of the smaller systems have all been repainted to conform to the company's standard, a dark tuscan red color with gold stripe and lettering, as rapidly as circumstances and the other work in hand would permit.

In 1902, 60 new open cars and 100 new closed cars were ordered, the last of the latter being delivered in February, 1903, and this year an order for 100 more has been placed.

The older cars are mounted on single, the standard on the Consolidated lines having been McGuire and Peckham trucks; on the Second Avenue system, the Lord Baltimore and on the Monongahela, the McGuire trucks. The motor equipments were Westinghouse No. 62 and General Electric No. 57 on the Consolidated; Westinghouse No. 38 on the United, and Westinghouse No. 62 on the Monongahela system.

The older cars excepting those operated by the Southern Traction Co. which were 38 ft. 8 in. over all, are for the most part about 30 ft. over all, the closed cars having bodies 19 ft. 6 in. long inside. The cars ordered last year are all larger than the older type.

The 60 open cars, which were built by the St. Louis Car Co., are



HALF PLAN AND CROSS SECTION OF ST. LOUIS CAR.

34 ft. 2 3/4 in. long over all, 7 ft. 10 in. wide and 8 ft. 7 1/2 in. from the under side of the sills to the top of the roof. A bulkhead is at each end with a stationary bench on either side and in the central portion are seven reversible seats, making 11 benches for the cars. The posts of these cars are of white ash, the interior finish and the floor of white maple. Malleable iron seat-panels are used and pantasote curtains which extend to the floor. The cars are mounted on "Lord Baltimore Special" trucks with a wheel base of 7 ft. 6 in. and an extra long spring base.

The new closed cars of which 100 were ordered of the LaCledde Car Co. in 1902, are 42 ft. 8 in. over all, 30 ft. body with platforms 5 ft. 6 in. long, 7 ft. 11 1/2 in. wide. The interior finish is mahogany excepting the ceiling which is maple. The cars are mounted on Bemis double trucks with 4-ft. wheel base, the distance between truck centers being 18 ft. 6 in. All of these cars are equipped with the Westinghouse Traction Brake Co.'s magnetic track brake; there are four Westinghouse No. 38 motors per car. The Pittsburgh Railways Co. is well satisfied as to the efficiency and economy of the magnetic track brakes, and now has 610 sets in service, 500 sets having been purchased in 1902.

The company now has 690 closed motor cars, 773 open motor cars, 178 trail cars, 68 miscellaneous cars, 1378 single trucks, 120 double trucks, 1840 motors and 2357 controllers.

Where so many different routes use the same down-town tracks a ready means of marking the cars is extremely desirable and the

company has provided a sign indicating the route by colors as well as lettering. The route sign is carried on both dashes and on both sides, the sign being of enameled iron and slipped in brass frames secured to the sides of the car body and the dashes, thus being readily changed. There are 21 colors or combinations of simple colors used for car markers and at night the same combinations of colored glass in hood lamps serve to distinguish cars when at a distance.

An important addition recently made to the car equipment of this road was the placing of a jack on every car for use in emergencies, enabling the car crew to avoid many delays, and in event of accident to extricate bodies from under the wheels without awaiting the arrival of an emergency wagon. The jack adopted is the Barrett No. 2 made by the Duff Manufacturing Co. of Pittsburg.

PARKS AND ADVERTISING DEPARTMENT.

The company fully realizes, as have several of its predecessors, the potency of first-class resorts for public amusements and recreation as a stimulant for traffic, and as will be noted from the organization chart this department is in charge of a superintendent of parks, Mr. A. S. McSwigan.

Kennywood Park is a tract of 100 acres situated on the banks of the Monongahela River opposite Braddock and is the social center for the great manufacturing district in which it is located, being particularly popular for picnics. The park was opened by the Monongahela Street Railway Co. in 1899 and about \$100,000 has been expended in the purchase and improvement, which include a band stand in front of which are arranged seats for 10,000 persons, a dancing pavilion, toboggan slide, roller coasters, merry-go-round and other attractions. A first class restaurant is maintained at the Casino, a building 115 x 175 ft. Heretofore there has been no theater at this park but vaudeville entertainments were given at the band stand. The park has been leased for the season of 1903 to the Pittsburg Steeplechase & Amusement Co., which will build a theater on the grounds. Admission to this park is free at all times.

Calhoun Park is located 9 miles southeast of Pittsburg about half-way to McKeesport. This park comprises 66 acres and was the first resort opened by the United Traction Co. Band concerts and vaudeville have been the principal attractions aside from the merry-go-round, roller coaster, bowling alley, shooting gallery, dancing pavilion and ball fields. This park is rented to societies which wish to give picnics and charge admission fees, the lessee being privileged to charge admission during the entire term if so desired.

Oakwood Park, a 35-acre tract, is at Crafton, and one of its principal attractions is a lake with a fleet of boats. The buildings at this resort comprise a music pavilion, refreshment casino, bowling alley and enclosed carroussel. The park, which is four miles from the city hall, was opened in 1896 by the Pittsburg & West End Passenger Railway Co. During 1902 vaudeville shows and band concerts were given at the park. When rented by societies, the lessees are privileged to charge an admission fee up until 7:30 p. m., after which time entrance is free to all comers.

The oldest street railway resort is Southern Avenue Park, which is five miles south of the city, about 32 minutes' ride on the cars. This park, 35 acres in extent, was opened in 1893 and leased by the Suburban Rapid Transit Railway Co. in 1894. Like Oakwood the park is in all cases free after 7:30 p. m.

The company's most unique resort, however, is Duquesne Garden at Craig and Ellsworth Sts. in Pittsburg which is one of the city's leading amusement houses both summer and winter. The "Garden" was built in 1890 as a car house by the Consolidated Traction Co., and used for this purpose for five years. In 1896 Schenley Park Casino, owned by the traction company, was burned and the Craig St. car house was then remodeled for a skating rink and opened early in 1897. In 1898 further changes were made so that the building became available as a theater. Up until November, 1902, Duquesne Garden was leased to the Duquesne Garden Co., but the past season it has been operated by the Railways company under the management of Mr. McSwigan, who has made it a very successful enterprise from a financial standpoint.

The building is of brick with sandstone trimmings and is 100 x 180 ft.; the arena which is in winter covered with ice is 60 x 272 ft. The garden represents an investment of over \$400,000; the refrigerating plant cost about \$40,000. At the front of the building are check rooms for skates, cloak rooms, smoking rooms, offices, etc., and at the rear a stage with 16 dressing rooms.

During the winter and until April 1st, the Garden is open for ice skating. Following this a week of grand opera is given by the Grau Metropolitan Opera Co., of New York; this is the largest auditorium in the city and seats 2,500 people, and in 1902 the gross receipts for four days of opera were \$35,000. After the grand opera season vaudeville and comic opera will be put on for the summer.

*Mr. McSwigan states that the best attractions for the winter seasons have been hockey games and exhibitions of fast and fancy skating by professionals. Last winter there were three private skating classes which had the garden on Tuesday, Thursday and Friday mornings. Saturday mornings the admission was put at 10 cents and there were always 1,200 to 1,500 school children taking advantage of the holiday and the low rate. The admission for skating at other times is 15 cents for children and 25 cents for adults during the day, and 35 cents in the evening. At hockey games the general admission is 50 cents, reserved seats 75 cents; for special games these rates are increased 25 cents. The hours for skating are 10 to 12 a. m., 2 to 5 p. m., and 8 to 10:30 p. m. The total admissions during the four months of the last skating season were almost 200,000. As 90 per cent of these were riders on the company's cars the traction receipts were increased \$18,000.

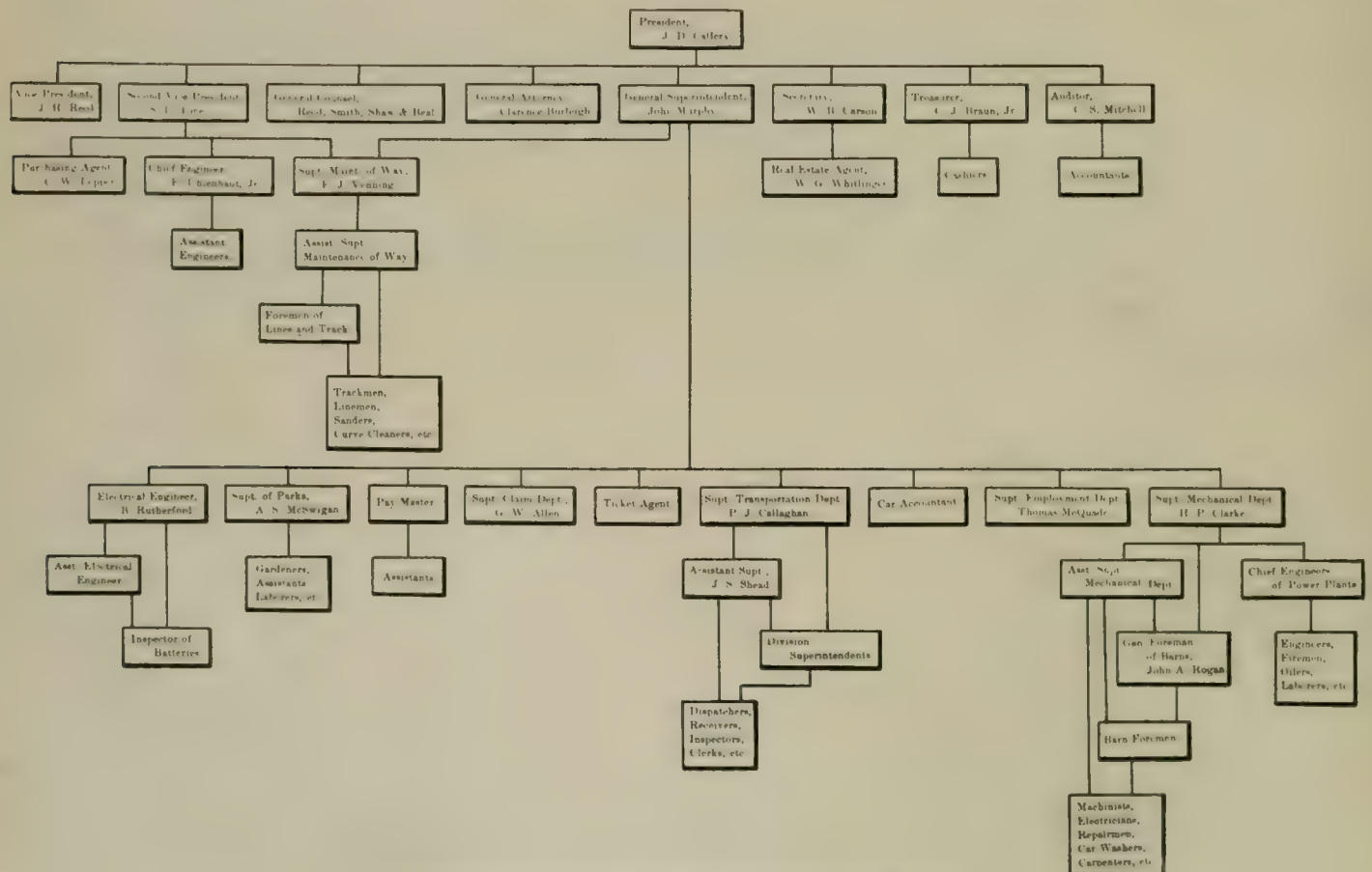
indicated on the accompanying diagram, though it should be needless to say that the conventional positions are not held after the game is once started; the result is then more like a football scrimmage. One of the engravings shows the interior of the garden with the Queens College and the Pittsburg hockey teams on the



POSITIONS OF HOCKEY TEAMS.

ice. Advertisements for park and Duquesne Garden entertainments are placed in the local newspapers, and placards with appropriate announcements carried on the cars and posted on walls and in show-windows.

As part of his duties as superintendent of parks Mr. McSwigan has charge of the advertising literature issued by the company, and he also acts for the company in giving information to the local



ORGANIZATION DIAGRAM OF THE PITTSBURGH RAILWAYS CO.

The game of hockey is played on ice skates, seven men to a side; the "ball" is a rubber disk about the size of a small blacking box, and the club has a wooden head shaped something like a golf putter but about 8 in. long by 2½ in. high and ½ in. thick. The goals are wickets about 6 ft. wide by 4 ft. high, protected at the sides and back by netting, into which the disk must be driven. The disk may be struck by the stick or picked up on the flat side of the head and "lifted". The names and positions of the players are

press. By thus arranging for the issue of authentic statements the company escapes much of the annoyance which street railways often suffer when representatives of the local press cannot see the proper official of the company, and evolve their "stories" by the subjective method.

EMPLOYMENT DEPARTMENT.

On taking over the consolidated properties Jan. 1, 1902, an employment department was established, the head of this department

being also given supervision of the ununiformed inspectors or secret service men. Two days are set aside each week for receiving applications for employment; on one of these days applications are received at what is known as Oakland Station and on the other at the Allegheny Station.

During 1902 the company employed 2,047 men of whom 1,212 were conductors. Our readers will doubtless remember that on June 1, 1902, the company announced its adoption of a premium system for trainmen under which a sum equal to one cent per platform hour would be paid Dec. 1, 1902, to those whose records for accidents, tidiness of their cars, etc., was good. * This system was not productive of the most satisfactory results as a number of the oldest and best employes of the company became dissatisfied because of the loss of expected premiums or of the inability of the company to determine the premium due, owing to accident claims not being adjusted. Feb. 10, 1903, announcement was made of a new schedule effective Dec. 1, 1902, under which each trainman was given an advance of one cent per hour.

In passing upon applications for employment it is the aim to accept only men who are physically sound, who are of good habits and who are recommended by two respectable citizens, satisfactory to the company. Special tests are made of the applicants' vision and hearing.

The company's employes are now as follows:

| | |
|--|-------|
| Operating department, including conductors and motormen..... | 3,330 |
| Power house | 175 |
| Maintenance of way department..... | 490 |
| Division officers | 70 |
| Duquesne Garden | 80 |
| General offices | 85 |
| | 4,230 |

The total of wages for 1902 for the transportation department was \$1,675,484.92, and for all departments, \$2,592,136.02.

ACCIDENTS AND DAMAGE CLAIMS.

In connection with the company's policy as to premiums on accidents it is interesting to give the statistics as to the number of accidents in 1902 and the cost per car-mile. The figures by months are:

| Month. | Number of Accidents. | Amount paid for accidents per car-mile. |
|-----------------|-------------------------|---|
| January | 700 | \$0.107 |
| February | 799 | .0071 |
| March | 877 | .0120 |
| April | 807 | .0060 |
| May | 883 | .0069 |
| June | 891 | .0129 |
| July | 953 | .0057 |
| August | 992 | .0040 |
| September | 1,000 | .0059 |
| October | 1,031 | .0084 |
| November | 1,022 | .0062 |
| December | 1,154 | .0062 |
| Total | 11,184 | \$0.075 |

NEW OFFICE BUILDING.

The Philadelphia Co. has just recently completed an office building at the corner of Sixth Ave. and Garland Alley, which is a model structure. The building has a frontage of 35 ft. on Sixth Ave. This width extending back for 100 ft.; for the next 20 ft. it is 60 ft. wide and for the last 60 ft., 50 ft. wide, the total depth being 180 ft. The inability to secure all of the building lot desired responsible for the irregular shape.

The building is eight stories high, of fire proof construction and entered by two high speed passenger elevators. The various departments are located as follows: Ground floor, treasurer's office and gas and electric lighting contracting department; second floor, power center; the first two floors are connected by a spiral stairway which is separate from the main stairways near the elevators; third floor, miscellaneous and partly unoccupied; fourth floor, electrician's office and director's room (the director's room, which is at the front of the building, is very handsomely finished, being pan-

eled throughout with solid mahogany); fifth floor, offices of the Pittsburgh Railways Co.; sixth floor, offices of the Philadelphia Co.; seventh floor, office of engineer and drafting room; eighth floor, auditor's office.

One of the most interesting rooms at the new quarters of the company is the telephone exchange which is under the charge of Mr. J. W. Boden, superintendent of telephones. The company has 16 trunk lines to the exchange of the local Bell company, the Central District & Printing Telegraph Co., thus insuring good service for outside parties. In Pittsburgh it has 105 instruments on its own lines, 75 in the office building, 15 at car houses, 7 at power stations and 7 known as "emergencies" which are mounted on poles along the railway lines. On its long distance lines, which cover the oil and gas territory of the Philadelphia Co., are over 300 other telephones, the total for the exchange being about 425.

All fire alarms are reported to the telephone operator who at once orders the nearest emergency crews to report at the proper points if it appears that the company's property can be affected in any way by the fire. The city telephone exchange has instructions that when the Philadelphia Co. exchange (3200 Grant) is called and the word "emergency" added, all interfering connections are to be broken instantly and thus the company can promptly act in case of fires or accidents.

The company's telephone system has been extremely successful in operation, and although telephone lines are carried on the railway poles no trouble from noise has been experienced.

PERSONAL.

The active executive officers of the Pittsburgh Railways Co. are: James D. Callery, president; James H. Reed, vice president (president Phila. Co.); S. La Rue Tone, second vice president; John Murphy, general superintendent; W. B. Carson, secretary; C. J. Braun, jr., treasurer; C. S. Mitchell, auditor.

Mr. James Dawson Callery has the distinction of having been the president of the pioneer electric line in Pittsburgh. His first experi-



J. D. CALLERY.



S. LA RUE TONE.

ence in street railway work was in connection with the Second Avenue Traction Co., operating a local horse car line. He so well demonstrated his ability in a subordinate capacity in this company that he was elected president. Directly after this, in 1889, Mr. Callery converted the road for electric operation, the first in Pittsburgh to be put on a paying basis and established permanently. Extensions were made in all directions; theretofore inaccessible tracts of land were connected with the city and developed as residential suburbs. By connecting many towns along the Monongahela River between Pittsburgh and McKeesport, Mr. Callery soon made the Second Avenue system one of the largest in the country at that time. In 1897 he effected the organization of the United Traction Co., which brought about the consolidation of the Pleasant Valley and Manchester systems in Allegheny City with the Second Avenue lines in Pittsburgh.

Mr. Callery was made president of the United company. Two years later the West End system in Pittsburgh, in which Mr. Callery was also interested, was purchased by the Southern Traction Co., and he was elected president. Mr. Callery was born in Allegheny City about 41 years ago. He is son of the late James Callery, a prominent business man of Pittsburgh, who was best known as organizer of the Pittsburgh and Western R. R., running from

Allegheny to Akron and now operated as an important division of the Baltimore & Ohio system. Mr. Gallery is also vice president of the Philadelphia Co. and is an officer or stockholder in a score of Pittsburgh's leading business institutions.

Mr. S. LaRue Tone was born in Cincinnati in 1864. He was graduated from the Rensselaer Polytechnic Institute in civil engineering and entered the service of the Pennsylvania R. R. He resigned to accept a better position with the Philadelphia Traction Co., controlled by the Widener-Elkins syndicate, and when the latter bought the old Pittsburgh, Oakland & East Liberty Passenger Ry., in 1887, Mr. Tone was employed to effect its conversion into a cable system, a work which was successfully accomplished, in the winter of 1888. The name of the company was changed to the Pittsburgh Traction Co., and Mr. Tone remained with it for two years. Later he became identified with the Duquesne Traction Co., and in 1892 entered the service of the West End Traction Co., as a chief engineer. Mr. Tone has acted as chief engineer in charge of the construction lines in Connellsville, Kittanning, and Rochester, Pa., and Steubenville, O. When the United Traction Co. was organized he was made chief engineer of all the lines it controlled, a position which he retained until the merger.

Mr. John Murphy is a native of Ireland and 41 years of age. He came to America in his early youth and devoted himself diligently to obtaining a thorough education. His home was in Central

Pennsylvania. After leaving school he obtained employment as an engineer on a steam railroad, and in this connection improved his opportunity to study the mechanical construction of the road and locomotive, all of which prepared him for his subsequent success in the economical construction and management of electric lines. When the Second Avenue horse car line in Pittsburgh was converted into an electric system he was chosen superintendent. In 1898 he was made general superintendent of the United Traction Co. Since his appointment as general superintendent of the Pittsburgh Railways



J. MURPHY.

Co. he has been actively engaged in effecting practical improvements of the system. He is, as well, an inventor of ability, being the inventor and patentee of the Murphy carwheel truing machine

CONVENTION ANNOUNCEMENTS.

The American Street Railway Association has issued the following circular:

The American Street Railway Association will hold its Twenty-second Annual Convention at the Grand Union Hotel, Saratoga Springs, New York, on Wednesday, Thursday and Friday, Sept. 2, 3 and 4, 1903.

We have held an executive session at Saratoga, and give you in this circular the substance of the arrangements we have made in your interests.

The Exposition will be held at the Grand Union Hotel, with all the light and power required.

The Convention will be held in the hotel, thus insuring the attention of all delegates and visitors to the exhibits.

The income from the sale of space will go to the American Street Railway Association. The executive committee of the association has fixed the price at 10 cents per sq. ft., and ruled that no space of less than 100 sq. ft. be assigned, but applicants may have as many multiples of this quantity as they wish, all in one body. Payment for space should be made to Mr. T. C. Penington, secretary and treasurer of the American Street Railway Association, No. 2020 State St., Chicago, Ill.

Applications for space should be made to Mr. Frank M. Cozens, Saratoga Springs, New York, chairman committee on exhibits. Please state in your application for space, the shape desired, number of feet wide and long, and the committee on exhibits will comply with your request if possible.

It is earnestly requested that all exhibits shall be in place and all

work finished by Tuesday evening, September 1st, which is the evening prior to the opening of the convention. Watchmen will be in charge of the building and grounds, so that the exhibits will be safe.

All articles intended for exhibition shall be delivered at the Grand Union Hotel, Saratoga, New York, by the agent or owner, and at his expense; but the local committee has made arrangements with the Tooley Brothers Co. to haul and deliver all shipments to and from the building, if desired, at low rates. Mark goods to yourselves care of the Tooley Brothers Co., Saratoga Springs, N. Y., send the company bill of lading or advice of shipment and prepay charges.

Ship all goods early to insure delivery in time. We hope to have you with us with an extensive display.

Articles will be placed on your space if you mark the number on your boxes, which will be mailed to you in ample time for shipment.

All electrical connections for power and extra lights must be made at the expense of the exhibitor.

We expect a large exhibit and perhaps it would be in the interest of the exhibitors to make arrangements to have the exhibits open in the evening, as it is well lighted, and the electrical companies expect to make a large display.

Space should be applied for by July 1. Assignments will be made as promptly as possible and exhibitors notified of their location. Exhibits of like character will be grouped together and space will be assigned in the order of application.

The committee on exhibits will make contracts with carpenters, electrical workers and laborers, at regular prices, so the exhibitors will not be overcharged for lumber, labor, etc.

Each afternoon and evening of the convention has been set apart for the examination of the exhibits, they being at the hotel which will take care of most if not all delegates, they are sure to be examined by all. Light exhibits will be displayed on the veranda of the hotel, heavy ones in the court. Those in the court will be covered to protect them from storms, and front of verandas will be covered. Cars and sweepers can be left on side track within a block of the hotel.

The headquarters of the association will be at the Grand Union Hotel. Other first-class hotels are: United States, American-Adelphi, Congress Hall, Worden, Kensington and a number of others.

The executive committee found our Saratoga friends so enthusiastic as to the coming meeting, and so hospitable in their greeting that success is assured, the location being central and accessible, and the inquiries and information already received being so encouraging, an unusually large attendance seems guaranteed.

The annual dinner will be held Friday, September 4th. Tickets will be sold at the actual cost to the association.

The railroads will sell tickets on the certificate plan. Be sure and leave your certificate with the clerk the first day of the convention, when you register. It will be signed, vised and ready for you on Thursday, Sept. 3, 1903.

Please make your arrangements and applications as above noted as promptly as possible.

With kindly greeting and wishes for the health and prosperity of all, and with confidence of meeting you in September, we are,

T. C. PENINGTON, Secretary.

JERE C. HUTCHINS, President.

Maj. Edwin W. Halliday, president of the Cairo (Ill.) Electric Railway Co., which leases the Sycamore Street Ry., and a stockholder in the Egypt Electric Co., the Cairo City Gas Co., and the Cairo Electric Light & Power Co., has sold his interests in the combination to the W. P. Halliday estate for about \$135,000. The general offices have been removed to rooms over the Cairo City Gas Co's. office. Major Halliday has numerous other interests and thought it wise to give up the more arduous duties.

VIEWS OF PITTSBURG.

Half-tone engravings (11 x 40 in. in size) of the view of Pittsburgh, shown on pages 186 and 187 of this issue, may be obtained from William Campbell, 327 Fifth Ave., Pittsburgh, at 25 cents each.

CORRESPONDENCE.

THE NAME OF THE A. S. R. A.

Editor Review: In this period of advancement and improvement it is essential to keep abreast with the times, to change with them. Within the past ten years the names applied to companies and lines in the so-called traction field, have varied as much, if not more, than those in the marine and railroad fields.

The expressions tramway, rapid transit, horse, cable, rapid, city, street, electric, union, united, consolidated, suburban or interurban in connection with railway or railroad, and railway or railroad suffixed to a specific city street or avenue, town or compass point, have all had their share of usage. Companies engaged in auxiliary businesses, as heating, lighting, furnishing power, carrying baggage and hauling light freight, usually adopted names indicative of such.

At the time of the organization of the American Street Railway Association the term "Street Railway" was used commonly. Since the consolidation of numerous city corporations, and the construction and completion of many inter-town lines, "Traction" has become the vogue. As many members of the association are connected with, or managing the latter class of road, the present name is no more appropriate for the organization than "Medical Society" would be for an assemblage of dentists, though the molar-bicuspid expert is addressed doctor.

"Electric" in lieu of "Street" would not be general, as electricity is not the only motive power presently employed, although it is the nearly universal one. The horse car is as yet not entirely extinct, a few cables are still lending their hum to the din of cities, while a "way-back" dummy is "tooting" over the midget "T"-rail in another locality. Compressed air and gasoline are used both experimentally and practically.

"Railway" or "Railroad" instead of "Street Railway", though embracing every kind of motive power, is too easily confused with the steam railroad organizations.

"Traction" would cover all classes of locomotion, and would be distinguishable from the railway associations. This name in place of "Street Railway" would cause the elevated, subterranean and rural electric railroader to feel as much at home as his city relative, who is at present in closest identity with the association from a nominal standpoint.

The writer suggests that the present name of the American Street Railway Association be changed to "American Traction Association."

Yours truly,

D. C. HINSTORFF.

Chicago, Apr. 9, 1903.

LOCATION OF BOILER FEED.

Editor "Review": A great many engineers have expressed their opinions as to the proper place to introduce the feed into boilers, especially those of the return tubular type, and perhaps it will be impossible to say anything new along this line. But a bit of the writer's experience may help some one to better the conditions of his boiler or boilers.

Some time ago the writer took charge of an electric railway power house where return tubular boilers were used to generate the steam. Duplex feed pumps were used, the water being forced through an exhaust feed-water heater into the boilers through the blow-off. On examination the boilers were found to be badly scaled, particularly the back heads about half way up the sides, and the three lower rows of tubes for three-fourths their length.

Inquiry as to how the boilers had been treated for the scale revealed the fact that they had been treated regularly each day with kerosene and each boiler cleaned once a month. I readily concluded that oil was not the proper thing for this case and decided to try something else as soon as possible. We first changed the feed by allowing the pipe to enter the boiler at the top about 2½ ft. from the front end down to within about 6 in. of the top row of tubes, thence toward the back to within 2 ft. of the back head; capped the pipe and had enough 3-16 in. holes drilled in each side of the

pipe to equal the area of the pipe. While this arrangement works well I have found by later trial a cross pipe placed at the end of the long pipe, and holes drilled in it instead of the long piece, admits of water being heated much hotter before leaving the pipe than in the former case.

After this arrangement was completed I sent some of the scale to a well-known firm, had it analyzed, some compound made to suit the case, and as soon as it was received I commenced to use it according to directions. The boilers were cleaned each month as usual and before long the scale had disappeared from the back head, sheet and tubes, and we had clean boilers. Of course some scale would continue to form in the boiler, but it is mostly on the top of the top row of tubes where it is readily removed.

Many engineers recommend feeding in the blow-off, but I have failed to find as yet that place which can be recommended in preference to the top. Some one says passing the feed water through the blow-off keeps the latter free from scale; true, so will opening the blow cock once each day or more if the water is very bad. Another says the blow-off pipes will not burn out so soon if the blow-off feed is used; granted, but the damage to the bottom of the boiler and tube ends caused by contraction and expansion when the feed is intermittent, is of much more consequence than burning off the blow-off pipe.

A boiler came to my notice at one time with which there had always been trouble because of the girth seams leaking, also the tube ends of the lower rows of tubes at the back. Any amount of calking was of no avail, until one day some one recommended the feed be changed from the blow-off to the top; this was done and there has since been no more trouble with leaky seams or tube ends.

It does seem that a great many engineers and some manufacturers of boilers have the idea that if you stick the feed pipe in any old place in a return tubular boiler it is all right so long as the water gets there. It is my belief that if the same care were exercised in the manufacture and management of return tubular boilers and those of similar design, as with the water tube boiler, there would be fewer accidents laid at their door.

A. K. VANDERBURG.

NEW MEMBERS OF THE ACCOUNTANTS' ASSOCIATION.

Among the members of the Street Railway Accountants' Association which have joined since the Detroit meeting are:

Atlantic Coast Electric Ry., Asbury Park, N. J.
Northwestern Elevated R. R., Chicago.
Lynchburg Traction & Light Co., Lynchburg, Va.
Rockford & Interurban Ry., Rockford, Ill.
Nashville Ry., Nashville, Tenn.
Santa Barbara Consolidated Ry., Los Angeles, Cal.
Cleveland & Southwestern Traction Co., Cleveland.
Geneva Electric Ry., Geneva, Switzerland.
Evansville Electric Ry., Evansville, Ind.
Hoosac Valley Street Ry., North Adams, Mass.

The association has published in pamphlet form the report of Messrs. Ham, White and Duffy on "A Standard Form of Reports for Electric Railways," which was presented and approved at the Detroit convention. The United States Census Bureau in preparing the statistics of electric railways has followed the standard system recommended by the Accountants' Association.

The Central Railway Co., Peoria, Ill., has fitted up the second and third floors of its Washington St. car barns as club rooms for its 400 employees. The rooms were opened April 1st by Mr. Walter

A Toronto (Can.) alderman introduced a motion at a recent city council meeting providing that the city's net revenue from the Toronto Street Railway Co., after paying the charges on track allowance payments, be put into a special fund for the purchase of the street railway plant at the termination of the franchise. The net revenue from the railway this year will be \$150,000 and after next year it is expected to be over \$200,000. At that rate the accumulated fund in 18 years hence will be \$3,600,000 without interest. It is argued that no matter how many extensions the company may build, the purchase of the plant will be a simple matter with such a fund at hand.



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CORRESPONDENCE.

We cordially invite correspondence on all subjects of interest to those engaged in any branch of street railway work, and will gratefully appreciate any marked copies of papers or news items our street railway friends may send us, pertaining either to companies or officers.

DOES THE MANAGER WANT ANYTHING?

If you contemplate the purchase of any supplies or material, we can save you much time and trouble. Drop a line to THE REVIEW, stating what you are in the market for, and you will promptly receive bids and estimates from all the best dealers in that line. We make no charge for publishing such notices in our Bulletin of Advance News, which is sent to all manufacturers.

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MUNICIPAL OWNERSHIP.

Interest in Chicago is still centered in the settlement of the traction franchise question, in connection with which the subject of municipal ownership and operation of the railways is being widely agitated. Several bills have been recently discussed in the Illinois Legislature, all of which authorize any city of the state, if it so desires, to own, lease and operate street railways. While these bills and their suggested amendments vary somewhat in their specific terms, they all have as their ultimate object municipal ownership of street railways, and whichever of these measures may be adopted it is expected it will have an important bearing on the settlement of the franchise question in Chicago. In general, these bills provide that any city may own and operate street railways or lease the same for certain periods; for the purpose of acquiring the street railways cities are permitted to issue either negotiable bonds or street railway certificates, the latter not to be a liability of the city but to be payable solely out of the revenues of the street railway properties for which they were issued. These bills further provide that cities shall keep the accounts for the street railways distinct from other city accounts and also that the proposed law shall not be in force in any city until submitted at an election and approved by a majority of those voting thereon. We consider it extremely doubtful whether a majority of the voters of Chicago wish to try an experiment in municipal ownership, but the bills under discussion are so framed that an insignificant minority could determine the city's policy, and if the returns of the last city election may be taken as a criterion such a minority would in fact do so. It has yet to be demonstrated that municipal ownership has been a success where adopted, notwithstanding the extravagant claims made for it.

The principal reason for questioning the results of municipal operations in places where considerable profit has been reported is the method of accounting employed. As our contemporary "Engineering" of London has stated, in reference to the Glasgow Corporation Tramways, "With a company the proof of profit is the dividend warrant; no amount of artifice can compensate the share-holder for its absence, but with a (municipal) corporation it is all a matter of accounting. A large net profit can be recorded even if it is afterwards dissipated for such purposes as renewals, reserve and depreciation, all of which are as chargeable to an undertaking soundly financed as wages or coal." Thus in the accounts of the Glasgow Tramways for a year ago £100,495 is shown as net balance added to general reserve fund. This is apparently a fine profit and might be supposed to represent the amount available for dividends, but by examining the accounts more closely it will be seen that all of this reserve and more, carried from the previous year, was transferred to the permanent way renewal fund and was spent on renewals during the year. Again, practically all that was left of the general reserve fund up to the time of this report was used for writing off the capital account in order that the horse traction plant and other items might disappear from this account. In the Liverpool municipal accounts the same system is used and a net profit of £147,056 is recorded before deductions have been made for depreciation, reserve and renewal; after crediting these items the net profit shown amounts to but £17,607.

An analogous case of municipal accounting is shown in another column, in which the light committee of St. Joseph, Mich., estimates the cost per year for each arc light at \$38.85 and the cost of the equipment is figured at \$19,103.93. Analysis of this report shows the cost of equipment to be below the actual figures, and the cost per lamp, if proper allowance for depreciation be made, amounts to \$62.72. From these examples it is very evident that so-called net profits shown on municipal balance sheets are by no means net and at this time may be generally considered merely conventional.

The condition in Chicago at present apparently prohibits the acquisition of the street railways through a bond issue, as the city has already reached the limit of its bonded indebtedness under its present charter. The alternative provided in the proposed law of purchasing the roads by means of issuing street railway certificates presents a rather anomalous condition. The railway companies are asked to sell their properties to the city and take in payment street railway certificates payable out of the profits earned by these properties. In other words the companies are asked to relinquish the control of their properties and investment without obtaining any additional security in return, and from the point of view of the present owners it might be asked why the companies are not entitled to the same profit on their investment and still retain their ownership after the

expiration of the franchise term. Further than this, however, municipal operation would undoubtedly develop conditions in the course of a few years equally as objectionable as those which now prevail. The improvements in all departments of electric traction which have been going on for the past few years can by no means be said to have reached their climax and improved apparatus and systems will undoubtedly be forthcoming during succeeding years. In the case of private ownership under suitable franchise conditions the city is in a position to demand the latest and best obtainable, and for this reason a private corporation must necessarily set aside large sums for depreciation. Under municipal ownership such improvements can not be expected, as the city would hardly be justified in venturing public money in improvements which might be speculative. The present cable systems in Chicago may be taken as an illustration of this point. These were installed but a comparatively few years ago at which time the cable was considered the most approved form of street railway traction. While the present companies are asked and are willing to discard these systems as scrap and to substitute in their place an underground conduit system at a cost of \$70,000 or \$80,000 per mile, it is very doubtful if such an expense would be considered at all were the present systems owned by the city.

The waste due to inefficient administration under public ownership is greater than the profit which the private company needs to make the investment attractive to capitalists, and this should determine the question of expediency.

TRACK CONSTRUCTION.

We describe on another page an unusually interesting piece of track construction which has recently been built in Hartford, Conn. The principal points of interest in connection with this experimental track are the heavy rails, the solidity of the sub-construction and the provisions for drainage. Ever since the introduction of electric railways the necessity for a constant increase in weight of rails corresponding with the gradual increase of weight of rolling stock has been found necessary, and in the case under consideration the rails used are heavier than those used by the largest steam roads. The same tendency has been noticed in regard to the sub-structure of roadbeds, and apparently the practice in electric railway work today is in the direction of providing a foundation for the rails which shall be as nearly rigid as possible. While the desirability of such a rigid roadbed is questioned by many engineers, for the reason that an inelastic roadbed would be expected to cause increased wear of the rails the life of the pavements adjoining rails in city streets is undoubtedly prolonged by using the rigid construction. The elastic roadbed favors the life of the rail and the desirability of either construction will be eventually determined by the comparative cost of renewing the rails more frequently, the pavement remaining in good condition, or paving oftener during a longer life of the rails.

The question of drainage has also been very thoroughly considered in the case of the experimental track at Hartford and the ample facilities provided for drainage should not only go far towards extending the life of the roadbed, but the absence of surface water on the tracks will prevent much trouble in the shape of burn-outs of the equipment under the car. It appears in this case that everything possible has been done to produce a track as nearly perfect as possible and the results of this experiment should prove several heretofore disputed points, among which the advisability of solid concrete construction, and whether asphalt can be successfully maintained when laid close to the rail are important ones.

THE CURTIS STEAM TURBINE.

The first announcement concerning the design and performance of the Curtis steam turbine was made public in a paper read before the American Philosophical Society, Philadelphia, April 20, by Mr. W. L. R. Emmet, which is reproduced in this number of the "Review." The Curtis turbine involves principles found in both of the turbines best known to steam engineers, the DeLaval and Parsons. There is a resemblance to the DeLaval in that the steam is permitted to acquire a high velocity by passing through specially designed nozzles, before impinging upon the vanes; on the other hand the use of more than one set of moving vanes, which alternate with sets of stationary vanes is the same principle found in the Parsons turbine. A set of expanding nozzles and two or more sets of moving and stationary vanes which are needed to absorb the kinetic energy due to

the velocity acquired in the nozzles, constitute a "stage." Compounding effect is secured by using two or more "stages." In the Curtis turbine there are a series of expanding nozzles placed close together so that steam is admitted to the vanes as a broad band or belt when all the nozzles are open, and governing is effected by opening or closing the necessary number of nozzles, and thus regulating the amount of steam admitted. In the Parsons turbine steam is admitted intermittently through an annular opening to the entire circumference of the first set of vanes, and the regulation is by varying the length of time the admission valve is open.

In the Curtis design the object in admitting steam through a portion only of the circumference is to permit the use of larger vane wheels and get a lower speed of rotation with a given velocity of the periphery. Also by arranging for the expansion of the steam in nozzles the pressure throughout the vanes of one stage is nearly uniform and leakage between vanes is avoided.

It is to be regretted that more information is not given as to the details of the turbines now building, and also that the results of tests on the large size units are not available. The figures on performance given by Mr. Emmet are from tests of a 600-kw. unit and the curves presented show steam consumption per kilowatt-hour, with steam at 140 lb. per gage and a vacuum of 28.5 in., as follows: At 750 kw., 19.1 lb.; at 500 kw., 19.3 lb.; at 250 kw., 21 lb.; at 100 kw., 24.4 lb. Reduced to a horse-power-hour basis the water rates are: 750 kw., 14.2 lb.; 500 kw., 14.8 lb.; 250 kw., 15.7 lb.; 100 kw., 18.2 lb. Results obtained with other turbines indicate that with 200-lb. steam superheated 150° F. the machine tested may be expected to give a horse-power-hour with less than 12 lb. of steam when operating at full load.

These figures on water consumption are remarkably good, and the results that are obtained with the larger units of the same type will be awaited with interest by all steam engineers.

CO-OPERATION OF EMPLOYEES.

The value to the management of suggestions from the operating department of a street railway or a manufacturing company is often-times very great and such suggestions deserve to be encouraged. In several cases which have come to our notice the managers of roads have offered rewards for meritorious suggestions of a practical nature which may be adopted either with a view to economy or to improving the service. The same plan could well be adopted in many railway repair shops and especially in those which really constitute complete car manufacturing establishments. It should also be borne in mind that aside from the question of cheapening the work or improving the service the fact that every employe is on the alert to make suggestions of value gives the employes an added interest in their work and lends to a mutual interest and cordiality between the company and its employes which goes far towards increasing the efficiency of the entire force. Two cases of this character have recently been mentioned in the "Review," in one case a suitable reward being offered for any suggestions for the improvement of the service and in the other case a series of prizes were offered for the best papers on railway subjects presented by any of the motormen and conductors of the road. A prominent manufacturing company in Ohio, during the last six months, has received 2,800 suggestions from its employes, of which 1,100 were adopted, and the plan appears to be the most commendable one, both from the standpoint of the employer and employe.

A STEP TO PROTECT CORPORATIONS.

Every street railway company has felt the effect of lax enforcement of the common law rules against champerty and maintenance and of the statutes permitting attorneys to take contingent fees which have been enacted in many of our states. In Missouri the prohibition against attorneys taking contingent fees was removed in 1901, and it has developed that those members of the profession who most harass corporations by prosecuting personal injury cases of doubtful merit, are not above imposing upon the state also, in asking that their clients be allowed to sue as "poor persons" without giving security for costs. One of the circuit court judges in St. Louis has held recently that when an attorney takes a case on a contingent fee he has such an interest in it as to make himself liable for costs. This is a step in the right direction and it is to be hoped that the ruling will be sustained by the supreme court.

New Track Construction at Hartford, Conn.

Description of One of the Heaviest If Not the Heaviest Types of Electric Railway Track in This Country—Concrete Cement Beams—Drainage—Cost.

During portions of the year 1901 and 1902, the city authorities of Hartford, Conn., carried on a more than usually thorough investigation into the best form of track construction, including forms of paving for city streets. A joint standing committee visited Boston and New York and personally inspected representative streets in both cities, paying especial attention to the results obtained with the "Metropolitan" and "Boston" sections of grooved rail when laid with asphalt and wooden block paving. At the same time Mr. Norman McD. Crawford, general manager of the Hartford Street Railway Co., prepared an exhaustive report, containing notes on the

ford R. R. on any part of its system. It will be observed the new "Hartford" rail is a modification of the "Boston" three-quarter grooved rail and the "Metropolitan" section as used in New York. It closely resembles the "Metropolitan" section, but the groove is $\frac{1}{4}$ in. wider at the top. This increased width, together with the more moderate slope on the lip, will undoubtedly give the rail a self-cleaning property that will prevent to a large extent the packing of dirt in the groove. This quality is enhanced by dropping the lip 3-16 in. below the level of the head of rail.

Having decided upon an acceptable section of rail, every effort was



BREAKING UP OLD CONCRETE FOR BALLAST.
COMPLETED BEAM ON ONE SIDE, TRENCHES ON THE OTHER SIDE.

PLACING DRAIN TILE BETWEEN TRACKS.
BEAMS WITH FORMS REMOVED.

life of various improved pavements and suggesting a form of rail and track construction which it was believed would best meet the conditions from the standpoints both of the railway company and of the general public as represented by the city authorities. As the result of numerous conferences, a compromise was finally adopted and it was determined to build a section of track on Main St., Hartford, embodying what were believed to be all the essential characteristics of a perfect track for city conditions.

This track has now been in constant use for several months and through the courtesy of the Hartford Street Railway officials and of the city engineer of Hartford we are able to give the details of construction, including the cost of the work.

The type of construction adopted is one of the heaviest ever tried in this country for electric railway work. The section of rail, as will be seen from one of the engravings, is a 9-in. grooved girder and weighs 102.9 lb. per yard, heavier, it may be stated, by 2.9 lb. than the heaviest rail used by the New York, New Haven & Hart-

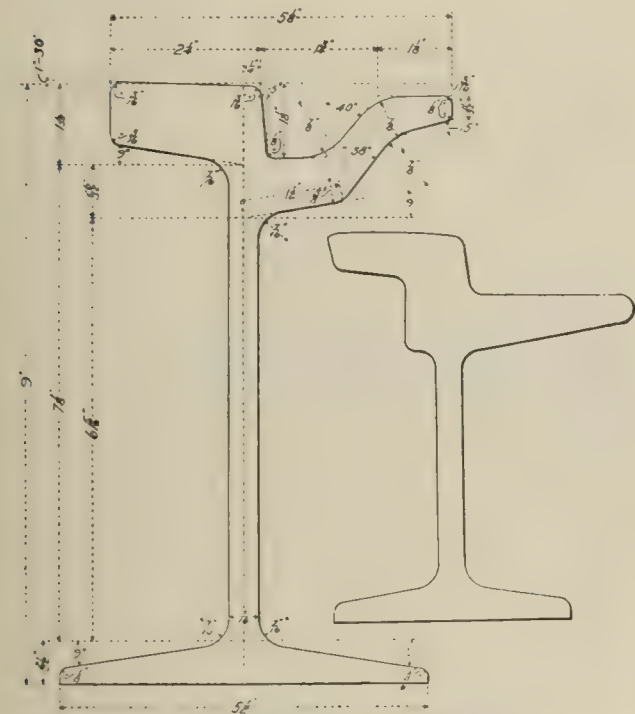
ford R. R. on any part of its system. It will be observed the new "Hartford" rail is a modification of the "Boston" three-quarter grooved rail and the "Metropolitan" section as used in New York. It closely resembles the "Metropolitan" section, but the groove is $\frac{1}{4}$ in. wider at the top. This increased width, together with the more moderate slope on the lip, will undoubtedly give the rail a self-cleaning property that will prevent to a large extent the packing of dirt in the groove. This quality is enhanced by dropping the lip 3-16 in. below the level of the head of rail.

Having decided upon an acceptable section of rail, every effort was made to obtain a roadbed that would be absolutely solid and so free from any motion as to permit of laying asphalt paving hard against the rail. It is not at all evident that even with the heavy type of construction adopted the sheet asphalt will stand up against the rail without deterioration, but one thing is settled, and that is, if sheet asphalt paving will not stand up against this improved track it certainly will not against any track construction.

From the line and half tone engravings it will be observed that each rail is embedded in a concrete cement beam 21 in. wide and practically 18 in. deep, giving 9 in. of concrete cement under the base of the rail. The method of preparing the roadbed was about as follows: The trench was first opened to the end of the ties and about 1½ ft. deep. A sub-base was then formed of broken stone which in this case was obtained by breaking up the old concrete which had been used in the previous track work, the men breaking this up with sledges just as it lay and throwing it in behind them as they progressed. Sawed ties, 6 by 8 in. by 7 ft. were next placed

on the sub-base of broken stone and spaced 6 ft. between centers. To the ties were spiked the 9-in. grooved rails and the whole track brought to surface and alignment. It was usual at this stage and before the concrete cement was poured in to let cars pass over the track for a day in order to secure good settlement of ties and insure

the sub-grade under each track, the bottom of the ditch was given a cross slope of 1 in. to the foot, the slope in each case being toward the center line between the two tracks. Along this center line was laid a line of 4-in. tile drain pipe, laid with open joints and connected at frequent intervals to the street sewers. In addition to

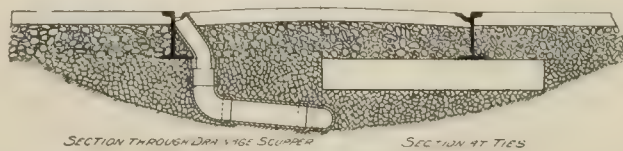


HARTFORD STANDARD GROOVED RAIL.

Weight 102.9 lb. per sq. yd. Laid on Main St. in 1902. Smaller section shows the old rail removed.

better surface and line. When the track had been brought to perfect position the side forms for the concrete beams were placed and the concrete cement shoveled into place.

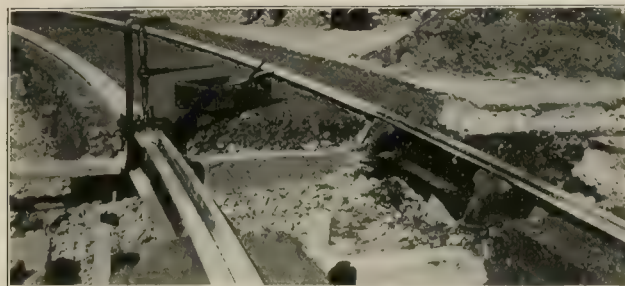
The concrete cement is a 1: 3: 6 mixture of clean sand and best Portland cement. For convenience, the wooden forms were built in 6-ft. sections of 1½-in. stuff, 18 in. deep. Each section was notched at both ends to permit the forms to set down over the ties. In preparing the work for the concrete cement, the forms were set up along each rail and held in place by tie rods as shown in the reproductions from photographs. After the concrete beams had been formed they were allowed to set for from 36 to 60 hours.



LIGHT CONCRETE CONSTRUCTION.

this provision for sub-surface drainage, the two inner rails were frequently set somewhat higher than the two outer rails, thus preserving the crown line of the street and thereby giving better surface drainage.

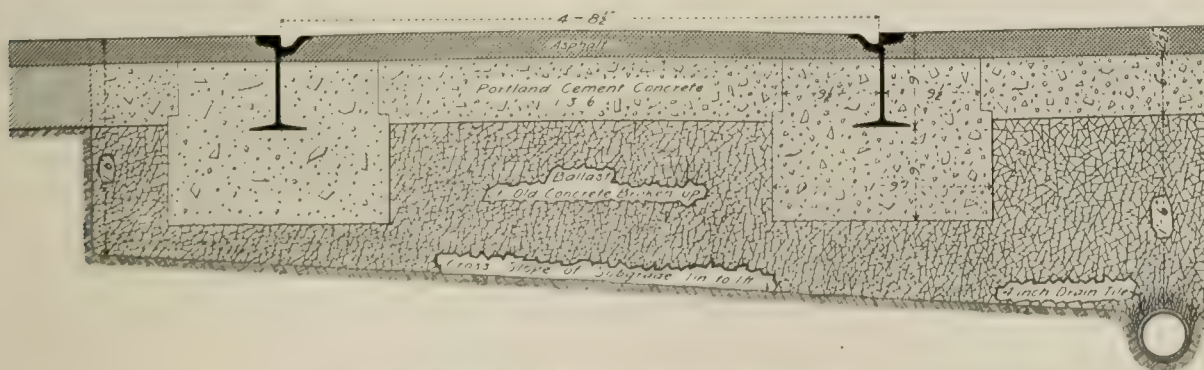
As is well known, one objection to the use of the grooved rail is found in the fact that the groove in rainy or slushy weather fills with water and becomes a runway for a large amount of the surface drainage, the water being thrown up by the wheels, causing considerable damage to armatures and fields. To prevent this in the Hartford construction, catch boxes locally called "scuppers," were placed in the rails at intervals varying from 300 to 500 ft. At low



SCUPPERS IN PLACE.

points in grade, two sets of these boxes were used in each rail about 5 ft. apart, as shown in one of the half-tones.

This scupper is a casting set on the inside of the rail and having openings into the groove of the rail. The boxes were connected by drain pipes to manholes which were always put in on the uphill side of intersecting streets so as to keep the street crossings dry. The details of the scupper and the methods of draining are set forth in the drawings. Some difficulty was encountered at first



CROSS SECTION OF NEW TRACK ON MAIN STREET.

when the forms were removed. The space between rails was then filled with broken stone with a top dressing of 6 in. of cement concrete. The sheet asphalt was then laid over the cement concrete and brought up close to the rail on both sides. It will be evident, the wooden ties fill no other purpose than to hold the rails in alignment until the concrete beams have been poured and are thoroughly set.

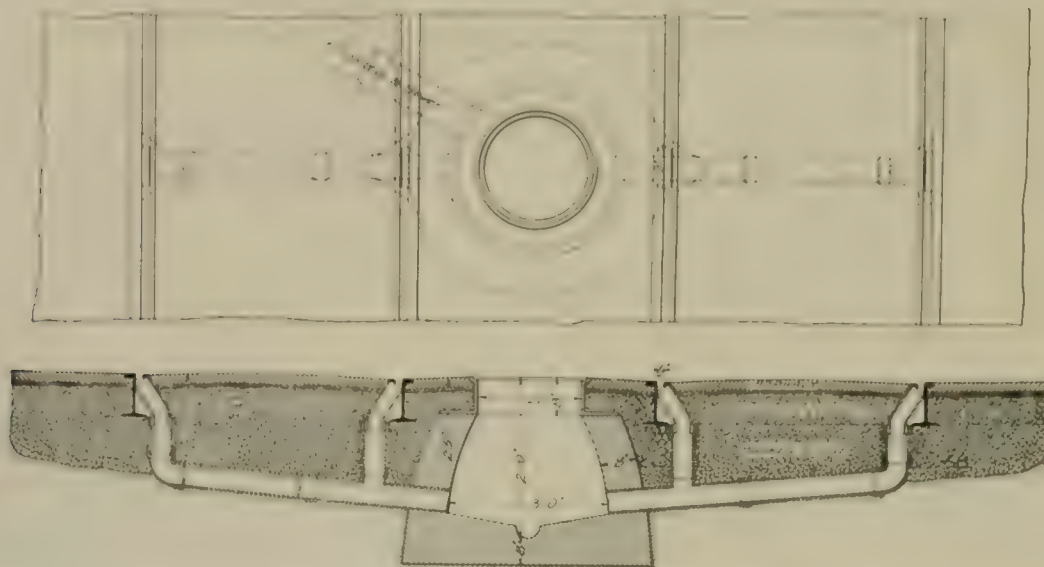
In order to get the highest degree of permanency, the question of proper drainage was given considerable attention. In preparing

when attempting to drill through the groove of the rail in making the openings into these catch boxes, inasmuch as the drill would slew off on the slope of the lip. This was overcome by casting a babbitt mold which exactly fitted the groove of the rail. When drilling the groove, the mold was first set in the groove and the drill started in the babbitt. By the time the drill had passed through the babbitt and reached the slope of the lip there was no longer any tendency for the drill to slew off, as the babbitt held it suffi-

ciently firm to guide it straight down. Five 1½-in. holes were drilled at each scupper and the metal between holes cut out with a saw

Labor and cartage on track construction
Rails

\$42,268.83
11,680.37



SECTION THROUGH CATCH BASIN AND SCUPPERS.

In reference to this new type of track construction, Mr. Frederick L. Ford, city engineer of Hartford, makes the following statement as regards the cost of labor and material:

| | |
|---|-----------|
| Special work and track materials other than rails.. | 3,786.10 |
| Concrete materials and sundries..... | 13,246.40 |
| Labor and cartage on concrete..... | 8,824.64 |
| Asphalt wearing surface..... | 18,521.13 |
| Engineering and inspection..... | 587.50 |

Total cost\$69,155.97

The cost of rails was \$37.20 per ton or \$1.22 per foot of single track. The cost of asphalt wearing surface 2½ in. thick was \$1.79 per sq. yd. The average rate of construction was as follows: Laying of single track, 180 lineal feet per day; laying of concrete beams, 500 lineal feet per day of single track. Entire construction 158 lineal feet of single track per day. This work was commenced on August 8th, and completed on November 11th, 1902.

It is interesting to note that the cost of former track construction with the 9-in. girder rail and sheet asphalt wearing surface, as laid on Farmington Avenue, was about \$4.12 per lineal foot as compared with \$6.95 per foot on Main Street.

The track is laid with ordinary fish plate joints and is bonded with American Steel & Wire Co.'s "Worcester" bonds.

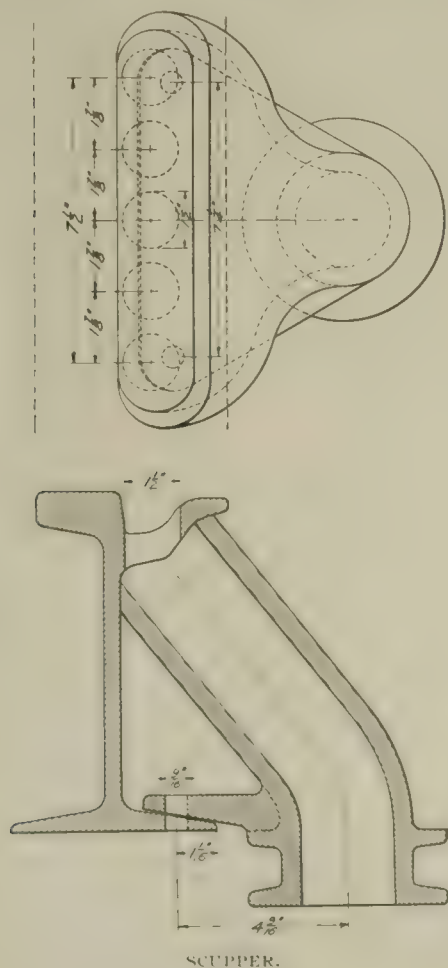
As before stated, the track on Main St. is designed for principal streets where the traffic is heavy. On less important streets the 9-in. grooved rail will be laid on ties resting on broken stone with a 6-in. layer of concrete cement above the ties, but no concrete beam beneath the ties. The same careful provision for drainage will be made as in the case of the heavier construction. A cross section of this standard lighter construction is shown herewith.

MASSACHUSETTS STREET RAILWAY ASSOCIATION.

At the April meeting of the Massachusetts Street Railway Association in Boston 41 members listened to a paper on "Transfer Tickets, Their Use and Abuse," by Mr. J. Harry Stedman, of Rochester, N. Y. An animated discussion followed. Mr. Karl A. Andren, purchasing agent for the Cape Breton, Ponce, El Paso and Seattle Electric Companies, also contributed to the evening's enjoyment.

FIFTY DOLLARS FOR AN IDEA.

In order to arouse interest in interurban travel in that section of Michigan of which Detroit is the center, the Detroit United Railway recently offered \$50 for an idea, either drawings, verses or suggestions, which will be displayed in the cars upon a card 11 x 21 in. The idea must be broad and capable of elaboration and continuation. All ideas must reach Mr. John H. Fry, 12 Woodward Ave., Detroit, by 6 p. m. April 30th.



The total length of double track and pavement laid was 4,878 ft. and cost \$69,155.97, approximately \$13.90 per lineal foot of double or \$6.95 of single track. This cost is divided as follows:

Street Railway Park Development.—V.

Design of Amusement Park Theaters—Methods of Advertising Employed by Street Railway Park Managers—Descriptions of Railway Parks.

AMUSEMENT PARK THEATERS.

Seating, Site and Roof.

BY W. E. PARTRIDGE, MECHANICAL AND SANITARY ENGINEER.

In selecting a plan for an amusement park auditorium the seating arrangement very properly is considered first because upon it to a great extent depends not only the selection of the site but the roof and the form of the building itself. Existing theater plans can be profitably studied in this connection. But in looking them over one is at once struck with the great and radical difference between building a city theater and building one in a park. The manager of the amusement park wishes for the moderate seating capacity of 2,000 but he is perhaps surprised to learn that many of the largest theaters of the world cannot accommodate half that number on the ground floor. The writer knows of but two theaters in Europe that seat 3,600; one holds 3,700 and the famous Paris Opera House a few less than 2,200. But in order to secure these capacities there are tiers of boxes and galleries one above another. The auditorium accommodating 2,000 persons on a single floor may be accounted a very large one. Its design is correspondingly difficult.

The first point to decide is whether the floor shall be level, a straight incline or rise with a curve. The level floor requires an excessively high stage. As it is not pleasant to look upward for any length of time, this is one undesirable construction. In addition to this the stage has to be inclined forward considerably. These reasons ought to put the level floor out of consideration.

For the best hearing and seeing, the seats must be elevated as they recede. There are several ways of effecting this. They may be ar-

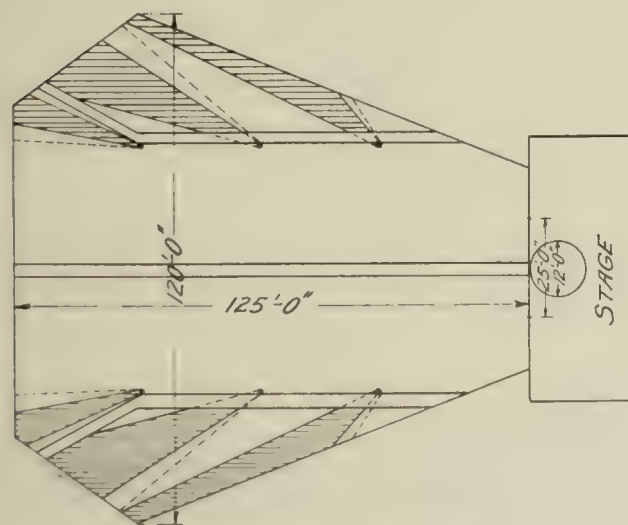


FIG. 1 INTERFERENCE OF POSTS.

All seats within the shaded area will have a post between them and the stage.

ranged in a straight line rising toward the rear, or they may follow a curved line. In the great casino at Mount Holyoke (See Street Railway Review, Feb. 15, 1902, page 79) the floor is made on a straight line, with a rise that is shown in the drawing to be 1 in. to 11 ft. This gives each seat a rise of a fraction more than 3 in. above the seat in front. With a straight floor this is about as much as can be given with safety. It is not, however, nearly enough to make good "lighting" and hearing.

The ideal auditorium should have a stepped floor rising in conformity to a very peculiar curve which gives the line of sight from each seat to the stage a fixed amount of elevation, namely, 9 in., above that of the seat in front. This elevation is assumed to be sufficient to clear the head of the person sitting in front. Contrary to

what might be expected, this does not result in a straight line for the seats. It produces a peculiar curve. This is shown in Fig. 4, which also shows the method of laying out. In this case the eye is supposed to be four feet from the floor, at the lowest point and the line of sight carried to a point on the drop curtain 15 feet from the front seat and twelve feet above the level of the floor. Seats are spaced three feet from back to back. In constructing the curve the lowest line of sight is drawn. Through a point 9 in. above this the line of sight for the next seat in the rear is drawn and so on.

By this construction the rear seats have a somewhat better view

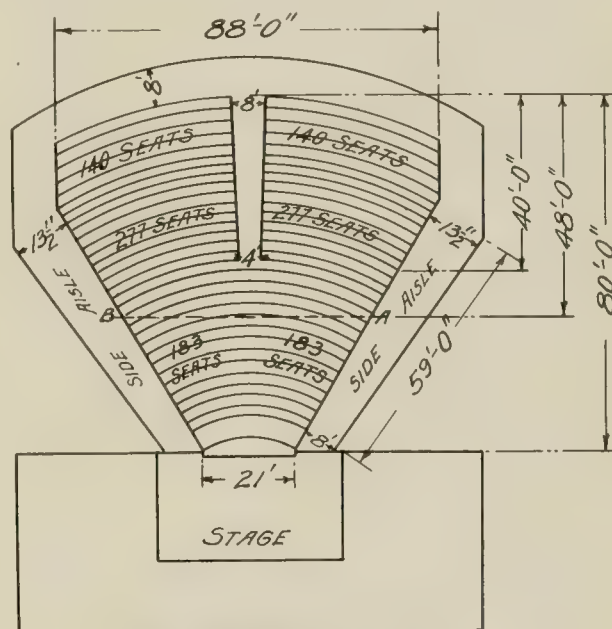


FIG. 2 SUMMER THEATER IN GREECE.

Seating capacity, both sides 1,200, aisles 240, total 1,440. (American seating, 1,730.)

Including side aisles 240 seats will be added. Adding extension in rear 448, and aisles 240, total seating capacity 1,888. (American seating, 2,250.)

By extending plan at back 8 rows, or 24 ft., 440 seats will be added, giving a total seating capacity of 1,648. (American seating, 1,950.)

of the stage, which to some extent compensates for the greater distance. It tends to equalize the value of the seats.

The stepped floor rising on a curve toward the rear has the advantage of conforming readily to the bowl or saucer shape. This is the best for seeing and hearing. Both Greeks and Romans adopted this form for their theaters which were in the open air. They always chose a hillside when practicable, excavating to secure the oval basin shape, or the semi-circular form. We can well take a lesson from them and choose a hillside for our park theater. A small amount of excavation will usually give the desired form even when the hill is convex.

For spectacular performances the amphitheater may be of almost any desired dimensions. It may be a half, two-thirds or even a whole circle or ellipse. The size of an amphitheater can be very large. Those of the Greeks and Romans sometimes exceeded 500 feet in diameter with a central stage or arena of 150 or 200 ft. A seating capacity of 70,000 or 80,000 was not unusual. In our own day, by using the amphitheater form, seats have been provided for 25,000 persons.

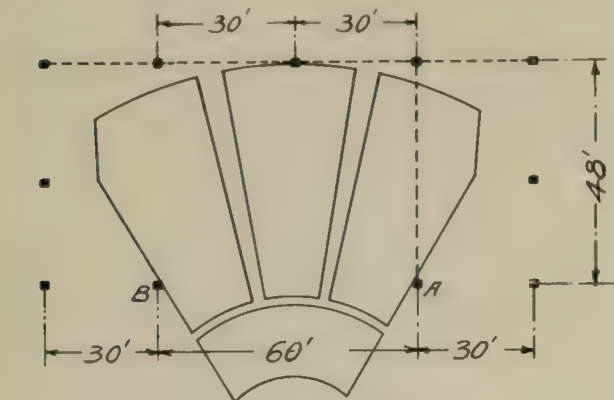
For theatrical performances of the modern character, as well as for the opera, the auditorium can not be spread around even half of a circle. The seats as they spread from the stage should not occupy an angular space much exceeding 90 degrees. Seats outside this angle are badly situated for hearing and give a very limited view of the stage.

We may assume that the form of the auditorium will be that of the amphitheater, the outside seats from the front nearly to the

rear making an angle of about 90 degrees from a point in the center of the stage and well back of the drop curtain line. The next question is that of size. The following table will throw light upon that point.

| Name of Theater | From Curtain to Farthest Seat | | Stage Opening at Curtain Line | |
|-----------------------------------|-------------------------------|-------|-------------------------------|--------|
| | ft. | Width | ft. | Height |
| Monte Carlo | 78.75 | 101 | 37.75 | 37.75 |
| Opera Comique, Paris | 73.75 | ..... | ..... | ..... |
| Her Majesty's Theater, London, 70 | ..... | ..... | ..... | ..... |
| Lavie Theater, London | 75 | ..... | 30 | 28 |
| National Opera House, Paris | 100.75 | 173 | 52 | 45 |
| Essen | 70.75 | 55.75 | 44.5 | 23 |
| Shakespeare's Stratford | 47 | 52.75 | 27 | 28 |
| Summer Theater, Piraeus | 80 | 88 | 21.5 | ..... |

This gives the dimensions of the audience rooms of some of the largest and best-known theaters in the world. It should be remem-



MODIFIED PLAN OF AISLES FOR FIG. 2.
Dotted lines indicate roof trusses.

bered that for regular theatres the stage is by far the largest part of the house. The theatres selected are remarkable for their size or for good hearing qualities.

The measurements show the distance from the drop curtain to the farthest seat. The width on the ground floor and the width and height of the stage opening at the curtain line. If we except the National Opera House in Paris the average distance from cur-

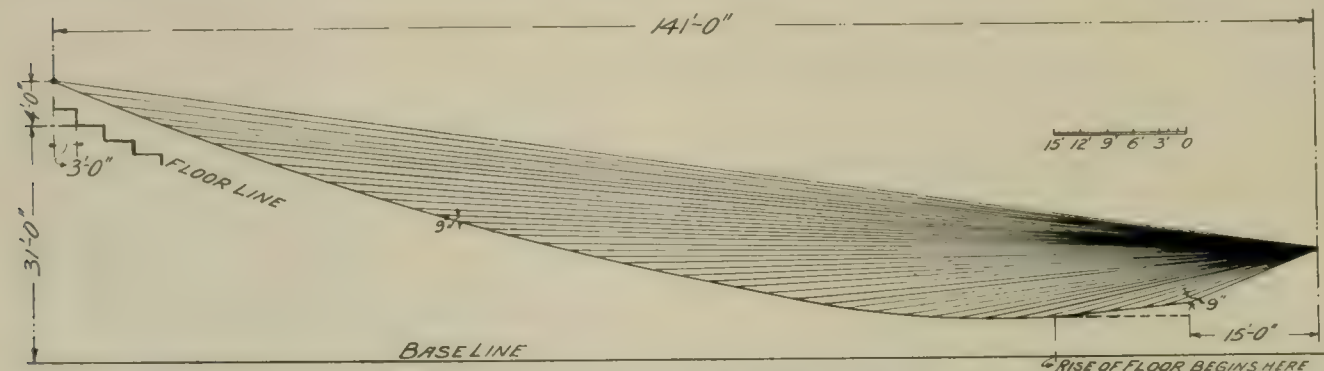


FIG. 4. ARRANGEMENT OF SEATS ON A STEPPED CURVE.
Last seat 141 ft. from the curtain line. Floor at this point 27 ft. above the lowest point. If the curve is followed close to the stage it will be seen that some of the nearer seats may be higher than those just in their rear. The curve as drawn is 4 ft. above the floor, the lines of vision being drawn from the average height of the eye when persons are seated. All seats are supposed to be of same size, spaced 3 ft. from back to back.

tain to farthest seat is but 72 ft. The greatest distance is less than 102 ft., which seems to be the greatest practicable for fair hearing. In widths there is a great variation. Some architects prefer getting the audience in front of the stage at the expense of a greater distance for the rear seats. The larger theaters have the fan shape. To these we must look for examples of seating arrangements because it is only the largest theaters where the lower floors have any approach to the capacity of an ordinary park casino. One of the largest European houses seats nearly 3,000, but has space for less

than 1,000 persons on the lower floor. The park theater designer, on the other hand, would wish for 2,000 seats at least on the ground floor.

Following the idea that all seats should be as nearly as possible of equal value, differing in "sighting" and hearing only by the distance of their different ranks—having all seats of the same rank equal—we have selected two seat plans to illustrate these points.*

Fig. 2 shows the seating plan of a summer theater in Greece

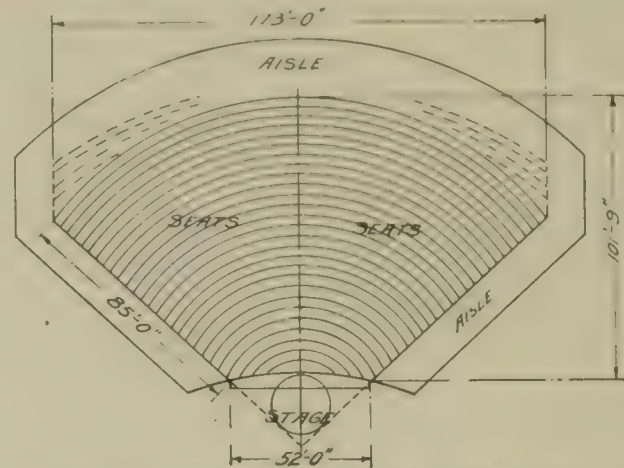


FIG. 3. FLOOR PLAN, NATIONAL OPERA HOUSE, PARIS.
Seating capacity, 2,000. American seating, not including aisles, 2,400; with seven rows added in rear, 3,400.

The stage is small, having an opening of but 21 ft. The seats all face a point in the center of the stage 12 ft. inside the curtain line. A novel but correct feature is the widening of the aisles from the front outward. The center aisle only comes a little more than half way to the front, saving more than 30 valuable seats. The side aisles or platforms widen from 8 ft. at the front to more than 13 ft. in the rear. The block occupied by the seats is 80 ft. from front to rear and 88 ft. wide. This gives a seating capacity of 1,200 (1,450 American seating). By extending the seats into the side aisles 240 additional seats could be gained, and by carrying the seats back 24 ft. there would be an addition of 450—a total of about 1,950 as seated in this country. The design is compact and economical. As a seating proposition it is not easily improved upon.

Although this theater has but a single aisle, the blocks of seats

are so proportioned that they are quite as well served as though more aisles had been introduced. No seat in the whole house is more than 20 ft. or 13 seats from an aisle. This is somewhat more than the usual rule, but it may perhaps be tolerated in view of the great additional number of valuable seats which it gives. The

*It may be noted that the seating given in these plans assumes 4½ sq. ft. of floor space (3 x 1½ ft.) for each individual. This seems to be much larger than the space allowed by American architects. In each case we have given the number which would be seated by the American plan in addition to the European.

and the auditorium from the weather, when we have to incline our auditorium. In selecting a site for an open air theater the slope, if possible, should be to the east, away from the afternoon sun.

Having a covering of tent there are many advantages. The seats at one end can be protected by a tent which has one stout pole only, placed at X in the aisle. The remaining portions of the canvas can be carried by wire ropes from poles at the sides of the seat space. This one pole cuts off nothing of the stage from the seats. The wire cables may be arranged so that it is not necessary to place other poles among the seats. One point needs attention. Have poles and cables so high that there are no bags in the canvas, otherwise there will be trouble when a shower comes up during a performance.

A permanent roof for a casino is a simple matter. Any builder will design one. It will be cheap and strong and tight. He will give a 60-ft. span, put lines of posts through the auditorium spaced 25 ft. on centers regardless of the seats and the audience which is to occupy them. He looks at the proposition as he would at roofing a foundry.

In some of our large casinos nearly half of the seats are undesirable on account of the bad management of posts. By reason of the level floor those at the rear in the center bay are of small value.

It is an axiom that for the greatest profit one seat should be just as good as another. Then as long as there are seats to be had the public will come.

A glance at Fig. 1 shows what an annoyance posts may become. It is a kite-shaped theater. The central bay is 60 ft. wide and there are three posts on a side. That at Syracuse has five and is 165 ft. deep instead of 125.

While a post does not seem to occupy a large area yet it does cut off a large portion of the stage from many seats. The nearer it is to the front the greater obstruction it becomes. It is also a great impediment to hearing. Fig. 1 shows how large a portion of an audience room may be injured by so few as six posts. Here the roof trusses and posts are spaced 30 ft. The shaded portions show the area in which the whole stage cannot be seen. Or more accurately, it is the space where the whole of a 12 ft. circle in the center of the stage cannot be seen on account of the posts. Only a few of the seats in the side bays are able to see the whole of the stage.

This arrangement is rather better than the average. Yet it is a question whether the spaces outside the posts are worth the cost of enclosing. As the posts are set closer or nearer the front the case becomes worse. A smaller auditorium with all the seats good; i. e., without obstructions, is probably a better business scheme.

Fortunately roofs can be supported without placing posts in the seating spaces. This can be done without using unusual spans. But the roofs will be somewhat irregular and will require more planning on the part of the builder.

In Fig. 2 by connecting A and B by a 60-ft. girder the whole of the remaining space may be covered by 48-ft. girders. This leaves the whole seating space without a post or other obstruction in the way of a clear view of the stage.

The 60-ft. girder will have to be of ample, but not excessive strength. Its load will be a little more than half the weight of a roof section 60 by 48 feet. As the height of the truss or girder is not limited it may have great strength for its weight.

In the case of the casino seating in Fig. 3 the girders or roof trusses must have a longer span and must be proportionately stronger. By placing pins or posts just outside the seat lines the whole space may be covered with 86-ft. girders. Only one of these—that in front—need be of unusual weight, strength or depth. They would be distributed as in Fig. 2.

The advantage of being able to advertise that every seat in the house has a clear view of the stage and of the whole house as well will go a long way toward making up for the trouble and cost of producing an unincumbered auditorium.

HOW TO ADVERTISE STREET RAILWAY PARKS.

The methods used in advertising street railway parks are of the greatest importance to the management of the roads as well as the success of the undertakings. The greater the number of attractions offered by street railway parks the greater is the necessity for keeping the public informed as to what is offered. There are innumerable ways of presenting this information to the public and

we mention here a number of successful plans for advertising that have been adopted by various street railway park managers throughout the country. One of the most generally adopted plans is the distribution of pamphlets or folders describing the park and its attractions, giving rates of fare, directions for reaching the park, etc.

The Dartmouth and Westport Street Railway Co., of New Bedford, Mass., which operates Lincoln Park, published a folder $8\frac{1}{2} \times 11$ in. in size containing an engraving of the pine woods at Lincoln Park and a brief statement in regard to the opening of the park season, the special holiday attractions, the rate of fare, a statement of different attractions, including dancing in the Casino and clam bakes at the rustic cottage, descriptions of the different park buildings and the special service offered to clubs, lodges and private parties.

The Delaware & Magnetic Springs Railway Co., of Magnetic Springs, O., has recently purchased and will operate a health and pleasure resort called "Magnetic Springs and Park," and will build a handsome new 400-room hotel to be used as a health resort. The company which has heretofore operated this resort has published a pamphlet $3\frac{1}{2} \times 6$ in. in size, showing illustrations of the park and containing condensed information in regard to it. The park contains the Ohio Magnetic Springs, a hotel and sanitarium, a number of cottages, and comprises about 11 acres of ground. All of these features are briefly described in the pamphlet as well as the outdoor amusements, the rates of board and the connecting railroads.

The Waupaca Electric Light & Railway Co., of Waupaca, Wis., owns Grand View Hotel and cottages on Chain o' Lakes, $4\frac{1}{2}$ miles from Waupaca. This resort is leased to the Grand View Hotel Co. and is under the management of Mr. John B. Caughill. It contains a theater with a seating capacity for 500 people. The resort is advertised by means of an eight-page folder $3\frac{1}{2} \times 6$ in. in size, which illustrates a number of the buildings and cottages, giving a brief description of the resort, hotel accommodations, rates, and other information.

Kingston Consolidated Railroad Co., Kingston, N. Y., owns and operates Kingston Point Park, 2 miles from the center of Kingston, projecting into the Hudson River. The park is managed by Mr. C. Gordan Reel, manager of the company, and contains a convention hall seating 500 people, boats and merry-go-round, refreshment pavilion, summer houses and picnic grounds. The company advertises this park by means of a most attractive pamphlet $5\frac{1}{2} \times 8$ in. in size, which is replete with artistic illustrations. The booklet states that the resort is 88 miles from New York and 54 miles below Albany, and is located on a point of land jutting out from the west bank into the Hudson River. It is essentially a resort for Sunday schools, church associations, social societies and organizations, and with this end in view no liquors are allowed within the park and no boat on which liquors are sold is allowed to land excursionists at the park. The park is advertised as an ideal place for holding conventions of a literary and religious nature and is largely used by such associations.

The International Railway Co., of Buffalo, N. Y., which operates Olcott Beach Park, advertises this resort in a number of ways. The park is situated 38 miles from Buffalo and 13 miles from Lockport, and contains an open air rustic theater, seating 1,500 people. It also contains a hotel known as Olcott Beach Hotel and various other amusement features for the entertainment of children, etc., usually found at street railway parks. Vaudeville and band concerts have been given at the theater, the former being apparently more popular. No fee is charged to the entertainment. The company advertises in the local papers the different attractions and theatrical entertainments for each week, including bands or other features. It also advertises through the medium of half-sheet posters in car windows and has found this method very effective. Its other advertising is done by illustrated folders and leaflets. One of the folders used contains a complete panoramic view in colors of the territory served by the different lines of the International Railway Co., the illustration being 30 in. long by 8 in. wide. The reverse of this folder contains a general description of the various points reached by the company's lines, including considerable historical data, as well as the rates of fare between the different points. The company also publishes an illustrated folder descriptive of Olcott Beach Hotel and Park.

The Milford & Uxbridge Street Railway Co., of Milford, Mass., operates Lake Nipmuc Park, situated in Mendon, about 7 miles from

Milford. It contains a theater seating 1,000 people, in which vaudeville and light opera have proved the most remunerative performances. The park also affords facilities for boating and contains a dancing pavilion. The company advertises its parks largely by means of time tables, which contain some illustrations and descriptions of the park.

The Omaha & Council Bluffs Street Railway Co., which operates Lake Manawa Park, advertises this resort by means of a descriptive booklet and a half-sheet poster giving a view of the Kursaal and the bathing beach and boating. These cards are 11x14 in. in size convenient to be hung in car, store or hotel windows. The company also uses an eight-sheet poster, which is a facsimile of the card just mentioned, to advertise on the billboards in the cities of Omaha, South Omaha and Council Bluffs and in the surrounding country. The booklet is distributed within the radius of 100 to 150 miles of Council Bluffs. This is a highly artistic publication devoted almost exclusively to handsome half-tone illustrations, with but a small amount of explanatory reading matter. It is 11 x 7 in. in size and contains 24 pages. The company also runs a large advertisement in the Sunday papers, giving the Sunday program and list of attractions for that day.

The Atlantic Coast Electric Railway Co., of Asbury Park, N. J., owns Pleasure Bay Park, located 1¼ miles north of Long Branch. The park is leased to Capt. A. B. Stoney, and is managed by Mr. George S. Starling. It contains a theater with a seating capacity of 3,500. Opera and vaudeville have been the most remunerative entertainments, in addition to which the park has a large hotel, electric launches, merry-go-rounds and all of the usual attractions obtainable. The company makes use of all kinds of advertising, using pamphlets, folders, three-sheet billboards, in the surrounding towns, newspaper notices and banners attached to the sides of the cars, and in fact, every means of getting the resort before the public. One of the banners used along the sides of the cars bears the inscription in large letters, "Let's go to Pleasure Bay." The booklet is entitled "Pleasure Bay Views" and is devoted entirely to illustrations of the park and its buildings. One of the novelties of the stage at the Park theater is that it is built out in the water and is entirely separate from the grand stand proper.

Olentangy & Minerva Parks, on the lines of the Columbus Railway Co., were well advertised in former seasons in a souvenir pamphlet describing "Ohio's Greatest Summer Resorts." The souvenir, which is a large pamphlet 10½ x 8 in. in size, contains over 40 pages, a large number of which are devoted to illustrations and views of these two parks. The souvenir comprises an artistic advertisement and one that would attract general attention and would not be apt to be destroyed.

DESCRIPTIONS OF PARKS.

YORK, PA.

Highland Park is operated by the York Street Railway Co. of York, Pa., and is located on Codorus Creek, two miles from the center of the city. The park is operated by the company and is under the management of Mr. W. H. Lanius, president of the company. It is provided with a theater which seats 1,000 persons and the company has found comic opera and vaudeville performances to be the most remunerative class of attractions offered. Band concerts are also given in the park and it contains a small zoo in which there are squirrels, monkeys, deer and prairie dogs.

IOLA, KAN.

The Iola Electric Railway Co. has a park known as Crouch's Electric Park located a mile and a half west of the city. The company operates the park itself under the management of Mr. Charles M. Crouch, president and general manager of the company. The company intends to build a theater and to make other improvements as soon as possible the present being its first season of operation. The park is located on a river which provides good boating facilities, it also contains a base ball field and abounds in fine forest trees.

LYNCHBURG, VA.

The Lynchburg Traction & Light Co. own and operate Rivermont Park, situated 2½ miles northwest of Lynchburg. The park

contains a theater of 1200 seating capacity in addition to a bowling alley, shooting galleries and other attractions. The casino is leased to Mr. J. Wells, of Richmond, Va., and all of the other attractions are operated by the company. The most remunerative class of entertainment has been comic opera, and dancing has also formed a popular entertainment every afternoon and evening during the season. A concert is given by a fine orchestra from 3:30 to 11:00 p. m. to which no admission is charged.

LANCASTER, PA.

The Conestoga Traction Co. has three pleasure resorts upon its lines called Rocky Springs, Chickies Park and Lititz Springs. These resorts are respectively 3 miles, 14 miles and 8 miles from the city of Lancaster, and Rocky Springs and Chickies Parks are operated by the company while Lititz Springs is managed by a church. The two parks operated by the company are under the management of Mr. Frank S. Given, general manager of the company. The company has not yet completed its arrangements for 1903 but has arranged to build a theater at Rocky Springs with a seating capacity for 2,000 in which light opera will be given. The other attractions offered are dancing, merry-go-rounds, animal shows, base ball, tennis, etc. The company's pavilion and other buildings were burnt down last July but extensive improvements will be made during the coming season. The company is also preparing to build a new double track road into the park instead of making the trip to the park partly by rail and partly by boat as at present.

EUREKA SPRINGS, ARK.

The Citizens Electric Railway Co. has established an all-the-year resort called Auditorium Park which was opened for the first time late in the season last year when the company purchased a large auditorium surrounded by several acres of land to which it expects to add a number of park attractions. The resort is situated one mile from the city and is under the management of Mr. M. D. Jordan. The pavilion has a seating capacity of 3,500 people and has been used for vaudeville and musical entertainments.

ATCHISON, KAS.

Forest Park is a resort owned and operated by the Atchison Railway, Light & Power Co. and is under the management of Mr. C. M. Marshall, superintendent of the company. The park contains a pavilion seating about 1,000 persons in which light vaudeville and moving pictures have proved the most remunerative entertainments. Other attractions offered are band concerts and base ball.

ISPHEMING, MICH.

The Negaunee & Ispheing Street Railway & Electric Co. owns and operates two pleasure resorts, one of which is called Union Park, situated one mile from Ispheing and 1½ miles from Negaunee, and the other, Cleveland Grove, situated 1½ miles from Ispheing and 1 mile from Negaunee. These parks are managed by Mr. H. F. Pearce, superintendent of the company. The entertainments offered are band concerts, base ball, foot ball and racing. The company states that dances and large picnics have proved the most remunerative attraction. It rents either the park or the grove for any special entertainment such as circuses, etc. We are informed by Mr. Pearce that special attractions have been offered at both the park and the grove but these did not prove successful. The company has found that large Sunday picnics in connection with a beer garden at the park has proved most remunerative. The resort is divided into two parts, one containing a club house and the other a pavilion. Each of these places attracts its own class of patronage neither of which interferes with the other and the company has never had any trouble on this account.

GREENFIELD, IND.

Spring Lake Park, situated 5 miles west of Greenfield is owned and operated by the Indianapolis & Eastern Railway Co. The park contains a small theater with a seating capacity of 260 in which vaudeville has proved the most remunerative entertainment. The other attractions at the park are base ball, high diving, trapeze,

tumbler, truck bicycle riding, etc. The company has a ball park and amphitheater from which it has secured the most satisfactory receipts. The company runs extra cars from its main line to the park when necessary and extra cars on the main line on Sundays and Holidays.

OSHKOSH, WIS.

The Winnebago Traction Co. operates a resort known as Electric Park, situated about four miles from the city of Oshkosh on the



CHUTES AT ELECTRIC PARK, OSHKOSH.

west shore of Lake Winnebago, which is one of the most beautiful and the largest inland lake lying within any one state of the United States. The park is owned and operated by the Winnebago Traction Co. and contains a theater having a seating capacity for 1,000 persons. The tract consists of 18 acres of wooded land comprising many pretty groves and contains several streams of pure water winding in and out among the woods. It is one of the coolest and most attractive places on the lake and is visited by thousands of people during the summer season, although uncomfortably hot weather is something unknown in Oshkosh.

Aside from the natural attractions offered by the lake and the park the company has provided a water toboggan slide or chute the chutes, bath houses, and attractive bathing suits, steel clinker-built row boats, ice cream booths and a large refreshment pavilion where all kinds of refreshments are served. The pavilion is shown in one of the accompanying illustrations, also views of the bathing beach and the band stand. There are also numerous other forms of entertainment such as the theater, electric carousal, electric fountain and shooting galleries. The electric fountain was made in the shops of the Winnebago Traction Co. The main feature of the entertainments however has been band concerts which the company finds to be the most profitable and best-appreciated attractions which can be introduced, and which never fail to draw large crowds when the weather is pleasant. Mr. E. E. Downs, vice-president and general manager of the company states that he considers this kind of entertainment the most satisfactory of anything that can be secured, especially so when it is possible to obtain good music. The company is exceptionally fortunate in this respect having in Oshkosh the "Famous Arions" which is considered the finest band in the state of Wisconsin and which has a national reputation.

The city of Oshkosh is a very attractive summer resort and annually attracts a large number of strangers which add largely to the patronage of the park. The rapid growth of the interurban roads in this section of Wisconsin also helps to draw a large attendance to the park from a large area of the country contiguous to these lines.

The location of Electric Park on Lake Winnebago makes yachting a feature of special interest and Oshkosh is the headquarters of a number of yacht clubs which hold annual regattas each summer. The largest of these clubs is the Inland Lake Yachting Association, whose annual regatta has been made a fixture at Oshkosh. The Oshkosh Yacht Club has also constructed a very fine harbor with the aid of the city, and is now erecting a club house on the shore of Lake Winnebago.

COLUMBUS, O.

The Olentangy Park Co. own and operate a pleasure resort some four miles from the center of the city which is known as Olentangy Park and Theater and Zoological Garden and also Minerva Park and Casino, located some 9½ miles northeast of the city. At Olentangy is a theater having a capacity of 3,000 persons. Theatrical performances by a stock company, vaudeville, minstrels, musical concerts have all proved remunerative. The other attractions at the park include toboggan slide, merry-go-round, pavilions for dancing and bathing, row boats, steam launches, swings and other



BEACH AT ELECTRIC PARK, OSHKOSH.

similar amusements. The park is located on the main line of the Columbus Electric Ry.; also on the roads of the Market Street Ry., the Columbus & Worthington Street Ry., and the Columbus, Delaware & Marion Ry. The officers of the Olentangy Park Co. are: President, J. W. Dusenbury; secretary and treasurer, Will J. Dusenbury.

PADUCAH, KY.

La Belle Park, located 2½ miles from the center of the city, is owned by the Paducah City Ry. and it is operated by a lessee. The arrangements for next season have not yet been closed. The park contains a theater of 800 seating capacity in which dramatic entertainment interspersed with vaudeville have proved the most remunerative. In addition to the theatrical performances lake bathing and dancing have proved attractive entertainments and the park also



PAVILION, ELECTRIC PARK, OSHKOSH.

contains a pavilion and cafe. Special cars are provided in summer as required.

ITHACA, N. Y.

The Ithaca Street Railway Co. operates Renwick Beach located two miles from the center of the city. The beach contains a theater of 1,000 seating capacity and the company have found high

grade vaudeville the most remunerative attraction. The other attractions are merry-go-rounds, shooting galleries, bathing houses, small menagerie, boating, band concerts and refreshments.

NEW BRITAIN, CONN.

The Connecticut Railway & Lighting Co. owns and operates White Oak Park located $2\frac{1}{2}$ miles from New Britain. The park is under the management of Mr. E. L. Terry, and contains a theater, bowling alleys, boats, dancing pavilion, merry-go-rounds, etc. The theater has a seating capacity of about 1,000 and the company has found vaudeville performances to be the most remunerative class of entertainment.

BRUNSWICK, ME.

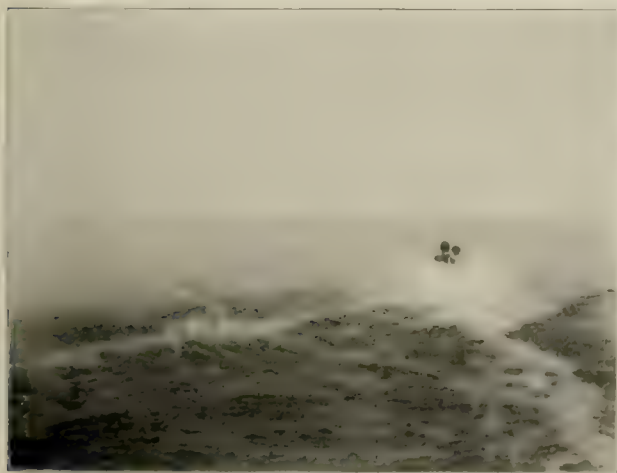
The Lewiston, Brunswick & Bath Street Ry. operates two pleasure resorts called Merrymeeting Park and Lake Grove. The former is located 2 miles from Bath and the latter is 6 miles from Bath and 3 miles from Lewiston and Auburn. The park is under the management of Mr. M. H. Blackwell. Each of the parks contain a theater of 2,000 capacity in which vaudeville is the only entertainment which has been offered. Band concerts and balloon ascensions, etc. have been given at various times.

ROANOKE, VA.

The Roanoke Railway & Electric Co. is preparing to operate Mountain Park which is located 3 miles south of the city of Roanoke at the end of Mill Mountain. The site has been recently purchased by the company and is now being improved. The management will be in the charge of Mr. J. W. Hancock of the street railway company. A theater is to be erected this season with a capacity of about 1,000 seats and the company expects to be connected with the Wells Vaudeville Circuit. Other attractions will be added during the season. The park lies upon one of the company's most important suburban lines which provides ample transportation facilities.

NEWARK, O.

The Newark & Granville Electric Railway Co. has leased Idlewild Park at Newark, for the term of five years, and has engaged W. D. Harris as manager. Some extensive improvements have been made at this park in the way of buildings and it is to be opened about June 7th. The entertainments contemplated include high-class vaudeville shows each night in the week. Both this company and the Columbus, Buckeye Lake & Newark Traction Co. are open for



BATHING AT ELECTRIC PARK, OSHKOSH.

proposition concerning amusement to be put on on a percentage basis at Idlewild and at Buckeye Lake Park. J. R. Harrigan, Newark, is manager of both companies.

WARREN, PA.

The Warren Street Railway Co. operates Inland Park located $2\frac{1}{2}$ miles from Warren. The park is under the management of Mr.

H. A. Siggins and it contains a theater having a seating capacity of 700. The attractions offered have been minstrels, moving pictures and vaudeville, the latter having proved the most remunerative.

MANISTEE, MICH.

The Manistee, Filer City & Eastlake Railway Co. maintains a pleasure resort known as Orchard Beach Park, located some $2\frac{1}{2}$ miles from Manistee. This is under the management of Mr. Archie Thurlby. At the park is a theater with seating capacity for 600. The most remunerative class of entertainment has been vaudeville and plays which included good specialties. When there is nothing else at the theater, band concerts are usually given. The bathing facilities (Lake Michigan) are excellent and the company has erected a bath house 40x100 ft.

BURRVILLE, CONN.

The Torrington & Winchester Street Ry. owns and operates Highland Lake Park which is about 5 miles from Winstead and 8 miles from Torrington. It is under the management of Mr. W. M. Harris. At this park is a theater seating 600 persons. The most remunerative entertainments have been vaudeville shows although band concerts and boat carnivals have both been popular.

ST. CATHERINES, ONT.

The Niagara, St. Catherines & Toronto Railway Co., of St. Catherines, Ont., maintains a pleasure resort known as Lakeside Park some five miles from St. Catherines. It is under the management of E. F. Seixas, general manager of the company. The attractions which have proved most remunerative are band concerts. There is no theater at the park. The other attractions include swimming, boating, fishing, base ball and Lacrosse.

ALBANY, N. Y.

The Albany & Hudson Railway & Power Co. operating between Albany and Hudson, N. Y., owns a pleasure resort known as Electric Park. It is located at Kinderhook Lake, about 18 miles from Albany and the same distance from Hudson. This resort is operated by the company and is under the management of Mr. Robinson. There is a theater of 2,000 capacity at the park and while high class vaudeville has proved the most remunerative attraction, the management reports that comic opera has also been fairly successful.

The Canton-Akron Railway Co. is to spend \$10,000 in improving a summer resort at Meyers' Lake, a short distance west of Canton.

It is announced that Col. J. D. Hopkins, manager of the Forest Park Highland of St. Louis, has organized a company of which he is president to build an amusement resort near the terminus of the Independence line of the Metropolitan Street Railway Co., of Kansas City.

EMERGENCY STATION AT BIRMINGHAM, ALA.

The emergency department of a large electric railway system is in a great many respects like a well-organized fire department of a great city. With several new lines put in operation and the general overhauling and standardizing of the old lines, the Birmingham Railway, Light & Power Co. found that it would have to enlarge and add many new features to its emergency department. With this idea in view the engineering firm of Ford, Bacon & Davis, which has charge of the vast improvements being made, cast about for a suitable location for the emergency station and finally purchased a lot 140 x 110 ft. just five blocks from the busiest part of the city. On this lot were an old machine shop and foundry and two brick stores, two stories in height. These latter were remodeled for the emergency station, the partition between the two stores was removed and a row of columns put in its place. A corrugated iron roof was put on the building and placed for two wagons and stalls for six horses were put in.

The second floor has been divided into sleeping apartments for the emergency men, feed and storerooms, a workshop for the re-

parting of the equipment of this department, bath rooms and a reading room. Access to the second floor is obtained by a staircase from the wagon room and there is also a brass sliding pole from the hallway above to the wagon room, down which the men slide when there is a call to turn out.

When there is a breakdown in the wire at any point communication with this station is had by means of telephones, at the different stations along the line.

When an alarm comes in the pressure of a button rings the gong in the horses' stalls, throws the gates open and unchains the horses. The horses are thoroughly trained and at the sound of the gong rush out of their stalls and into their places at the wagon. The harness for the wagon is of the latest improved fire department type and hangs ready to fall on the horses' backs, and with one snap of the collar and another of the reins they are all ready to start. When an alarm comes in at night the watchman on duty presses the button which releases the horses and opens the front door, and also rings a gong over the heads of the beds in which the men are sleeping.

The wagon is one of the newest extension ladder tower wagons and carries the usual set of tools and repair parts necessary for the repairing of overhead work, and in addition two large track hose bridges which weigh 600 lb. each. In order to be on hand promptly at fires a signal box, similar to those in the fire stations, has been installed at the emergency station, and when an alarm is turned in of a fire, it is registered on this indicator just as it is in the fire department, and if the hose bridges may be needed the wagon turns out at once and not infrequently gets to the fire ahead of the department. The rivalry is keen between the emergency wagon and the fire department and the races they have to some of the fires are much talked of in the respective departments.

Besides this wagon, which is drawn by two large horses, there is a stationary tower wagon drawn by one horse, which is used for general repair work and in cases of large breaks to assist the large wagon.

There has also been placed on the first floor of the station in the wagon room a track for the placing of an emergency car, which was designed and is being built by the master mechanic of the company in its own shops. This car will be equipped with four motors, Christensen air brakes, an arc headlight and a folding ladder on the top for getting up to the wire. The inside of the car will be arranged to carry the necessary ropes, blocks and all necessary tools for repairing and erecting overhead construction. This car is painted the company's standard color, chrome yellow lemon, and when finished will be the most complete thing of its kind to be found. When this car is put into service it will take a great many of the hard, long runs off the horses, as they have to be kept quite busy answering fire alarms and looking after wires along the 100 miles of track owned by the Birmingham Railway, Light & Power Co. and the life of the lineman, while in many ways fascinating, is by no means a rosy one.

In the rear of the emergency station is a building 30 x 60 ft., which is the general stable and has stalls for 20 horses and a large feed room. There is a large space between the back of the station and this stable, which is roofed and paved, and is provided with a watering trough and all the necessary appurtenances for the washing of the horses and wagons.

At the station and stable there are chemical fire extinguishers and water plugs with lines of hose conveniently placed to guard against fire.

Under the same roof and directly adjacent to the emergency station is the office of the very complete freight department operated by the company. In the front of the building next the sidewalk is the office and to the rear is a large and roomy wareroom. Connecting with this wareroom by large fire doors is the freight shed, into which the cars are run to be loaded and unloaded. Three tracks are under this shed, two running entirely through the lot and the other only about half way, being a spur track. Between these tracks are platforms, one running the entire length of the yard and the other only about half way. This shed is supported by heavy wooden trusses and has a corrugated iron roof. All the woodwork about the shed and the platforms between the tracks have been treated with the "Carbolineum" process and are practically water proof. The spaces between the tracks are made of chert and slag,

rolled and packed until it is almost as solid as concrete. The shed yard is surrounded by a high board fence painted a deep brown, and the entrance is provided with hanging gates to admit access of the cars.

Four freight trains daily are run to Ensley, Pratt City and Thomas, suburban towns six and seven miles out from Birmingham.

This freight train often comprises six and eight cars and is drawn by a powerful four-motor car "Alfred". Other towns have one and two freight trains each way daily and a special steam freight train is run to Bessemer, 13½ miles from Birmingham. This means of shipping freight is growing daily in favor with the shippers, as they are enabled by means of it to lay goods down at the doors of their customers within a few hours after receiving the orders.

Freight business on this line has been developed by Mr. J. B. McClary, manager of the railway department, and his brother, Mr. A. B. McClary, general freight agent.

COST OF OPERATING MUNICIPAL PLANTS.

One of the most serious charges which can be made against those operating any enterprise is that they fail to correctly keep their accounts and this charge is one which has, with good reason, been brought against many of the boards operating municipal undertakings of various kinds. A tendency to juggle accounts and bring about a desired result by kiting charges among different departments of the municipal government, and omitting from statements sundry items which should be included is very marked in Great Britain, if we may judge from the technical papers devoted to these fields, and numerous examples of the same kind of accounting may be cited in this country.

One of the latest municipal reports to come under the search light is that for the electric lighting plant of St. Joseph, Mich. The report for the Light Committee of St. Joseph for the year 1902 gives:

| | |
|--|-------------|
| Cost of equipment | \$19,103.93 |
| Cost of maintenance, including 4 per cent on cost of plant.. | 4,495.52 |
| Cost per year for each arc light..... | 38.85 |

Under date of March 14th Mr. W. Worth Bean, president and general manager of the St. Joseph & Benton Harbor Electric Railway & Light Co., in order to show the incorrectness of the conclusions which had been drawn from the report of the St. Joseph municipal plant presented by the Light Committee, published side by side with that statement, itemized construction and operating accounts compiled from the public records in which the various accounts are itemized instead of being lumped under the convenient words "supplies" or "sundries" as is done in the committee report.

Mr. Bean found that the committee had made no report covering the period of 27 days before the commencement of the calendar year 1902, that various items properly chargeable to the light account had been charged elsewhere, and that there were numerous errors in the distribution of the expenses between maintenance and construction accounts, and in the basis on which the cost per lamp per year was computed.

The figures which Mr. Bean reached after his analysis show an investment in the plant of \$19,997.95, which is \$852 in excess of the cost reported by the board and nearly 50 per cent in excess of the estimate made before the plant was installed. His analysis of the operating account shows the cost per lamp per year including cost of operation and interest on the investment, without depreciation, to be \$46.83; if depreciation at 7 per cent be included the cost is \$57.96 per lamp; if the depreciation be placed at 10 per cent the cost is \$62.72.

The council of Benton Harbor refused to call a vote for a municipal plant and proposed to contract with Mr. Bean's company.

The Danville (Ill.) Street Railway & Light Co. has inaugurated an express service on its suburban lines. A special car makes three or four trips daily. A material increase in the business has been noted during the past few weeks.

The Seattle Electric Co., Seattle, Wash., recently laid a new steel cable, 19,000 ft. long, on its Madison St. line, to replace the town end of the cable running between the power house and the water front. The work was done between 1 a. m. and daylight, avoiding interruption of the operation of the road.

Track Construction of the International Railway Co. in Buffalo, N. Y.—II.

BY T. W. WILSON.

It has been found that it is not always necessary to cut in a piece of rail in place of a broken joint, as a very neat patch can be welded in a great many cases which gives very satisfactory results.

As an average therefore on all welding done in Buffalo, the breakage has been about 1 per cent.

The welding done in 1901 and 1902 in Rochester and other cities shows even better results, and of 5,308 joints welded in Rochester in 1901, there were but 6 broken rails in the spring of 1902. When

| | | |
|--------------------------|------|-----|
| Rochester, N. Y. | 1901 | 18 |
| Rochester, N. Y. | 1902 | 8.5 |
| Columbus, O. | 1902 | 18 |
| Worcester, Mass. | 1902 | 22 |
| Lowell, Mass. | 1902 | 6.8 |
| Lawrence, Mass. | 1902 | 4.2 |

Total miles welded. 194



EXCAVATING.



LINING TRACK, SHOWING TIES SUSPENDED.

it is considered that the quality of each weld depends entirely upon the personal equation of the welder (since it is by a cherry red color alone that the proper point of fusion is known), it seems wonderful that such remarkable results are achieved.

Roadbed.

There are two types of roadbed used by the International Railway Co., viz: the beam type and the solid type.

In the streets in which toothed asphalt is required by the city a



DISTRIBUTING TIES AND RAILS.



SURFACING TRACK.

The following table shows the mileage of electrically welded track in this country to day

| Place | Year | Mile |
|------------------------|------|------|
| Indianapolis, Pa. | 1897 | 1 |
| Rochester, N. Y. | 1898 | 9 |
| Buffalo, N. Y. | 1899 | 39 |
| Buffalo, N. Y. | 1900 | 60.5 |
| Lawrence, N. Y. | 1900 | 1 |
| Buffalo, N. Y. | 1901 | 6 |

concrete beam about 18 in. wide and 8 in. deep under each rail is used. Concrete consists of 1 part portland cement, 3 parts sand and 5 parts stone. Ties are spaced 5 ft. apart and the odd ties are tamped with old concrete stone and the even ones with concrete. After the beam sets the toothing is laid in a mixture of 1 part cement to 8 parts gravel. The back concrete is then filled in and finally the space between the toothings is asphalted. The solid type is used in streets in which we pave with stone, which, as stated the city has consented to have us substitute for asphalt

Methods of Construction.

Very early on, however, it was realized that in order to keep the welding machine going (which the Lorain Steel Co. always demands under heavy penalty) day and night, it was necessary to devise a method of construction which could be carried along without any



STEEL TIE CONSTRUCTION.

going back over the work, such as tamping the ends of ties with sand in order to surface and line, then concreting centers of ties and finally going back and replacing the sand under the end with concrete.

The welder makes about four joints per hour, or with 60-ft. lengths, about 2,880 ft. per day.

The following was determined upon:

One track was laid at a time, regular traffic being maintained upon the other track by means of portable crossovers at proper intervals. A trench was first excavated 8 ft. wide and 16 in. deep. Steel ties were then distributed, spaced at 10 ft. A wooden tie was placed between each two steel ties, which made a tie at every 5 ft. The rail, which was drilled with only one hole in each end, was then placed on the wooden ties and spiked to gage, plated



9-INCH TRACK SOLID CONCRETE CONSTRUCTION, SHOWING GROUTING GANG.

and bolted with two bolts and the steel ties were raised and fastened to rail with brackets. This completed the track laying. The track was then surfaced and lined on the wood ties, the steel ones remaining suspended in the air above the bottom of the trench. In some cases the steel ties were replaced by wooden ties, and a pocket was excavated every 10 ft. in which the wooden tie was placed.

After spiking, the tie remained suspended above the pocket and was ready for concrete.

Next the concrete gangs appeared dragging the mixing boards (6 ft. x 6 ft. x $\frac{1}{4}$ in. steel) on top of the rail, and filled in the whole trench to about 1 in. above the base of the rail, tamping well under ties and rail. After 72 hours the welder was allowed on the track, the temporary plates and bolts were removed, a bar 1 in. x $3\frac{1}{2}$ in. x 18 in. with one boss at each end (to form the contact points between the bar and the rail) placed, and the rail welded, first in the center, then at each end. The track was then paved with Medina sandstone on gravel cushion and poured with a grout of 1 part portland cement to 2 parts of sand. After 72 hours more the utility equipment removed the surplus dirt and cleaned the street, and regular traffic was turned back on new track and the other track relaid in the same manner. This method proved eminently satisfactory, a maximum of 2,900 ft. of track per day of 10 hours was reached and the organization moved from street to street like a small army. In 1900, two welders were kept busy night and day all summer and a record made of 60½ miles of welded track. Having successfully solved the welding of old and new track, it remained to tackle the proposition of relaying track which had already been welded. This was successfully done, first a short stretch in 1900, and lastly, a long stretch of about 4 miles



TRACK ON BEAM CONSTRUCTION, SHOWING METHOD OF LAYING TOOTHING.

in William St., Buffalo, in 1902. The method of procedure in William St. was as follows:

The asphalt was removed by barring and sledging, the old concrete removed down to bottom of ties, all ties removed, except those at joints and centers, (these were left to stop expansion) new ties were quickly slipped in and spiked, the old joint and center ties removed, tie pockets dug under every alternate tie and the work proceeded as before, except that there was no welding to be done. Some doubts had existed before this last trial as to the practicability of relaying long stretches of track without having it curl up like a loop-de-loop in hot weather, or snap like a pipe stem in cold. In the William St. job we exercised the precautions mentioned and by keeping the concrete gang on the heels of the track layers, not the slightest difficulty was experienced.

In the first old track which was relaid and then welded the joints were staggered. This was found to be a mistake for the reason that the rail was more or less surface bent and the cars, which were of the long double truck design, oscillated from side to side. By laying the rest of the relayers with joints opposite a pitching motion resulted which was not nearly so perceptible or dangerous.

In addition to welding our joints, the ground return around special work has been taken care of by welding or electrically brazing copper ground cables to the rails. For this purpose a copper block $1\frac{1}{2}$ -in. thick with a suitable groove across one face to pass over the cable is provided. The cable is placed against the rail web and the copper block over the cable. The welder is then brought into position, a bessemer steel plate, about $\frac{3}{8}$ -in. thick is interposed be-

tween the copper block and the contact of the welder. This acts as a heat insulation and enables the copper block to be brought up to proper heat for brazing. Hard spelter is used. By this means a 500,000-c. m. cable can be attached to a rail so that the full carrying capacity of the cable is realized, the area of union between the cop-



CLEANING UP.

per and the steel being ample to allow for the difference in carrying capacity of the two metals.

Paving.

Mention has already been made of the Medina sandstone paving, laid on a cushion of gravel and grouted with a mixture of one part

of portland cement and two parts of sand. The quality of the sandstone is excellent and the gritty surface is particularly valuable during the icy months, as a horse's hoof has a much better chance of catching and holding than on smooth granite block. Even in summer it presents a clean sandy surface while the granite block is apt to be greasy and slippery and liable to chip. The wearing quality is excellent and some engineers claim that it will outwear granite, notwithstanding the fact that it is the softer of the two. This is doubtful. The cost of granite in this section of the country of course makes it prohibitive. From present indications, the sandstone paving will outlast the rail.

It is always well to have an ideal in everything, and one may therefore be permitted to think of an ideal track for paved streets. Such a track should be capable of receiving both the small street car wheels and the standard M. C. B. steam treads and flanges but with a groove not too deep to interfere with team travel, and so designed to be self cleaning. The tram or lip should be heavy enough to stand up under heavy trucking and the web thick enough to carry heavy steam cars if necessary. A rail of the same general type as Lorain Section 137-371, 9 in. high, $6\frac{1}{2}$ -in. base, but having a head $3\frac{1}{2}$ in. wide tapering at outer edge, a throat of $1\frac{3}{4}$ in. deep with wide, flaring groove, a Trilby lip and a web 9-16 in. thick, would seem to be an improvement. Then perhaps we may hope to see the time when the electric weld will be applied by a mechanism which will not occupy the track and interfere with the regular service, for after all this is the greatest objection to this style of welding. With these improvements, and perhaps a little better quality of steel rail, we will have at least materially bettered present conditions.

THE VALUE OF FREQUENT SERVICE.

The Detroit United Weekly in a recent issue publishes the following forcible editorial on the "Value of Frequent Service":

"The desire to reach a given destination in the shortest possible time and the mechanical means that have accomplished the realization of that desire have appeared so nearly simultaneously in the growth of society that it is well nigh impossible to tell which of these is cause and which effect. What would happen to the theaters, the schools, the stores, the offices, the courts, and the churches if the old stage coach were once again installed as our sole means of communication of town with town? What would become of our amusement, our business, our education, and our religion? That makes complex and gloomy contemplation. The speed of transit, the annihilation of space in our city and suburban cars have been a stride of the 'seven league boots.'

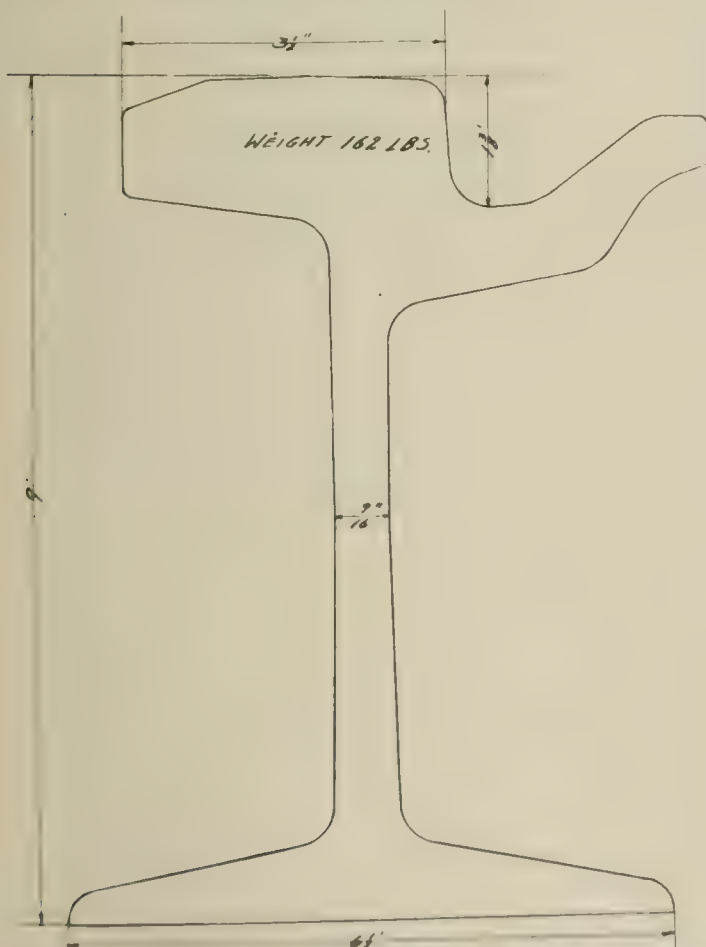
"But as a great stimulus of solid growth it is not as valuable, as indispensable now, as Frequent Service. It is the car following car; your ability to get to any place at any time, to go and come when you please, the chance to adjust your business and pursue your diversion without making all hours and minutes dependent upon a time table. You don't have to make up your mind in the morning where you can go at night. Frequent Service meets the impulse and the emergency of the moment. This is the greatest economic ally of time and exertion."

WATCHMAN ATTACKED BY ROBBERS.

Three would-be robbers entered the Steubenville office of the Wheeling (W. Va.) Traction Co., March 23d, and attacked the watchman who was eating his midnight lunch. They commanded him to hold up his hands. Instead he drew a revolver and fired. The men answered his fire and rushed outside. The Saturday and Sunday receipts, amounting to \$700, were in the office.

The Moline (Ill.) East Moline & Watertown Railway Co. will install loops in each of the three cities to facilitate the handling of large cars.

Beginning March 1st the Houghton County Street Railway Co., Houghton, Mich., increased the wages of all motormen and conductors. For the first three months the scale will be $12\frac{1}{2}$ cents an hour, the next 12 months 20 cents, the next year 21 cents, next two years 22 cents and thereafter 23 cents an hour.



PROPOSED RAIL FOR PAVED STREETS TO ACCOMMODATE BOTH STEAM AND STREET RAILWAY CARS.

UNDERTAKERS ENDORSE THE FUNERAL CAR.

When the funeral car as an adjunct to the service furnished by electric railway companies was first proposed the idea met with more or less opposition from the undertakers, as they, presumably, feared a loss of their commissions on carriage hire if the public generally approved of the funeral car as a substitute for horse-drawn coaches. It is a matter of record, however, that as a class the undertakers have abandoned their opposition to the "trolley funeral" and in all the cities where a funeral car service has been established the undertakers recommend the car in place of coaches owing to the greater comfort, convenience and cheapness thus secured.

As outlined in the February issue of the "Review" the funeral car service at Detroit has been popular and successful and is now endorsed by physicians, the clergy, the public and the undertakers. A leading undertaker of the city recently wrote the company as follows: "I am much pleased with the new funeral car and its appearance; also with the courteous ways of the men in charge. I hope that the general public will soon adopt this method of removal exclusively as it is less confusing, entirely practical and cheap."

NOTES FROM RALEIGH, N. C.

Raleigh, the capital of North Carolina, is a quaint, peaceful, little city which has not yet felt the full tide of commercial activity that is rapidly creating the much talked of "New South." However, the population has practically doubled within the past twenty years, the railroad connections are good, the surrounding territory is being rapidly developed, and if present indications prove true, Raleigh will soon be a commercial center of no insignificant importance. The present population, including suburbs, is about 25,000.

The street railway and electric lighting business of the city is controlled by one company, the Raleigh Electric Co., which is directed by progressive business men of the city, who have in contemplation important extensions to the company's activities. The electric railway system comprises $4\frac{1}{2}$ miles of track, which is arranged in three single track lines that radiate to three distinct districts of the city, and meet at a common triangle in front of the State Capitol buildings. It requires three cars to fill the regular schedule, each car running over each of the three lines in turn, and meeting the other two cars at the triangle every 30 minutes.

The power house and the car barns of the company were destroyed by fire on Dec. 31, 1896, and the plant is now housed in a wooden



TRIANGLE AT STATE CAPITOL, RALEIGH, N. C.

MOTORMAN'S HEROISM REWARDED.

The bravery and presence of mind displayed by Clarence C. Carey, a motorman of the Cincinnati (O.) Traction Co., in risking his life to save others in an accident which took place on the night of February 15th, were substantially rewarded by the president of the company, Mr. W. Kesley Schoepf, at a meeting of the Street Railway Employees' Mutual Protective Association, of Cincinnati. Mr. Schoepf, despite the fact that he was laid up at home with an attack of grip, went to the men's meeting and presented to Mr. Carey a handsome gold watch and chain.

The accident was peculiar. Carey's car was bound up the Clifton Ave. hill, when he saw that the car ahead had become unmanageable and was running away down hill toward him. Instead of jumping, or running his car back down the hill, Mr. Carey put on his current and met the other car before it had time to gain much headway.

Mr. Luke Robinson, former assistant superintendent of the Montreal Street Ry., and the Montreal Park & Island Ry., has been appointed superintendent, vice Mr. M. J. Kennedy, resigned. By general orders the inspectors of the two systems will hereafter report direct to Mr. Robinson, instead of to the division superintendents as formerly.

building, located not far from the triangle in the center of the city.

The power house contains one 125 h. p. Fitchburg engine; two 120-h. p. Ball engines, and one 140-h. p. Armington & Sims engine. These are belted to five General Electric direct-current generators, and No. 9 Brush arc machines which generate alternating current at 1040 volts for the lighting system. Steam is supplied at 150 lb. pressure from three 200-h. p. Stirling boilers. The equipment includes Wainwright feed water heaters; Pratt & Cady valves, and Smith-Vale & Stillwell-Bierce pumps.

One of the engravings shows the method which was employed for raising the 90-ft. steel stack at the power plant. The stack was finished complete before raising. The two wooden towers were then erected as shown, these towers being about 50 ft. high. By means of rope tackle, one end of the stack was first raised as far as possible; the rope was then shifted to the center of the stack, and the chimney was then swung into the erect position.

The car house is about 50x105 ft., with capacity for 11 cars. The building is of wood with pressed steel sides laid on in square plates, and has a gravel roof. The building is protected against fire by the usual hose stands and fire buckets.

The company owns five open motor cars and five closed motor cars, built by the Brill, the Jackson & Sharp, and the Jones Companies. Some of the Brill cars have been rebuilt at the company's shops. In this work the outside car panels were formed of nar-

row pine strips laid lengthwise tongue and groove fashioned, a construction found to be inexpensive and that has held up well in service. Part of the cars are mounted on Peckham trucks and part on Brill double trucks, and the electrical equipment includes G. E. 800 and G. E. 67 motors. The closed cars are equipped with elec-



RAISING 90-FT. STEEL STACK.

tric heaters, part of the Consolidated Car Heating type and part of the H. W. Johns type. The company employs eight conductors, seven motormen, and two car house men.

The track was laid with 30-lb. T rails which are now being gradually replaced with 73-lb. girder rail. The sub-construction is



REBUILT BRILL CAR.

partly clay and partly gravel, the bonding being copper wire bonds with bonding lugs.

The officers of the company are: President W. G. Andrews; vice-president, A. A. Thompson; secretary and superintendent, Charles C. Johnson; treasurer, F. H. Briggs; chief engineer, George L. Womble. The company has capital stock authorized \$150,000, issue \$58,800, and funded debt authorized \$150,000, issued \$58,500.

The Hannibal (Mo.) Railway & Electric Co. has increased the wages of its conductor and motormen one cent per hour and given them, in addition, 2 per cent of the amount of the fares collected.

The interurban trolley line between Omaha and Colfax, Neb., was opened for traffic Friday, February 13th. The line has been completed for some time, but its operation was delayed owing to a disagreement with Colfax citizens regarding the terminal.

MAINTENANCE OF WAY CONVENTION.

The fourth annual meeting of the American Railway, Engineering and Maintenance of Way Association was held in Chicago, March 17th, to 19th. There were many interesting reports read, most of which were applicable only to steam railroad work. The reports and discussions on Track, Ballasting and Ties, however, will be found of interest to electric railway engineers, and we give herewith abstracts of these papers.

TRACK.

The report on Track was divided into four sections, namely: Definitions, Maintenance of Line, Maintenance of Surface, Maintenance of Gage. Part 1 of the report included definitions of alignment, curves, curve easement, curve simple, curve vertical, elevation, gage, level, line, surface, tangent and track.

Part 2 considered the maintenance of line. In regard to the adjustment of tangents the committee recommended that tangents shall be adjusted by throwing the tangents between summits, between curves, or by throwing the curves to meet the tangents, or by partially throwing curves and partially throwing tangents, as may produce the least work. Centers shall be set with the transit to insure accurate line. The committee recommended easement curves to be used as follows:

For speed not exceeding 30 miles per hour on all curves exceeding 2°. For speed not exceeding 60 miles per hour on all curves exceeding 1°. Where higher speed is attained, on all curves exceeding 30'. Easement curves shall be used between curves of different degree in the same way that they are used between curves and tangents. The length of easement curves shall be the same as the distance in which the curve elevation is run out; therefore, as the super-elevation of the curves depends not alone on the degree but also on the speed of trains the length of the easement curves should vary in the same manner.

For ordinary practice a chord length equivalent to 100 ft. for each degree of variation in curvature is recommended, but where the conditions will not allow this a chord length of 25 to 30 ft. may be used. For very high speed roads a chord length equivalent to 150 ft. or more per degree of variation is recommended, the essential point being that the length of the easement curve shall be the same as the distance in which the elevation of the outer rail is raised from zero to full elevation.

The method recommended for securing and maintaining perfect line is to place permanent witnesses at points of tangents, points of spiral, points of change of curvature, summits, and at such other points along curves or tangents as will enable the alignment to be identically reproduced with a transit.

Part 3 of the report treats of maintenance of surface. The committee advises that the following approximate formula be used for determining the elevation of curves with special consideration as to the amount and beginning and end of elevation as modified by location of curves and conditions of traffic.

$$e = \frac{G v^2}{32.16 R}$$

in which e = elevation in feet, G = gage of track in feet, v = velocity in feet per second, R = radius of curve in feet. This formula will give practically correct theoretical elevation for the outer rail of curves and is recommended for ordinary practice, but must be modified to suit special conditions. In general as a matter of safety preference should be given to fast passenger traffic. The slower freight traffic must also be considered, as it often happens that on freight lines the correct elevation for passenger service would be so excessive for freight service that the increased train resistance would materially reduce the tonnage hauled. In this case a compromise must be made between the two rates of speed and the curve elevation used will be theoretically too small for passenger service but practicable for freight service. The practice of running over curves at a speed greatly in excess of the speed for which they are elevated should be avoided, as it results in increased flange and rail wear and cost of maintenance. The curves cannot ride perfectly and the danger of accident is increased. The maximum allowable elevation of curves depends on local conditions. On fast passenger roads where crushed stone or other stiff ballast is used a difference

an elevation of 8 in. is successfully maintained and the committee recommended that this figure be adopted as a maximum, and when greater elevation is required speed shall be reduced until the 8-in. elevation gives satisfactory results. The inner rail shall be maintained at grade.

The use of vertical curves wherever changes occur in the rate of grade is so universal that it does not seem necessary to enter into a discussion of it. From reports from various roads received by the committee the balance of opinion favors a vertical curve between the limits of 200 and 900 ft. in length; the balance of opinion is also in favor of a rate in change of grade varying between 0.1 on summits and 0.05 on sags, and that a parabola or some modified form of this curve be used in the majority of cases. There is no satisfactory theoretical basis on which this question can be discussed.

Concerning the proper methods of tamping the committee recommends for earth or clay ballast the following tools: Shovel equipped with iron cuff or handle for tamping, and broad pointed tamping bars. Tamp each tie from 18 in. inside of the rail to end of tie with handle of shovel or tamping bar. If possible, tamp the end of the tie outside of rail first and let trains pass over before tamping inside of rail; give special attention to tamping under the rail; tamp center of ties loosely with the blade of the shovel; the dirt or clay between the ties must be placed in layers and firmly packed with feet or otherwise, so that it will quickly shed the water; the earth must not be banked above the bottom of the ends of the ties; the filling between the ties must not touch the rail and should be as high as, or higher than, the top of the ties in the middle of the track.

For cinder ballast the tools recommended are a shovel, tamping bar, or tamping pick. The work is the same as for gravel.

For burnt clay ballast the tools should be a shovel only, for soft material; when burnt very hard tamping pick or bar should be used. The ties should be tamped 15 in. inside of rail to end of the tie, tamping the end first and letting train pass before tamping inside of rail; tamp center loosely; tamp well between the ties; dress ballast same as for earth or cinders.

For broken stone or furnace slag the tools should be a shovel, tamping pick and stone fork. Tamp 15 in. inside of rail to end of tie and if possible tamp the end of the tie outside of rail first and allow train to pass over before tamping inside. Tamp well under the rail; tamp well under the tie from end of same; do not tamp center of tie; fill in between ties to top of tie and bank ballast into shoulder about the end of the ties level with the top of tie.

For chat, gravel or chert ballast the tools should be a shovel, tamping pick, or tamping bar. For light traffic shovel tamping is sufficient. For heavy traffic the tamping pick or tamping bar should be used. The tamping bar is recommended instead of the pick for ordinary work. Tamp solid from a point 15 in. inside of rail to the end of the tie, if possible, tamp the end of the tie outside of the rail first and allow train to pass over before tamping inside of rail; care must be taken not to disturb the old bed. The tie must be tamped solidly from the end using pick or tamping bar. After train has passed the center of the tie shall be loosely tamped with the blade of the shovel. Whether the material shall be banked around the ends of the ties or not will depend upon how well the ballast will drain.

Part 4 of the report relates to maintenance of gage. The report gives some historical data in regard to gages of some of the early railways. The earliest roads of which a record can be found used a 4 ft. 8½-in. gage to fit the wagons then in use. After many changes of gage the first one used finally became standard in Great Britain and is now standard for more than 200,000 miles of railroad in this country. In spiking, the standard gage tool shall be used and the rail held against the gage with a bar while the spike is being driven. Within proper limits a slight variation of the gage from standard is not seriously objectionable provided the variation is uniform and constant over long distances. Under ordinary conditions it is not necessary to regage such track when the increase in gage has not amounted to more than ¾ in. All spikes shall be started straight and so driven that the face of the spike shall come in contact with the base of the rail; the spike should never have to be straightened while being driven. Outside spikes of both rails shall be on the same side of the tie and inside spikes on the opposite side of the tie. The inside and outside spikes shall be separated as far as the tie will permit. The ordinary practice shall be to drive the spike 2½ in.

from the outer edge of the tie. The allowance, if any, in gage of curves varies widely in different parts of the country and the committee did not feel justified in making any recommendations on this subject at the present time.

To prevent spreading of track and canting of rails on curves the committee recommends for heavy traffic the use of tie plates on all ties on curves; for medium traffic tie plates on all curves over 3°; for light traffic double spike the outside of rails. Tie plates are recommended in preference to rail braces, except for guard rails and stop rails at switches, where the latter should be used.

The report was signed by W. P. Poland, F. R. Coates, John Doyle, Garrett Davis, C. B. Hoyt, H. C. Landon, G. A. Mountain, D. Mac Pherson, J. C. Sesser.

BALLASTING.

In the early construction of railroads we find cases where short rails were pinned to the top of stone posts set in the ground and even stone ties or sleepers were sometimes used to which to fasten the rails. This construction was followed by strap iron on wooden stringers supported on transverse wooden mud-sills. With these primitive forms of construction there was no necessity for ballast but with their abandonment and the adoption of the usual form of rails and cross ties the necessity of tamping to maintain line and surface came in and with it the necessity of ballasting.

Gravel was the most available material obtainable and was used in places where the natural material was of a soft or clayey nature. If no good gravel was obtainable stone, usually hand broken, and refuse from mills and mines that was hard enough to resist crushing were used. This brought cinder, slag and tailings into use. Eventually the demand for ballast where none of the above-mentioned materials were obtainable led to the use of burnt clay, probably suggested by the manufacture of brick. Of all the railroad mileage in the country less than half has any ballast at all and of that ballasted more than half is gravel. Next in amount of use is cinders and slag, then broken stone, then mine tailings and finally burnt clay.

After defining the various kinds of ballast the committee presented specifications for the various kinds in use.

Engine Cinders. There seem to be no specifications possible for cinder ballast but if cinders are wet down immediately after being drawn they will make better ballast than if allowed to continue to burn. Cinders make good ballast for sidings, yards and lines of light traffic; they make a good ballast on new work where dumps are settling; they are good in wet places; they are good on temporary work; they are easily handled. Anthracite cinders are better than those from soft coal and there is considerable difference in those obtained from different kinds of soft coal. The chemical action tending to destroy rails and ties varies greatly but the effect on both is injurious to a greater or less extent. They should not be used on main lines subject to heavy traffic.

Stone Ballast. This should be durable enough to resist the disintegrating influences of the climate where it is used; it should be hard enough to prevent pulverizing under the traffic to which it is subjected; it should break in angular pieces when crushed. It is recommended that the maximum size of ballast shall not exceed pieces which will pass through a 1¼-in. ring, but a ring of 1½ in. diameter is preferred as the maximum measure of size. It is recommended that the minimum size will not pass through a screen with ¼-in. holes. A minimum thickness of 6 in. under the tie is to be considered as ballasted track, but a minimum of 8 in. under the tie is preferred; the extreme maximum thickness of 18 in. under the tie is recommended with an ordinary maximum of 12 in. The upper surface of the ballast should be level with the top of the tie and should extend 9 in. beyond the ends of the ties; the slope should not be deeper than 1½ to 1.

Burnt Clay. This is of quite recent use and practically confined to the territory in the central basin of the country where sufficient quantities of stone or gravel cannot be obtained without excessive cost. It should be made from clay free from sand or soil and should be thoroughly tested in small test kilns before establishing a ballast kiln. Clay must be thoroughly burnt and coal must be fresh and clean enough to burn with a clean fire; quantity of fuel and time of burning will vary with the nature of the clay and weather conditions; burning should be done under supervision of a competent burner and fuel should always be on hand when re-

quired; ballast should not be loaded out of the pit hot; absorption of water should not exceed 15 per cent. Where fuel is cheap and suitable material can be obtained clay ballast can be made at about the same cost as crushed rock. The cost for putting it under the track is much less than for stone.

Gravel Ballast. This being a natural product no specifications can be made upon which a given deposit could be accepted or rejected. Whether a given deposit of gravel is of any value as ballast will depend on the results of tests. To make good ballast it must be composed of firm particles that will not readily decay and varying in size from coarse sand to $1\frac{1}{2}$ in. in diameter. It must be sufficiently free from clay and soil to allow drainage. Gravel ballast of irregular boulders containing considerable clay can be made into first-class gravel usually by passing it through a washer and crusher, the larger boulders being crushed into small, irregular masses, giving a superior holding quality on the tie. The washing will make the ballast drain so it will not churn in wet weather. The report defines ballasted track as track which is held in line and surface by selected material placed above the roadbed in which the ties are imbedded.

In conclusion it is stated that very little of the railroad mileage of the country can be maintained satisfactorily with the material which forms the roadbed. Almost always selected material is demanded that must be transported and put into the track. There is a great variety of natural or artificial material obtainable in various localities that meets the demands more or less perfectly and which it is good policy to use. With the increase of speed and weight of engines and cars the duty called for on ballast has grown more exacting, and materials that gave satisfactory results under 30,000-lb. axle loads fail in a short time under 45,000 and 50,000-lb. axle loads now coming into use. Except where an exceptionally good quality of gravel is obtainable it is the opinion of the committee that only stone ballast of proper size and having a depth of 12 in. under the tie, resting on a well-drained roadbed, will meet the requirements of roads with heavy traffic, largest engines and fast service.

There are several causes for the failure of ballast. It may not stand the action of the weather. This is true of certain kinds of stone and most artificial ballast. It may not have sufficient strength to resist pressure or it may wear out and become pulverized by the grinding of the pieces against each other and from frequent tamping. This is more or less true of all ballast but is less marked in good stone and gravel than with other varieties. It may fail for want of weight or cohesion and be blown or washed away, and fail to hold the ties in position. It may fail on account of a large part of the pieces being of a globular shape with smooth surfaces which allow the pieces to move as well as the tie, or the failure may be from want of support from below, especially if the roadbed becomes concave and has defective drainage.

The report was signed by E. Holbrook, F. A. Molitor, S. B. Fisher, J. V. Hanna, C. A. Paquette, N. P. Paret, W. B. Storey, Jr., G. M. Walker, Jr., H. U. Wallace.

TIES.

The report of the committee on ties stated that there was a wide difference in the terms applicable to the various kinds of ties and their conditions and gave the following definitions which represent what the committee believes to be the best and most general usage:

Fapped Tie.—A tie made from a tree from which the resin or turpentine has been extracted before felling.

Pole Tie.—A tie made from a tree of such size that only one tie can be made from a section. Such a tie generally shows sap wood on two sides.

Split Tie.—A tie made from a tree of such size that only two ties can be made from a section.

Quartered Tie.—A tie made from a tree of such size that only four ties can be made from a section.

Slab Tie.—A tie hewn or sawn on top and bottom only.

Sap Tie.—A tie which shows more than the prescribed amount of sap wood in cross section.

Heart Tie.—A tie which shows sap wood only on the corner and which sap wood does not measure more than 1 in. on line drawn diagonally across end of tie.

Strict Heart Tie.—A tie which shows no sap wood in cross section.

Wave Tie.—A tie which has a bend or crook in its length.

Wind Shake.—A defect in timber caused by action of wind on the growing tree resulting in the distortion or separation of the fibers.

Doty Tie.—A tie which contains dote or dry rot.

Pecky Tie.—A tie made from the cypress tree which is affected with a fungus disease known locally as "peck." This does not necessarily affect the usefulness of the tie.

Score Marks.—Marks made by the ax as a guide for hewing.

Tie Plate.—Something interposed between the rail and the tie to prevent the wear of the tie.

Much of the data received by the committee in regard to the specifications of untreated ties and the inspection and classification of the same was received so late that time did not permit it to be formulated into typical specifications, hence this subject was continued for a succeeding report. A large number of responses were received in reply to requests for statistics on tie renewals and associated points, which will be published in tabular form in the Proceedings of the Association.

In regard to preservative processes the data gathered for this year's report confirm the statements heretofore given as to the average life of treated ties in this country. The records of treated ties for several roads were given as follows: On the Atchison, Topeka & Santa Fe Ry. the treated ties removed between 1897 and 1901 showed an average life of from 10.18 to 10.78 years. On the Chicago, Rock Island & Pacific Ry. the treated ties renewed in 1901 show an average life on that road east of the Missouri River of 10.66 years and it is estimated at one year more west of the Missouri River. On the Southern Pacific (Atlantic System) all the treated ties laid from 1887 to 1889 had been removed; 17 per cent of the 1890, 64 per cent of the 1891, 83 per cent of the 1892, and 90 per cent of the 1893 ties are reported to be still in the track. On the Southern Pacific (Pacific System) 85 per cent of the ties laid in 1894, 75 per cent of the 1895, 85 per cent of the 1896, 94 per cent of the 1897 and 98 per cent of the 1898 are still in the track. On the Pennsylvania lines west of Pittsburg the ties removed on account of decay have had an average life from 8.8 to 9.2 years.

While it is not improbable that some new methods of preserving ties may prove of value it is assumed that the railroads will chiefly hold to the processes which have stood the test of time; these are creosoting, zinc-creosoting, Burnettizing and the zinc-tannin or Wellhouse process. It is desirable to emphasize the necessity for careful and conscientious supervision of the operation of a timber-treating plant. The value of treated timber when exposed to the elements depends upon a number of conditions such as the kind of wood, its treatment and its subsequent exposure, as well as the process which may have been adopted. Most important of all is the thoroughness with which the work is done. Although the processes are apparently simple experience has shown that there are quite a number of precautions necessary to produce good work.

In Europe ties are universally seasoned until fit for treatment. In the United States there is divergence of opinions. The Southern Pacific company claims that ties of Oregon fir are best impregnated fresh cut. This may be the result of resin and slimy sap in the wood which does not resist the entrance of the chemicals when limpid, but dries in the pores and gums the outer surfaces. In Germany the difficulty is met by sawing off thin slabs from each end of telegraph poles which have been seasoned before treating them, as the impregnating fluid chiefly enters at the ends and not from the side surfaces. The best way of governing the seasoning required for American woods will be to establish by experiment their weight per cubic foot when in condition to be impregnated throughout. This may be ascertained by chemical analysis of borings from the center, quarters and ends of treated ties allowed to season for varying times before treatment. Room must be made in the wood for the solution either by the natural seasoning or by extracting the sap.

Ties of different seasonings should not be mixed. This is obvious enough and yet is frequently disregarded. When ties of different degrees of seasoning are treated in one retort some will absorb more than others and the treatment will not be uniform.

It is assumed that for the present the chief processes used in the United States will involve the injection of chloride of zinc. The present German practice is to inject the equivalent of half a pound

of the dry set of chloride of zinc per cubic foot of wood. This was arrived at after some disappointing experiences with lesser amounts and it seems well to follow this practice.

Ties being generally cut in winter become better seasoned in the late summer and autumn. The strength of the solution should then be reduced so as to inject the same equivalent of dry chloride as before. If the amount determined on is injected the weaker the solution the better, for it is more thoroughly distributed in the wood. The universal practice in Germany is to weigh each buggy-load of 32 ties before running it into the retort and to weigh it again afterwards, thus ascertaining just how much solution has been injected into each log. If the lot has not absorbed enough it is put back into the retort and treated the second time. The committee especially recommends the use of dating nails or some other method for identifying ties so that an accurate record of the life of the ties can be kept.

The report was signed by E. B. Cushing, Robert Bell, W. Archer, J. B. Berry, O. Chanute, W. W. Curtis, R. R. Hammond, E. E. Hart, W. W. Hayden, C. C. Mallard, J. C. Nelson, S. M. Rowe.

TRADE MARK FOR DETROIT UNITED RY.

In January last the Detroit United Ry., realizing the desirability of having some distinctive emblem to mark the property, stationery and general literature of the company, decided to adopt an appropriate trade mark and invited the public to assist in the selection of a suitable trade mark design. It advertised for suggestive sketches and offered to pay the sum of \$25 for the design accepted. Particular emphasis was laid upon the necessity of simplicity in the design, and complex groups, lengthy mottoes or inscriptions were not considered.



In response to this invitation, the company received about 500 different designs, and has finally selected a simple arrangement of the words "Detroit United Railway" as being the most suitable for all the uses desired. The three words appear in white against a solid background, this arrangement giving an

attractive appearance and further being capable of adjustment to all the color effects desired. At the same time is so clearly individual in its application as to leave no doubt as to its purpose or ownership. For the printer, engraver and painter, it is easy of reproduction, and whether upon a letter head, check, panel or any other place to which it is adapted, its significance cannot be mistaken. It is to be accepted as the official trade mark of the company, and will appear on all its property and stationery, and wherever a distinguishing mark is desired. The design is original with Mr. William J. Ryan, of Detroit, who has been awarded the \$25 prize money.

This idea of a distinctive trade mark for electric railway companies appears to be a capital idea, as emblems and designs for this purpose have been used by railroad companies, steamboat companies and other large corporations, and it would appear highly desirable that the individual electric railway companies adopt a monogram or trade mark that will distinguish their property, stationery and advertisements from other corporations in the same locality.

The Jersey Shore (Pa.) Electric Street Railway Co. recently received the engine for its new power house.

A bill was recently introduced in the Alabama state senate authorizing street and interurban railways to extend their lines into Alabama from other states, and to sell current for power and heating. Its special purpose is to enable the Columbus (Ga.) Railroad Co. to enter Phenix, Ala.

PRIVILEGES FOR ELECTRICAL STUDENTS.

The American Institute of Electrical Engineers, New York City, has arranged to extend certain privileges to all those who are regularly pursuing studies in electrical engineering, such individuals to be designated as "Students of the American Institute of Electrical Engineers." Local or branch meetings of the Institute have been established in connection with the following institutions: Massachusetts Institute of Technology, Union, Lehigh, Cornell, Columbian, Ohio State and Purdue Universities, Pennsylvania State College, Western University of Pennsylvania and the Universities of Cincinnati, Illinois, Wisconsin, Missouri and Minnesota. The papers presented at the New York meetings, together with the discussions, are furnished to the branch meetings.

Privileges extended to students include those of being present at all but the business meetings of the Institute, of receiving the regular announcements and printed copies of monthly transactions, and of purchasing the semi-annual bound volumes of the Institute transactions at a moderate cost. The conditions imposed require proper endorsement and the payment of an annual sum of three dollars for the privileges. No student shall have the privileges for more than three years.

THROUGH LINE FROM CHICAGO TO TOLEDO.

The Toledo & Interurban Railway Co., of Toledo, O., recently incorporated, intends to build a line from Pioneer, O., to Goshen, Ind., connecting at Goshen with the Indiana Railway Co. At South Bend this latter road connects with the projected Chicago & Indiana Air Line Co. At Pioneer the new line is to connect with the Toledo & Western Railway Co. The Garrett, Auburn & Northern Railway Co. runs from Fort Wayne to a point between Pioneer and Goshen on the new interurban line and will be eventually consolidated with the latter. The Garrett, Auburn & Northern connects at Fort Wayne with the lines running to Indianapolis. This chain of roads will not only give a through line from Toledo to Chicago, but gives a line from Chicago to Indianapolis and from Toledo to Indianapolis. The material has been ordered for the Toledo and Chicago interurban and for the Garrett, Auburn & Northern. The two roads will cost \$1,800,000.

NEW CARS FOR THE TOLEDO RAILWAYS & LIGHT CO.

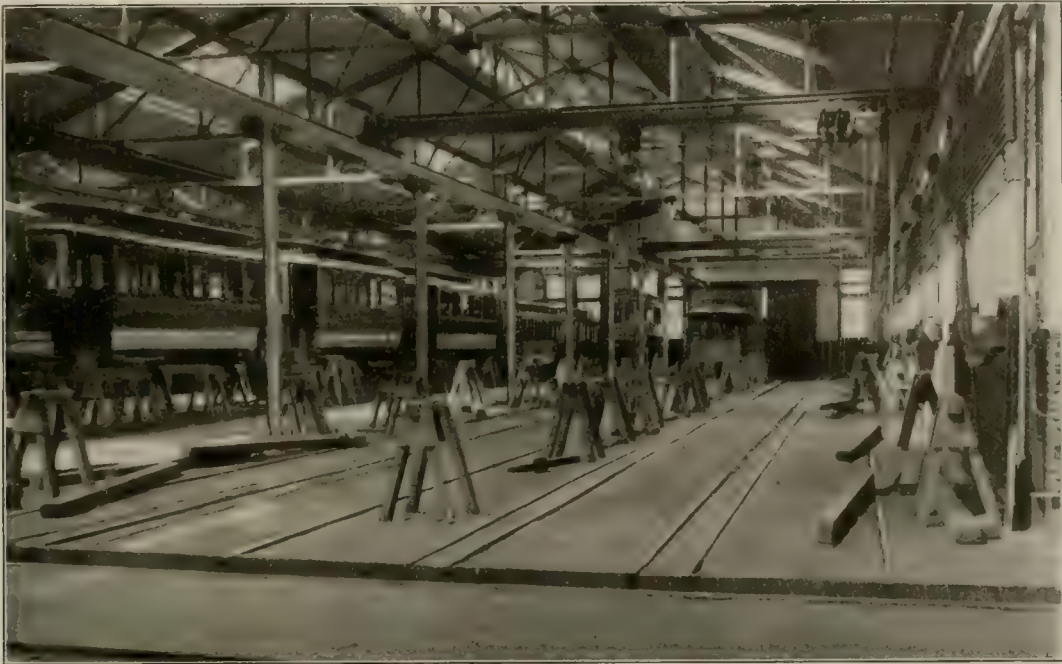
The Toledo Railways & Light Co. has recently ordered 40 new cars of which the G. C. Kuhlman Car Co. is building 30 and the J. G. Brill Co. is building 10. The Kuhlman cars are of the closed type, having cross seats with center aisle. The front platform is vestibuled and is enclosed on either side by folding doors. The rear platforms are unusually long and of the style known as the "Detroit" platform. This is divided into two sections, by means of a pipe railing. The part of the platform in front of the railing is used exclusively for egress and ingress to the car, while that part to the rear of the railing provides standing room equal to about the size of an ordinary car platform for those wishing to ride outside. The cars are designed to run with the vestibule end always forward and steps are provided on only one side of the platform. The dasher extends around the opposite side of the platform and sufficient space is left between the end of the cross railing and the inside of the platform to allow a passenger to pass around the railing. The cars are handsomely finished and decorated. The Brill cars are similar in general design to the Kuhlman cars, the length of the bodies being 32 ft. 4½ in. and the width over all 8 ft. The front platform is vestibuled and entrance to the front door of the car, which is on one side of the center, is made without passing through the motorman's compartment. The rear platforms are of the "Detroit" type. In the rear of the car are two longitudinal seats extending about one-third of the length of the body and there are eight transverse seats on each side of the center aisle in the remaining portion of this car. The car is heated with Peter Smith hot water heaters and the windows are built with upper and lower sash.

By a close vote the Missouri Legislature has decided that there shall be no "Jim Crow" cars in that state.

Kensington Shops of the Union Traction Co., Philadelphia.

All the car repair work for the Union Traction Co., of Philadelphia is at present carried on at two main repair shops, one at 8th

ing the entire block at the junction of Kensington and Cumberland. The company has adopted the policy of making many of its own



JACKING UP DEPARTMENT.

and Dauphin Streets, under the charge of Mr. R. G. Oliver, master mechanic, and one at Kensington and Cumberland Avenues in charge of Mr. Frank H. Wampler, master mechanic. Mr. Oliver takes care of most of the car painting, repairs to car bodies, car-

supplies, and these shops form practically a large manufacturing establishment.

The Union Traction Co. has abandoned the use of repair pits, except in the department devoted exclusively to the overhauling and



MACHINE SHOP AND OVERHAULING DEPARTMENT.

penter work, etc., and Mr. Wampler has charge of most of the electrical repairs and repairs of trucks.

The Kensington shops occupy a three-story brick building, cover-

repairs of trucks. When cars are brought in for repair, they go first to the "jack-up" room. Here the bodies are lifted from the trucks by means of a traveling electric hoist and crane, and are

used in the transfer truck. It was made from a Bemis single truck from which the side bars were removed, and the pedestal yokes brought close together giving a very short wheel base. On the truck is mounted

at one end a low cap made of sheet metal in which the boy sits who operates the transfer truck. With this contrivance the operator can run the transfer truck under the car and not behind as they do on the wooden tracks, and

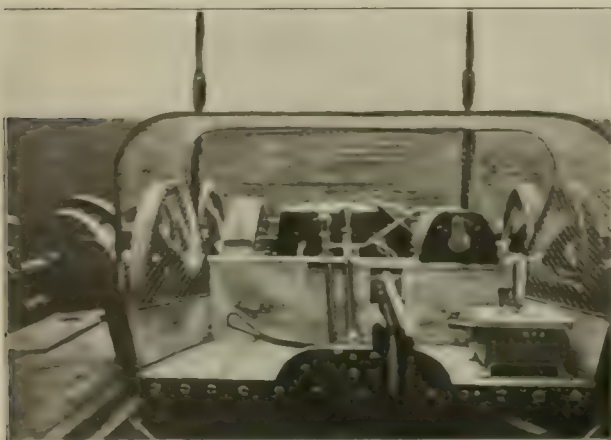


BEARING DEPARTMENT
WOODWORKING SHOP

WINDING ROOM
BLACKSMITH SHOP

the truck. The controller is placed in a horizontal position, and the handle is thrown by a lever located in the cab. There are three positions of the controller handle, off, on, and reverse, and for the purpose of starting slowly when necessary a rheostat box and a set

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TRANSFER TRUCK WITH METAL CAP REMOVED



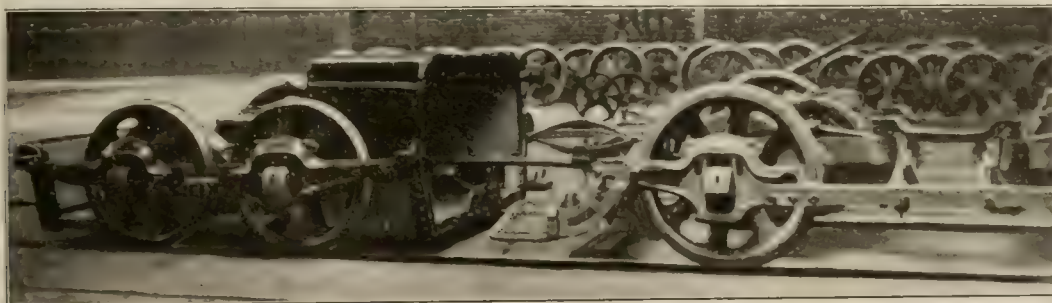
TRANSFER TRUCK SHOWING RESISTANCE COILS

one G. E. 800 motor, and at one end is a low enclosed cap made of sheet metal in which the boy sits who operates the transfer truck. With this contrivance the operator can run the transfer truck under the car and not behind as they do on the wooden tracks, and

at one end is a low enclosed cap made of sheet metal in which the boy sits who operates the transfer truck. With this contrivance the operator can run the transfer truck under the car and not behind as they do on the wooden tracks, and

each track. The top of the third rail is about 2 in. below the floor level and there is no chance of mishap through accidental contact.

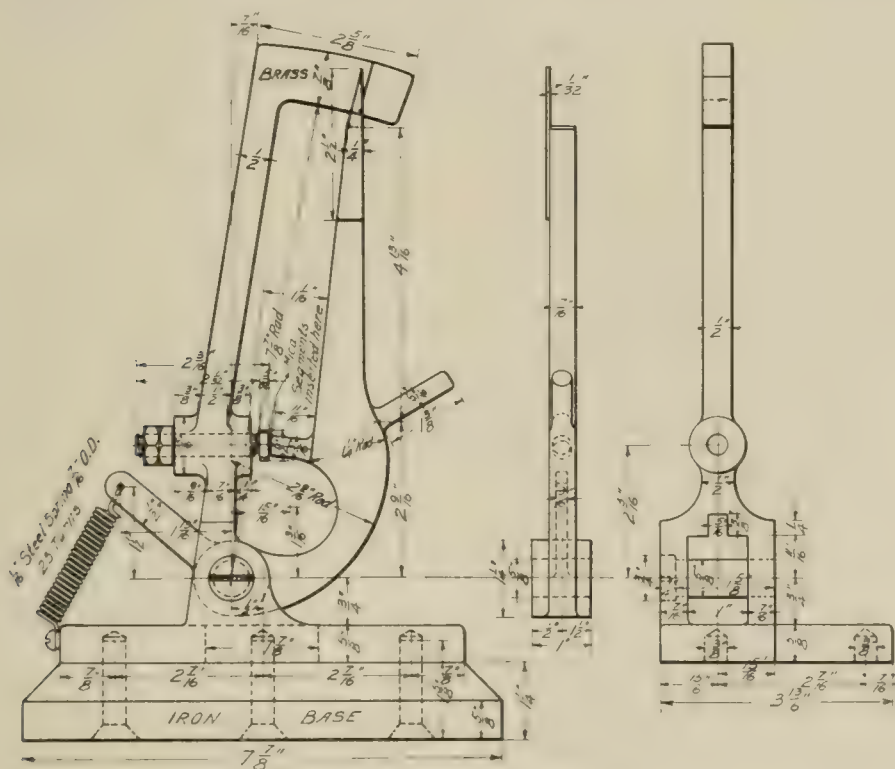
tools. This room is also fully equipped with overhead compressed air hoists, arranged to travel from one end of the room to the other,



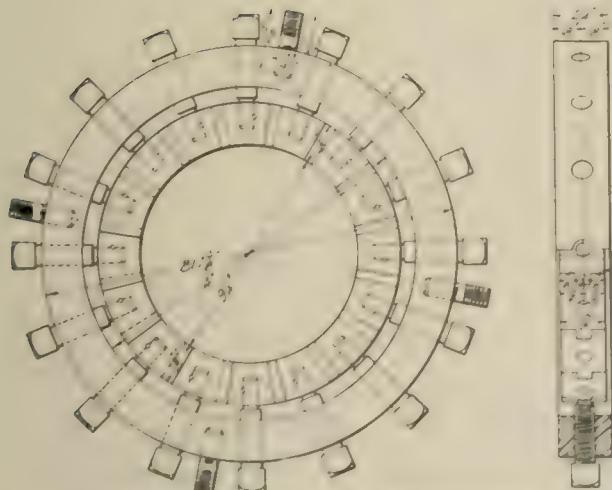
TRANSFER TRUCK IN OPERATION.

The room in which the truck repairs are made is provided with various kinds of lathes, and a great variety of labor-saving machine

and also across the shop from track to track. These hoists are used for lifting and carrying motors and wheels and truck parts.



GAGE FOR MICA SEGMENTS.



CLAMP FOR BUILDING UP COMMUTATORS.

The company pours all its babbitt bearings for the various styles of equipments used on the system. The boxes are poured in a special frame which was fully described in the "Review" for June 15, 1901. The frame comprises a hexagonal iron frame having rigidly fastened on each face a one-half cylindrical mandrel or core around which is placed the bearing shell to be poured. The shell is held in place by an iron-piece conforming closely to the outer contour of the shell, and fastened to the frame by two taper pins, which when driven home, hold the shell at a distance from the core mould corresponding with the thickness of the babbitt lining desired. To facilitate pouring, the frame is placed on a revolving table, enabling the founder to pour each bearing in rotation without moving his position. With this style of pouring table one man pours all the bearings for 3,000 equipments. The table is shown in the illustrations of the bearing department. The company does not bore the babbitt bearings after pouring.

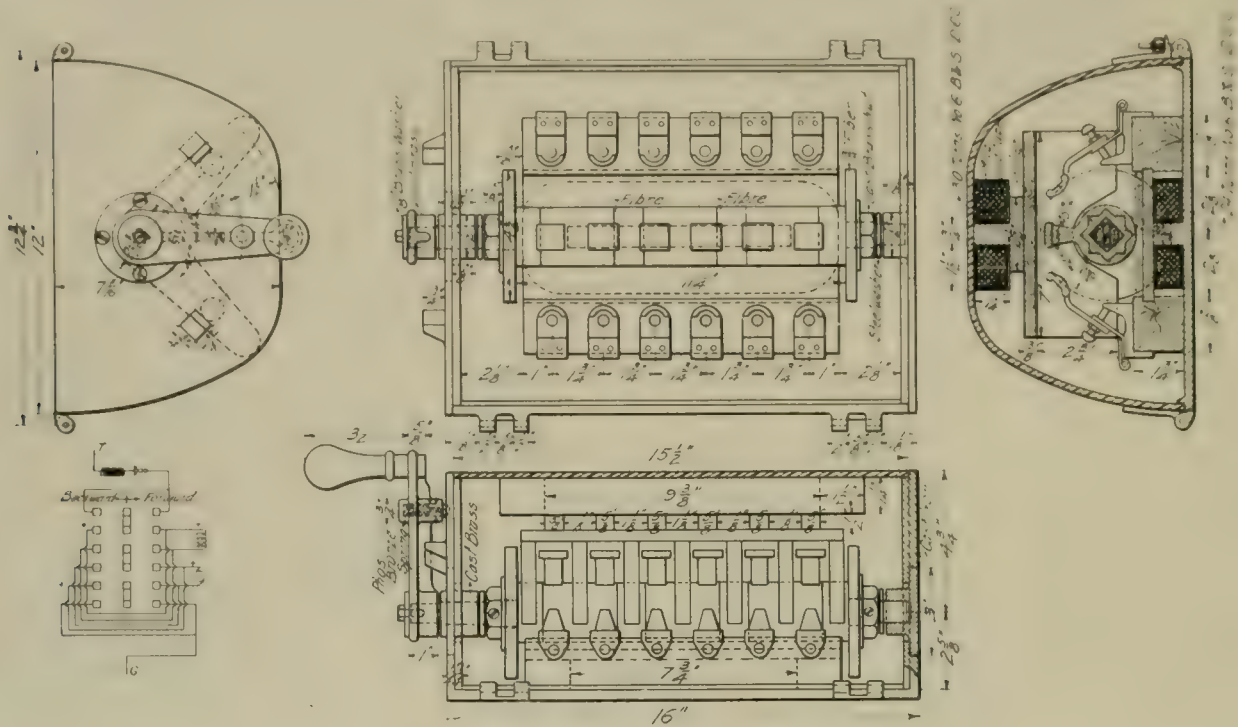
All the motors on the system are wound and repaired at these shops. The company makes the coils having its own forms, winding machines, etc. Repaired armatures are not baked, but care is taken in the manufacture of the coils to thoroughly dry them after

each dipping. For drying purposes the shop is provided with a large oven made of sheets of expanded metal with layers of asbestos between.

Worn out commutators are refilled and assembled at these shops. In this work the regular methods of commutator manufacture are followed. A working drawing of the clamping rings for repairing C. T. See commutators and the Westinghouse No. 3 commutators are reproduced herewith.

To facilitate the work of gaging mica sheets for commutator repair work, the master mechanic has devised a gaging machine, work-

is insulated by molded mica. This metal case or shell is securely bolted to the frame of the machine. The armature is 20 in. in diameter and is of the slotted drum type, the core being assembled on the spider on which the commutator is also carried. It has 53 slots and 159 coils, each of which consists of a single turn of copper strap. Coils are held in the slots by wedges of special unshrinkable material. The armature insulation consists essentially of mica, which extends between the turns at all points. The commutator bars are of hard-drawn copper and have solid necks raised above the surface of the commutator with milled slots into which



CONTROLLER FOR TRANSFER TRUCK.

ing drawings for which are also reproduced herewith. The indicator finger is first set to give the desired thickness of mica, and a boy then makes up the sheets of mica to the desired thickness by placing segments together in the machine, and adding pieces until the finger points at the prearranged mark.

WESTINGHOUSE MOTORS FOR NEW YORK SUBWAY.

The Interborough Rapid Transit Co., which has divided its order for car motors between the Westinghouse and the General Electric companies, will operate trains of two classes, five-car local trains and eight-car express trains. The former will make an average speed of 16 miles per hour and the latter 25 miles or more per hour. Each motor car will be equipped with two motors. The Westinghouse motors for this service are known as No. 86 motors and are unusually small in size for their output. The nominal capacity of each motor is 300 amperes at 570 volts, or about 200 h. p. The motors are designed to operate with voltages up to 625 and to carry up to 500 amperes without injurious sparking.

The field frame is of cast steel divided on the line of centers of armature and axle and completely surrounding the axle, thus doing away with separate axle bearing caps. The two halves are held together by eight bolts and by removing these the top half of the field can be readily lifted off. The lower half is suspended from the axle by stirrups permanently attached to axle bearings. The pole pieces are laminated steel riveted between heavy end plates and secured to the frame by three bolts, which terminate in a long nut inside the pole pieces. The field coils are of copper strap wound on edge and insulated between turns by asbestos and mica. The completed coil is sealed in a curved metal case from which it

the armature bars are tightly soldered. The mica segments and the ring which separates the bars from the spider are 1-16 in. thick and the wearing surface of the commutator is 16 7/8 in. in diameter and 9 7/8 in. long. They are of a depth which allows a reduction in diameter of 2 in.

The brush holders, which carry three carbon brushes each, are cast brass arms independently bolted to the frame by special "Vulcabeston" headed bolts. Copper clips are bolted to the carbon and these clips are connected by flexible shunts to the body of the brush holder, thus relieving the springs from carrying the current. Each brush holder can easily be removed through the opening above the commutator by loosening one bolt. The completed motor will stand an insulation test between winding and frame of 4,500 volts alternating current momentarily, or of 3,000 volts for one minute.

The armature bearings are contained in housings which are securely held between the halves of the field and frame. These bearings are provided with drip grooves into which oil is thrown by wiper rings on the shaft. The boxes are of phosphor bronze lined with babbitt, well grooved for oil. The gears are solid, of cast steel, with cut teeth, and the pinions are forged steel. The gear case is made of malleable iron planed to a tight joint with an opening at the top having a hinged cover. The design is such that the motor can be easily dismantled without the use of special tools, and the total weight of the motor, gear, gear case, etc., is about 6,600 lb.

The Greenwich (Conn.) Tramway Co.'s line from Mianus to Sound Beach was opened to traffic last month. At Sound Beach connection is made with the Stamford Street Railroad Co., and there is now only one break in continuous trolley service between New York and Boston. That is the other side of New Haven. The fare from New York to Stamford is 38 cents.

RECENT STREET RAILWAY DECISIONS.

EDITED BY J. L. ROSENBERGER, ATTORNEY AT LAW, CHICAGO.

LIABILITY FOR INJURY TO FEELINGS AND SENSIBILITIES OF PASSENGER BY WRONGFUL EXPULSION FROM CAR.

Mabry v. City Electric Railway Co. (Ga.), 42 S. E. Rep. 1025. Dec. 10, 1902.

A street railway company, the supreme court of Georgia holds, is liable in damages for an injury to the feelings and sensibilities of a passenger, caused by his wrongful expulsion from one of its cars, though such passenger may not have received any physical injury thereby.

JURISDICTION TO DETERMINE SUBMITTED QUESTION OF MODE OF CROSSING AT GRADE.

Jersey City, Hoboken & Paterson Street Railway Co. v. New York, Susquehanna & Western Railway Co. (N. J. Ch.), 53 Atl. Rep. 709. Dec. 21, 1902.

The court of chancery of New Jersey holds that when two railways, as for example a street railway and a steam railway, cross each other at grade, and, being unable to agree upon proper provisions for protection against collision, submit that question to its determination, it has jurisdiction to determine it. Furthermore, the court refers to it as a familiar principle that, where two carriers have a right of common easement in a place, the mode of its use may be determined by it.

DUTY TO CONSTRUCT LINES NOTWITHSTANDING PRO- VISO AS TO PRIOR GRADING OF STREETS AND AFTER NINE YEARS.

State v. Duluth Street Railway Co. (Minn.), 92 N. W. Rep. 516. Dec. 20, 1902.

A village ordinance required a street railway company, in consideration of the franchise thereby granted, to build lines of railway upon certain streets on or before a day certain. "Provided that the streets on which the same passes shall have been graded 60 days prior thereto." The supreme court of Minnesota holds that the proviso was inserted for the benefit of the railway company, and it was not released from its obligation by the mere fact that such streets were not graded within the time stated. It holds further, that the village, or its successor, was not guilty of laches (or inexcusable delay in asserting a right) in not requiring the construction of the lines until nine years after the passage of the ordinance.

CARE REQUIRED FOR SAFETY OF PASSENGERS AND DUTY TO GIVE THEM AN OPPORTUNITY TO ALIGHT AFTER CAR STOPS—NOT BOUND TO KNOW WITHOUT NOTICE THAT ANY ONE WILL AT- TEMPT OR IS IN ACT OF GETTING OFF WHILE CAR IS IN MOTION.

Ashtabula Rapid Transit Co. v. Holmes (Ohio), 65 N. E. Rep. 877. Nov. 18, 1902.

The law exacts of carriers of passengers, the supreme court of Ohio holds, a high degree of care for the safety of passengers, according to the circumstances, and this duty ordinarily continues until the passenger is discharged; but it is not required that the carrier shall keep a lookout to prevent passengers from jumping off from running trains, nor that it shall, at its peril, "see and ascertain" that a passenger is about to leave a moving car, without having given any notice, express or implied, of an intention to do so.

If a street car comes to a full stop for any purpose, and a passenger is in the act of alighting, it is negligence for the conductor to start the car before such passenger has had a reasonable opportunity to get off safely. But if the car does not stop, merely slackening speed sufficiently to permit a passenger to get on, the conductor, in the absence of notice of a passenger's intention to alight, is not bound to know that any passenger will attempt to get off, or is in the act of getting off, while the car is in motion.

DUTY WHERE ROAD IS BUILT THROUGH ANOTHER'S LAND AND IN PRIVATE STREET.

Bolster v. Ithaca Street Railway Co. (N. Y. Sup.), 79 N. Y. Supp. 507. Jan. 14, 1903.

Where a street railway company constructed its tracks upon the grounds of the campus of a university, in or crossing a street which was under the exclusive care and control of the university, and the company was, by contract with the university, so in occupancy of such street, with at least a joint duty with the university to keep the same in good repair, the third appellate division of the supreme court of New York holds that from this occupancy sprang a duty of reasonable care to those lawfully upon the premises upon the implied invitation of the university, the duty being imposed by the mere fact of occupancy.

LESSEE OF ROAD SUBJECT TO DEBTS NOT LIABLE FOR ACCRUED LICENSE FEES.

City of New York v. Third Avenue Railroad Co. (N. Y. Sup.), 79 N. Y. Supp. 431. Dec. 19, 1902.

Where one street railway company leases its property to another "subject to all debts and liabilities," and the lessee company agrees that "it shall and will pay, satisfy, and discharge all municipal, county, state, or government taxes and assessments, license fees, or other charges of any description whatever, which, during the term hereby granted, may be imposed upon the property hereby demised, or any part thereof," and the lessor company is not dissolved or merged with the lessee company, but is an existing corporation, liable for its debts and obligations, the first appellate division of the supreme court of New York holds that, while there can be no doubt but that the lessee company will be liable for all license fees accruing to the city after the execution and delivery of the lease, it is not liable for license fees accruing prior to its execution, so that an action can be maintained against it therefor.

STEPPING OFF FROM MOVING CAR—RISK OF INJURY ASSUMED.

Jones v. Canal & Claiborne Railroad Co. (La.), 33 So. Rep. 200. Dec. 15, 1902.

It is a matter of common observation, the supreme court of Louisiana says, that persons do every day get on and off from street cars while they are in motion under circumstances that would not, in the estimation of a reasonable man, be considered negligence. When, therefore, a person attempts to step off from a car that is barely moving, his attempt will not, of itself, constitute such negligence as will prevent his recovery for an injury caused by a sudden jerk of the car which throws him to the ground. But, while it may now be considered settled that it is not negligence, as a matter of law, to step off from a moving street car, a person stepping off from such car takes upon himself, in the absence of negligence or fault on part of the carrier, the risk of injury. And if there be no negligence on part of the carrier, there can be no recovery, although the act of the plaintiff may not have been negligent.

IMPLIED AUTHORITY TO ACQUIRE ELECTRICITY TO OPERATE STREET RAILWAYS AND VALIDITY OF SUBCONTRACT BY CITY TO FURNISH SAME.

Riverside & Arlington Railway Co. v. City of Riverside (U. S. C. C., Cal.), 118 Fed. Rep. 736. Nov. 1, 1902.

A grant of power to construct and operate "street railways," the United States circuit court, in California, holds, implies authority, as on the part of a city, to acquire electricity therefor. Nor is ownership of a roadbed, cars and other appliances, of a street railway a condition precedent to the exercise of the implied authority, but a contract, engaging electricity for that purpose, is good upon its face. And where the acquisition, construction, maintenance, and operation of street railways are among the declared purposes of a city's organ-

contract by the city to furnish a street railway company with electrical power, with which to operate its street railway, the power furnished being at the date of the contract surplus power not required by use of light or power other than the street railway company, the court holds to be within the scope of the city's powers, and that its obligations cannot be terminated or changed by any subsequent increase in the demand for electrical lighting.

DERAILMENT FROM COLLISION WITH OBSTACLE—NO CONTRIBUTORY NEGLIGENCE ON PART OF PASSENGER SEATED IN CAR

Ramson v. Metropolitan Street Railway Co. (N. Y. Sup.), 79 N. Y. Supp. 588. Jan. 9, 1903.

The defendant's negligence was predicated upon the fact that the open horse car in which the plaintiff was riding suddenly and violently left the track and tilted to one side, throwing her to the floor, and causing her injuries. This fact, together with evidence that the track at the place was being changed to electric service, that cobble stones were removed, that sand was piled along the track, a trench dug, and barrels of gravel were present, and that a barrel of gravel was the obstacle encountered by the car, causing it to be thrown from the track, the first appellate division of the supreme court of New York holds, justified the inference that the driver was negligent in his failure to observe due care in the operation of the car. The mere fact of derailment was not sufficient; but this, together with evidence as to cause, from which the inference might be drawn that the defendant's act or negligence produced it, was sufficient to present a question for the jury upon the subject of the defendant's liability.

The question of the plaintiff's contributory negligence did not arise, the court holds, it being conceded that she was seated as a passenger in the car when the accident happened.

PROHIBITED SOUNDING OF GONG IN HEARING OF JURY.

Bronk v. Binghamton Railroad Co. (N. Y. Sup.), 79 N. Y. Supp. 577. Jan. 14, 1903.

One of the questions litigated on the trial of this case was as to the ringing of the gong on the car as it approached the plaintiff from the rear, and as to whether or not the ringing was loud enough to be a sufficient warning to him as he was driving along in a noisy wagon with a coal chute and two shovels rattling in the bottom of the wagon box. During the trial the defendant had brought into the courtroom a gong or bell attached to a box so constructed that from one touch the bell would be rung by continued vibrations of the clapper for a considerable time. It was brought there for the purpose of offering it in evidence, but the defendant's witness could not identify it as the one which was on the car at the time of the accident, and it was not received. While being examined about the bell, the court prohibited the witness from sounding the gong. Notwithstanding this, at a recess of the court it was rung by an officer of the defendant and by one of its counsel in the presence of most, if not all, of the jurors. The bell looked like a new bell, and differed from those in ordinary use in Binghamton on electric street cars. Its construction and location in the courtroom were such as to make a sort of sounding board of the platform where it stood and of the walls of the courtroom, so when it was rung there on this occasion it made a very loud and sonorous sound. The third appellate division of the supreme court of New York holds that, on account of this ringing of the bell, a verdict in favor of the defendant was properly set aside and a new trial granted, even though the jury were instructed to entirely disregard the sounding of the bell, and affidavits were made by seven of them that they obeyed the instruction of the court in this respect.

INSULTING AND THREATENING OF PASSENGER BY EMPLOYEE—PERSON CARRIED BY STREET STILL A PASSENGER—\$100 DAMAGES.

San Antonio Traction Co. v. Crawford (Tex. Civ. App.), 71 S. W. Rep. 306. Dec. 10, 1902. Rehearing denied, Jan. 7, 1903.

The evidence showed, the court of civil appeals of Texas says, that

the party by whom this action was brought was a passenger on the street car, and was carried past her destination against her will, and afterwards she was not only addressed in an insulting manner, but had an iron bar or key shaken in her face by an employee of the company. The proposition could not be entertained for a moment that an employee of a common carrier could thus insult and threaten a passenger, and that the law would give no redress for such conduct. It would be a perversion of law and justice to hold that an employee of a common carrier could shake his finger and a piece of iron in a woman's face, because she wished to be put down on the street to which her contract entitled her to be carried, and that, because she was not actually struck in the face, she could not recover damages. Nor was there, the court holds, any merit in the contention that, the moment the car had carried her past her street, she lost her character of passenger. The implied contract with the street car company was to carry her to that street and permit her to leave the car, and she was a passenger on the car until that duty was fulfilled. The amount assessed by the jury, \$100, was not too much to pay for such an utter disregard of private rights.

INJURY TO WOMAN FROM FALLING INTO TRENCH AFTER ALIGHTING FROM CAR—ONE HAVING ALIGHTED NO LONGER A PASSENGER.

Lee v. Boston Elevated Railway Co. (Mass.), 65 N. E. Rep. 822. Jan. 8, 1903.

A woman stepped from a car upon a pile of earth about the height of the step of the car, extending from the step of the car some distance towards the sidewalk, on the right-hand side of the street. She noticed the pile before she got off, and she thought it was solid. If she had gone to the sidewalk upon the right-hand side of the street, she would have met with no injury. Instead of taking that course, she took a step towards the trench between the pile and the left-hand side of the street, and, the earth giving way, she fell into the trench. It was agreed that the work of digging the trench was being done by the authority and consent and under the general supervision of the commissioner of highways of the city, and the excavation was made for the purpose of laying down a new track, and that in order to lay the track it was necessary to cast upon the surface the earth taken from the excavation. Such a method of working upon the street, the supreme judicial court of Massachusetts says, is very common. It could not be said either that it was negligent so far as respected the woman, under the circumstances, for the company to permit the pile of earth to remain upon the street, or that there was any duty resting upon the company to direct her to take the safe course plainly indicated to her by the situation, and to cross to the right side of the street. The company had no reason to expect that a person of mature age would be in any danger in alighting from the car at that place in the daytime. Having alighted from the car she was no longer a passenger.

DAMAGES FOR BREACH OF WARRANTY OF ENGINE BOUGHT TO DRIVE ELECTRIC GENERATOR.

People's Savings Bank v. Waterloo & Cedar Falls Rapid Transit Co. (Ia.), 92 N. W. Rep. 691. Dec. 19, 1902.

An engine was bought for the purpose of driving an electric generator which supplied the power for the operation of an urban and interurban line of railway, and this purpose was known to the seller. There was also a full warranty of the engine as to power, control, regularity of work, steam economy and general efficiency. But the evidence conclusively demonstrated that the engine wholly failed to work as warranted. The company asked a recovery, among other things, for loss sustained by reason of its inability to transport passengers over its line, occasioned by the failure of the engine to do the work for which it was purchased and installed. The evidence offered in support of this claim was based largely upon the earnings of the company in transporting passengers to a summer resort or park in previous years. The supreme court of Iowa holds that such estimated loss of profits could not be recovered. It says that the public is at times capricious. Sometimes it travels, and sometimes it does not, depending upon too many conditions to make it at all certain that it will continue to follow the same line of pleasure year after year; and the profits to be derived from transporting it are too speculative and uncertain to furnish a safe rule for compensation.

in damages. There was evidence proving that passengers who had boarded cars for transportation were compelled to leave them before they had reached their destination on account of failure of power to run the cars, and, had the loss ensuing from such conditions been shown, the court thinks it would be just to allow it. Furthermore, the court concludes that there should be a recovery for excessive use of coal, extra labor, and injury to the generator.

NEGLIGENCE IN JERKING OR MOVING CAR WHILE PASSENGERS ARE ALIGHTING.

Skelton v. St. Paul City Railway Co. (Minn.), 92 N. W. Rep. 960. Jan. 9, 1903.

Where a street car stops for passengers to alight, and the servants in charge invite them to leave, such servants, the supreme court of Minnesota holds, have no right to jerk or move the car while such invitation is being acted upon, and it is negligence to do so.

STRICT COMPLIANCE WITH STATUTE REQUIRED IN DISPOSING OF FRANCHISE—EFFECT OF FRAUDULENT BID.

Pacific Electric Co. v. City of Los Angeles (U. S. C. C., Cal.), 118 Fed. Rep. 746. Nov. 1, 1902.

In determining whether or not a city council, in its proceedings for the disposition of a street railway franchise, lawfully complied with the requirements of the statute, the United States circuit court, in California, holds that the rule that mode is the measure of power and aside from the designated mode there is no power should be carefully observed. The statute providing that "Every franchise * * * to construct or operate street railroads * * * shall be granted upon the conditions in this act provided, and not otherwise," the court says that it should also be borne that negative words in a statute show an intent to make its provisions imperative, and require strict performance, both as to time and manner. And where the statute provided for the opening of sealed bids; an opportunity for further competition by new bids of not less than ten per cent above the highest before each; striking off of the franchise to the highest bidder; allowance of 24 hours to the successful bidder to deposit the amount of his bid; and, in case of such bidder failing to make the deposit, grant of the franchise to the next highest bidder therefor, the court holds that when the highest bidder failed to deposit the amount of his bid as required, it was the duty of the council to grant the franchise to the next highest bidder, unless there was some sufficient reason for a refusal. Assuming that the next highest bid was fraudulent, the council ought not to have granted the franchise to said bidder. When it refused to do so, however; its power in the premises was exhausted, the statute making no provision for any subsequent proceeding. The only way the franchise could be lawfully granted, after its refusal to the next highest bidder, would be under and pursuant to a new advertisement.

OBLIGATIONS OF MERGED COMPANY—LESSEE ONLY LIABLE FOR LICENSE FEE FOR CARS USED.

City of New York v. Sixth Avenue Railroad Co. (N. Y. Sup.), 79. N. Y. Supp. 319. Dec. 19, 1902.

Where there was a merger of one street railroad company with another the first appellate division of the supreme court of New York says that, while the corporate existence of the former was retained so far as it affected existing creditors at the time of the merger, as to all future transactions it became extinct by the merger, and all its obligations were assumed by and imposed upon the corporation that took its place, and it could after its merger create no new obligations, or be liable for acts of the corporation into which it had been merged; and the fact that there were obligations incurred after the merger could not create an obligation of the company that had lost its corporate identity in consequence of the merger.

By an agreement contained in a grant to a company "each passenger car to be used on said road" was to be licensed, and for such license there was to be paid annually such sum as the common council should thereafter determine. It was therefore, the court says, the cars to be used in operating the road for which a license was to

be obtained. There was imposed upon the incorporators no obligation, except for each car that was used in the operation of the railroad, and the only liability that the railroad incurred was a license fee for the cars so used. If the railroad company used no cars, it was under no obligation to obtain a license, and was not liable for the fees required therefor. When, therefore, the railroad company ceased to operate its road, leasing its road and franchise to another company, it ceased to operate its road, and ceased to use cars for that purpose. The obligation upon it to obtain a license for the cars used by its lessee, or to pay a license fee therefor, was no longer applicable to it. The lessee company, having assumed the obligations imposed upon the lessor by its charter, was bound to perform such obligations.

CONDEMNATION BY NATURAL PERSON IN INTEREST OF CORPORATION—NO TWO DIFFERENT RULES AS TO ALLOWANCES FOR BENEFITS.

Beveridge v. Lewis (Cal.), 70 Pac. Rep. 1083. Nov. 18, 1902.

The plaintiff, a natural person, commenced this action to condemn a strip of land through premises owned by the defendant for a right of way for a railroad. It was averred in the complaint that the board of supervisors of the county had granted to the plaintiff a franchise to construct and maintain an electric railway therein. The defendant offered evidence to show that the plaintiff was seeking to condemn the right of way solely for the purpose of transferring the same at once to a company which was engaged in building the railway, and which would own and operate it. The supreme court of California holds that the evidence was relevant, material, and competent.

The court says that this evidence was offered for the purpose of showing that the real party in interest was a corporation, with a view of enhancing the damage, as it was claimed that, if the corporation was the real party in interest, benefits could not be set off against the damage to the land not taken, while perhaps, if a natural person was in charge of the use, and was seeking to acquire such right of way, such benefits might be allowed as a credit. But the point cut much deeper than that. If the court were convinced that the facts were as contended, the plaintiff should not be allowed to maintain the proceeding at all. It is admitted on all sides, and necessarily, that the proceeding can be maintained only by one who is in charge of a public use, and who intends to perform the public service; and, further, if the proceedings may be in the name of an agent, or other representative, such agency should be stated. One who seeks a right of way to sell, merely, is not in charge of a public use.

Bearing on the suggested disadvantage of a private corporation as plaintiff, the court says suppose two cases: Land belonging to one person is being taken by a natural person, and other land belonging to him by a corporation, the uses and burdens being in all respects similar. Can the law provide that in one case an allowance shall be made for supposed benefits and not in the other? The court thinks it must be answered that the legislature cannot provide for the one case a less favorable rule than the constitution has provided for the other. They are entitled to the equal protection of the law, or "the protection of equal laws."

LIABILITY FOR INJURY TO PASSENGER ON SLIPPERY STEP OF SHORT-RUN CAR.

Foster v. Old Colony Street Railway Co. (Mass.), 65 N. E. Rep. 795, Jan. 6, 1903.

The plaintiff took a car which ran from a depot to the business center of the city. She put in evidence that when about to alight from the car she took hold of the handle of the dasher with her right hand, and stepped onto the step with her left foot; as she raised her right foot and threw her weight on her left foot, that foot went out from under her, by reason of the slippery condition of the step, caused by snow and ice which had accumulated upon it. The company contended that it was not practicable for a street railway company to prevent the open steps of its cars from becoming slippery during the continuance of such a storm as there was at that time, either by shoveling off the snow, sleet, or ice which must accumulate on the steps, or by spreading sand or sawdust on them. But under the special circumstances of this case, the supreme judicial

of the Motorman, but the court did not think that this question arose. It appeared from the evidence that the car was a short one, approximately 15 feet in length, and that it was, at the time of the accident in question, moving in the direction of the platform, and that the car was on its fifth trip. It further appeared that the car had waited at the railroad station 15 minutes, if not more. In addition to this, the motorman testified that by the rules it was the duty of the conductor, in case of storm, to sprinkle sand on the platform and step of the car, and that this could be done every two or three minutes, if necessary; and the conductor testified that he had sprinkled sand on the step where the plaintiff fell three times on the morning in question, and before the accident; and, lastly, that there was a sand pail at each end of the car. On this evidence, the court holds, the jury were warranted in finding that under the circumstances of this case the company could have prevented, and had undertaken to prevent, the open steps of this car from being slippery when the plaintiff alighted from it. For these reasons, the presiding judge was right in not directing a verdict for the company. Furthermore, the court thinks that the foregoing evidence, coupled with the testimony of the conductor that he put "about a quart" of sand on the step at about half past 9 o'clock, while the car was waiting at the railroad station, and the testimony of the plaintiff's witnesses that there was no sand on the step when the accident happened, and that there was no sand pail on the platform, was evidence on which the jury were warranted in finding that the company was negligent. In answer to the question, "So you got off without looking at the steps?" the woman testified, "I knew I had to look out for myself, because it was slippery, and I had hold of this handle"—meaning the handle of the dasher of the car. The court holds that the jury were warranted in finding that she knew that the step was slippery, and did all that due care demanded with that knowledge.

INJURY TO LINEMAN IN REMOVING SPINDLE USED TO
PULL OUT TROLLEY WIRE—GIVING OF ORDERS
NOT ALONE ENOUGH TO MAKE SUPERIN-
TENDENT.

Mulligan v. McCaffrey (Mass.), 65 N. E. Rep. 831. Jan. 8, 1903.

An experienced lineman was injured in connection with the operation of pulling out a trolley wire to its proper position above the track. A spindle of iron had been inserted by the lineman by an alleged superintendent's direction in the outer end of the horizontal arm of the bracket, so as to get the necessary purchase for pulling out the wire. The lineman was on a ladder which leaned against and was supported by the wire. But, instead of placing the ladder against the wire as nearly upright as could be safely done, in order to relieve the strain on the wire and bracket as much as possible, when the spindle was to be removed, he permitted the ladder to remain at the inclination at which it was left by the pulling out of the wire, and then mounted to the top, which projected above the wire, and towards the end of the arm, and leaned over to take hold of the spindle and pull it out by pulling it away from him; thus subjecting the bracket to a strain which there was no reason to suppose it was constructed to withstand, and making, as one of the witnesses testified, a calculation as to what the strain "on the whole thing" was, impossible. The result was that the bracket broke, and the lineman was thrown to the ground. The supreme judicial court of Massachusetts says that it would seem that hardly any method could have been adopted of pulling out the spindle which would have subjected the bracket at the points where it was attached to the pole to greater strain, and it holds that the lineman was not in the exercise of due care in doing what he did.

The alleged superintendent above referred to was one of a gang of four engaged in the common work of digging holes, setting poles, putting on brackets, and stringing wires. He received the same wages as the other linemen, and on the day of the accident and immediately before had been doing the same work that the lineman who was injured was doing, and at the place of the accident assisted in pulling out the wire and fastening it to the arm. He gave directions and orders both when their employer was there and when he was not. But in giving such orders and directions he acted, it seems to the court, as a workman whose experience qualified him to give them, and not as one whose sole or principal duty was that of superintendence. It was manifest, the court thinks, that he was there principally as a workman, but by virtue of his greater experi-

ence he acted also as foreman of the small gang to which he belonged, and gave such directions as the nature of the work required. This, the court holds, was far from making his sole or principal duty that of superintendence.

Wherefore, the court holds that the evidence did not warrant a verdict for the injured lineman.

NEGLIGENT STARTING OF CAR BY CONDUCTOR AFTER
HIS CHARGE THEREOF HAS BEEN TERMINATED
BY CHANGE OF CREWS—TEST OF LIABILITY FOR
NEGLIGENT ACT OF EMPLOYEE.

Lima Railway Co. v. Little (Ohio), 65 N. E. Rep. 861. Nov. 18, 1902.

While a woman was attempting to board a street car at a transfer station, having placed one foot on the lower step, the bell of the car was rung, and the car was suddenly started, throwing her to the street. The car was No. 36, and had come to the station only a minute or two before, in charge of one Cordrey as conductor and one O'Malley as motorman. It was Cordrey who rang the bell, though the evidence tended to show that it was the rule and custom of the street railway company, at that time and place, to change conductors and motormen on that car, and further tended to show that at the time the accident occurred such change of crew had actually taken place, and that Cordrey had then been relieved and gone off duty as conductor, although he had not yet left the car; that he had gone inside of the car, having left his place on the platform, which was taken by one McGuff, while one Smalley was the motorman. It was suggested that the jury be instructed: " * * * If, at the time plaintiff undertook to get on the car, McGuff, as conductor, and Smalley, as motorman, had absolute charge of the car No. 36, and so continued up and until the accident occurred, the company would not be responsible for the act of Cordrey, former conductor, if his trip and duties had ended upon the stoppage of the car No. 36 at its arrival at the transfer station in the center of the square at a time prior to the injury." The supreme court of Ohio holds that this was a proper instruction, and should have been given.

While the rule is well established that the master will not be exempt from liability merely because the act of a servant was in disregard of a rule laid down by the master, or was in disobedience of his express command, yet, on the other hand it is equally well settled, the court says, that, to make the master responsible for the act of a servant or employee, such act must be done by such servant or employee while engaged in the service and duties of his employment, and in the prosecution of his master's business. The fact that Cordrey worked daily for the company, and was, in a popular sense, its employee, could not operate to make the railway company liable at all times and under all circumstances for his negligent conduct. If, as assumed by the instruction requested, at the time the accident occurred, McGuff was then the conductor in absolute charge and control of said car, and Cordrey's trip and duties as conductor thereon had ended, then and in that event Cordrey, having no longer any duty to perform in or about that car, and it being no longer any part of his duty under his employment to be or remain on said car, his act (the ringing of the bell as a signal to start) was an unauthorized assumption of authority, not within the line of his duty or the scope of his employment, and the railway company would not be responsible therefor.

Whether the person (Cordrey) whose immediate negligence or misconduct caused the particular injury complained of was, at the time, the servant of and was then acting for the railway company sought to be charged, the court holds, was a question of fact to be submitted to the jury under proper instructions from the court. The test of a master's liability is not whether a given act was done during the existence of the servant's employment, but whether such act was done by the servant while engaged in the service of and while acting for the master in the prosecution of the master's business. A master is not liable for the negligent act of a servant or employee if, at the time of the doing of such act, the servant or employee is not then engaged in the service or duties of his employment, although the act be one which, if done by such servant or employee while on duty and at a time when actually engaged in his master's service, would be clearly within the course and scope of the usual and ordinary duties of such servant or employee.

Fond du Lac-Oshkosh Interurban.

The Fond du Lac & Oshkosh Electric Ry., which was opened for business Jan. 28, 1903, operates from Sixth and Main Sts. in Fond du Lac to High and Main Sts. in Oshkosh, a distance of 19.2 miles, these points being the business centers of the two cities. At Oshkosh the new line connects with the Winnebago Traction Co.'s interurban lines, running north to Neenah, 14 miles, and west to Omro,

is a beautiful and thriving city, having a population of a little over 30,000, supported by numerous manufacturing industries, and by trade from the neighboring cities and villages, and from the surrounding country. It has many handsome buildings, both public and private, and its principal streets are paved with asphalt and brick. Oshkosh has a street railway system of 22 miles, operating



TRESTLE AND EMBANKMENTS ON THE FOND DU LAC & OSHKOSH ELECTRIC RY.

10½ miles. The cars of the new line run through the city of Fond du Lac and the village of North Fond du Lac, over the tracks of the Fond du Lac Street Railway and Light Co. for a distance of about 4½ miles, of which 2.3 miles is over private right of way 50 ft. wide. The interurban section proper is 10.72 miles, connecting at Electric Park with the system of the Winnebago Traction Co. and running north into Oshkosh 3.75 miles. The line parallels the main line of the Chicago & Northwestern Ry. for 9 miles, and is built at an average distance of about 2 miles west from Lake Winnebago, which is a beautiful sheet of water about 28 miles long and 10 miles wide. The west shore of this lake forms a part of the famous Fox River Valley, so called from the Fox River, which enters the lake at Oshkosh, and leaves it at Neenah-Menasha, flowing northeasterly 40 miles to Green Bay, an estuary of Lake Michigan. The Fox River furnishes fine water power at Neenah-Menasha, Appleton, Kaukauna, and other cities which have sprung up on its banks. The chain of electric lines is now complete from Fond du Lac to Kaukauna, a distance of 49 miles, and the completion of the line from Kaukauna to Depere, 16 miles, now being built, will connect Fond du Lac with Green Bay, giving an electric system 72 miles long, running through nine cities and villages having an aggregate population of 113,800, which are supported by numerous manufacturing industries, and a fine farming country, rich in dairy interests.

The city of Fond du Lac lies at the south end of Lake Winnebago, 63 miles northwest of Milwaukee, and with the village of North Fond du Lac, which joins it on the north, has a population of 22,000. North Fond du Lac, with a population of over 2,000, has sprung into existence within the last two years, and its inhabitants are largely employed by the Wisconsin Central Ry., whose general shops were located at this point two years ago, and the Chicago & Northwestern Ry., whose roundhouses and division headquarters are also located here. Its residences and public buildings are unusually well built, and the mechanics available have not been able to build houses fast enough to keep up with the demands for homes. The growth of North Fond du Lac has also given a new life to Fond du Lac itself, and the city has rapidly gone forward in enterprises of every nature.

The city of Oshkosh lies on the west shore of Lake Winnebago, and is divided into two parts, north and south, by the Fox River, which flows from the west into Lake Winnebago at this point. It

twenty cars in addition to those of the interurban lines entering the city.

Fond du Lac has a local street railway system of about 8 miles, which is to be extended several miles this season.

The Fond du Lac & Oshkosh Electric Ry. is built entirely upon private right of way, which is 50 ft. wide, measured from the line of



VIEW ALONG THE LINE BEFORE BALLASTING.

right of way of the steam railroads. Leaving the tracks of the city system at Fond du Lac, it runs northward for about 6,000 ft., paralleling the Wisconsin Central Ry. at a distance of about 300 ft., when by making two slight curves, it closely parallels the right of way to the beginning of the under-crossing. The electric line crosses the Wisconsin Central Ry. and the Chicago & Northwestern Ry. at a point which is about 6,300 ft. north of the terminus of the city lines. The two steam railroads are side by side at this point, and continue northward paralleling each other. The right of way of the Wisconsin Central Ry. is 66 ft. wide, and that of the Northwestern

Ry. 100 ft. wide. The Wisconsin Central has but one track at this point, but the Northwestern has three tracks, one of which leads into its main yards. The under-crossing or subway is made at right angles to the line of these two railroads, and is built so that it has 14 ft. 6 in. clearance between the top of the electric rail and the

consin Central of concrete. The distance between the two abutments will be 23 ft., which will give clearance enough for a double track. At present the railway tracks are carried by temporary pile bridges, which are being now replaced by the permanent structures. The permanent bridges for carrying the tracks will be of the steel girder type known as the deck bridge, which will be covered with sheathing and gravel. The soil encountered is clay for the entire depth of the subway, and the slopes are finished one foot horizontal in width for each foot in height. Outside of the bridge abutments the subway is graded out to a width of 30 ft. at the bottom, which permits of a double track laid 12 ft. center to center, in order to provide clearance for the cars passing on the curves, and allowing for ditches outside of the roadbed. As the country about the subway is almost absolutely flat, it has been necessary to provide a protection embankment along the top of the subway, and outside of this a ditch for draining off the surface water into a neighboring creek.

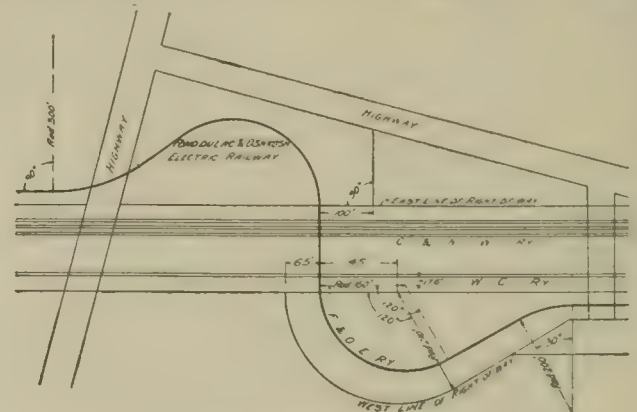
This ditch intercepts all of the surface drainage, and the only water that can enter the subway is from rain or snow falling inside of the embankment. The water so falling is at present being pumped out by an electric pump, which easily takes care of it, but a drainage sewer is under construction, which will carry the water from the bottom of the subway about 4,000 ft. into a creek leading to Lake Winnebago. In making the plans for the construction of this subway it was thought best to have a double track, so that there might be no possibility of a headend collision between cars, which might meet at this point, and also to provide for a possible double tracking of the entire system, which may be necessary within the next few years.

The entire line of right of way is almost level, the steepest grade being 1.2 per cent and the grades but few in number. There are no cuts of any kind on the entire roadbed, the greater part being built up as embankment, and to a height closely following that of the steam railroads, which it parallels at a distance of 65 ft. center to center. The track is laid with 70-lb. rails of A. S. C. E. section in 62-ft. lengths, using six-bolt angle bar joints. The rails are bonded with No. 0000 "Crown" bonds, of which there are three per joint on the south end, decreasing to one per joint on the north end, as the distance from the power house increases. The ties are Michigan cedar, 6 x 8 in. x 8 ft. and the track is ballasted with gravel one foot deep from the top of the ties. In constructing the roadbed



ROUTE OF THE FOND DU LAC & OSHKOSH ELECTRIC RY.

bottom of the steam railroad bridges. This clearance is preserved for the entire distance across the right of way, and in order to make the crossing square the electric tracks leave the line of right of way on a reverse curve of 160 ft. center radius. The grade to the subway is 4 per cent on each side. The abutments on the Northwestern are to be built of Duck Creek stone, and those on the Wis-

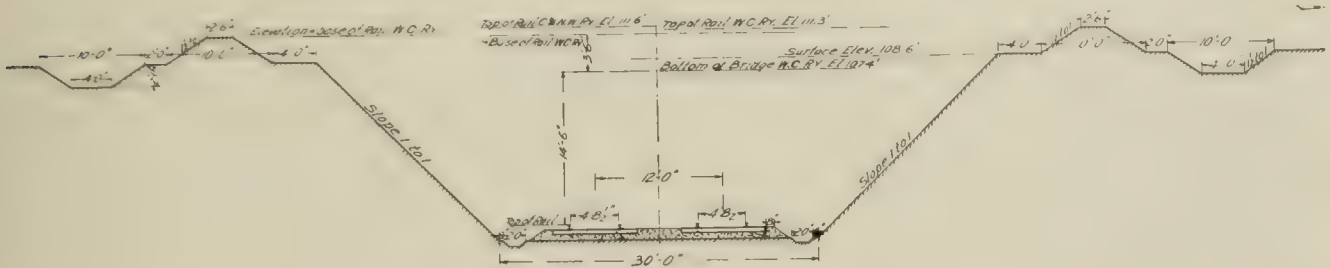


PLAN OF RAILROAD CROSSING.

especial care has been taken to make the grades so that while they are extremely light, the roadbed is elevated enough to keep it up above snow and water at all points. The entire construction approximates, as nearly as possible, to the best railroad standards, and the only right angle curves on the system are at the point where the electric railroad leaves the steam railroad right of way to join the system of the Winnebago Traction Co. at Electric Park and at the subway. From the subway north for nine miles the line is almost absolutely straight, except for an offset of 50 ft. at Van Dyne, to avoid the station grounds at that point. The right of way passes through several tracts of timber, which have been cleared the full width of 50 ft. in order that trainmen may see the approaching cars at a long distance, and so as to lessen the danger of accidents at highway crossings. The right of way is fenced in with a substantial woven wire fence.

The overhead construction is built with side poles, using Michigan cedar poles 7 in. at the top and 30 ft. long, set 110 ft. center to center. There are two figure 8 trolley wires the entire length of the line. Three 500,000-c. m. cables run north from the power house in Fond du Lac to the end of the city section, about four miles, and from this point two 500,000-c. m. feeders run to Van Dyne, where one is dropped and the other extended three miles further north. Current is furnished from the power house of the Fond du Lac Street Railway & Light Co., which was equipped for this purpose

The opening of the electric line, which was noted in the "Review" for February, 1903, and which was marked by a banquet given in each of the cities to the city officials of the other, has brought about a greater feeling of friendship between Fond du Lac and Oshkosh than has ever before existed. Although there has been for years an exceptionally fine steam railroad service, which being on the main lines of two great railroads, furnish handsome trains about every two hours, there was comparatively little acquaintance among the people, and very little visiting.



CROSS SECTION OF CROSSING UNDER RAILROAD TRACKS.

with a 500-kw. Westinghouse direct-connected generator, and a Reynolds-Corliss cross-compound engine, together with additional boilers and other small machinery. This unit operates all of the cars in the city of Fond du Lac as well as the interurban line, and the total distance of transmission from the power house to the north end of the interurban is 15 miles. The voltage is raised on the interurban section by means of a 30-kw. booster, and it has been found that the power furnished at the north end of the line is equal to all demands upon it, and quite satisfactory in every respect. Although the tracks have not yet been ballasted, and the bonding is still incomplete, it has been found that the current consumption is but about $2\frac{1}{2}$ kw.-h. per car-mile.

The cars were built by the St. Louis Car Co. and are exceptionally handsome and convenient. The total length is 46 ft. 4 in. over all, of which the bodies are 34 ft. and the platforms 5 ft. 6 in. The width of the car from out to out is 8 ft. 8 in., and the height from the bottom of the sill to the top of the roof is 9 ft. 3 in. The cars are divided into two compartments, one for smokers and express, and the other for passengers. The smoking compartment is furnished with seats along the sides, which are made so that the seats on one side can drop down, thus giving room for baggage or express, if necessary. The vestibules are unusually wide, and the vestibule doors and the doors of the cars are also wide, so that in case it is desirable to handle baggage, trunks can be carried in without damaging the car. The passenger compartment is furnished with St. Louis Car Co.'s seats, which are covered with maroon plush and furnished with extra high backs. The plush seats were provided so that the passengers might sit more comfortably than with the rat tan seats, as there is less tendency to slide forward, which sometimes makes a long ride tedious for persons who are not tall enough to reach the foot rest comfortably. The cars are built with Robinson's steel channel sill construction. The windows are of the St. Louis Car Co.'s semi-convertible type. They are unusually large, and the sills are cut 4 in. longer than the ordinary car window, so that when dropped down in summer the effect is nearly as good as an open car, without the exposure to too much wind. The trucks are of the St. Louis Car Co.'s M. C. B. type, similar to those built for the Milwaukee street railway, and the axles are 5 in. in diameter. Cars are equipped with Peter Smith heaters, Christensen air brakes, and arc headlights. The electrical equipment consists of four Westinghouse No. 56 motors to each car, geared to run 42 miles per hour. Each car is equipped with two trolleys, and the W. C. R. R. trolley catcher is used. No expense nor care was spared to make these cars the most complete and handsome examples of the car builder's art yet produced.

The running time between termini is at present one hour and 15 minutes. It is expected, however, to build some additional double track in both Fond du Lac and Oshkosh, and as soon as this is done and the interurban section completely ballasted, it is expected to make the run in 50 minutes each way, making two cars give hourly service.

Since the opening of the electric line each city has benefited by trade from the other, and there have been numerous excursions to theaters, society meetings and other matters of entertainment, not omitting several pugilistic encounters for the sportsmen.

The sentiment expressed by the mayor of Fond du Lac at the banquet in that city, "that all rivalry and jealousy should be forgotten, and that the cities of the Fox River Valley, now united by a means of cheap and rapid transportation, should work together as a unit for the benefit of the entire community," has been acted upon by the citizens of both cities.

The officers of the Fond du Lac & Oshkosh Electric Railway Co. are: George Lines, Milwaukee, president; T. F. Grover, general manager. Mr. Grover, who is president of the Fond du Lac Street Railway & Light Co., has entire charge of the operation and other business of the interurban line. The entire work of building the road was done by the Columbia Construction Co., of which Clement C. Smith is president. This company made the preliminary estimate of the cost of operation and probable receipts, and also secured all the right of way, closed the contracts for the steam railroad crossings, for trackage rights and for obtaining power from the terminal companies. It also handled all the engineering work on the line and put the road in operation complete. The changes in the equipment of the power house at Fond du Lac were designed by Sargent & Lundy, Chicago.

NEW THIRD RAIL SYSTEM IN NEW YORK.

The third appellate division of the supreme court of New York unanimously sustained the State Board of Railroad Commissioners in authorizing the New York & Port Chester Railroad Co. to construct an electric railroad line from Harlem to Port Chester, through Mount Vernon and New Rochelle. The company was incorporated April 3, 1901, with a capital of \$250,000. It proposes to build a third rail system, under its charter received Apr. 9, 1902, from Willis Ave. and 132d St., Bronx Borough, New York, northeasterly through Fordham, Williamsbridge, Mount Vernon, New Rochelle, Manaroneck, and Port Chester to a point on the boundary line between New York and Connecticut, a distance of about 23 miles. There will also be a branch to Clason Point, Long Island Sound, two miles long. Work will begin in May.

The road is expected to cost between \$12,500,000 and \$13,000,000. It will carry freight and passengers and will establish an express system that will convey passengers from Port Chester to City Hall, New York, via the subway system, in 54 minutes. The fare for the trip will be about 35 cents. The road will be operated on private right of way without grade crossings and will connect with the Rapid Transit system at 132d St. and Willis Ave. The New York, New Haven & Hartford Railroad Co. opposed the granting of the charter on the ground that the road is not a public necessity and will establish a ruinous competition. The officers are: W. C. Gotshall, president; Messmore Kendall, vice president; R. H. Eli, secretary and treasurer.

PERSONAL.

MR. SAMUEL HARRIS, general manager of the Lehigh Valley Traction Co., of Allentown, Pa., has resigned.

MR. CHARLES I. YERKES has been elected president of the London (Eng.) United Tramways to succeed Mr. George White, resigned.

MR. PHILIP BARNHARD, of Cynthia, Ky., has been appointed secretary and superintendent of the Georgetown & Lexington Traction Co., vice Mr. Robert Pryor, resigned.

MR. JOHN W. CARTER was promoted April 1st from assistant superintendent to general superintendent of the Metropolitan Street Railway Co., of Kansas City, Mo. Mr. Carter's first experience in



J. W. CARTER.

street railway work was in 1885 when he was employed on the construction of the 9th St. cable railway, and when this was completed he was made head rope splicer. In 1895 he was appointed line superintendent which position he held until November, 1899, when he was made assistant to the general superintendent. Mr. Carter was born in Chicago in 1863. He has made for himself an enviable record. His great consideration for the men under his charge has made him very popular with the employees. As an example of his influence, when the train men went out on strike in

May, 1900, Mr. Carter visited the various barns and through personal friendship induced over three-quarters of the men to return to their work, thus completely breaking the strike.

MR. CHAUNCEY B. FORWARD, representing the Eclipse Car Fender Co., of Cleveland, O., was a caller at the "Review" office the latter part of last month.

MR. ALBERT K. ALLIS, of Appleton, Wis., has been appointed superintendent of the Fox River Valley Electric Railway Co., vice Mr. W. H. Holcomb, resigned.

MR. BION J. ARNOLD, of Chicago, has been nominated for president of the American Institute of Electrical Engineers. The annual election will be held in May.

MR. T. E. FELT succeeds Mr. E. A. Spellman, resigned, as superintendent of the Ohio Central Traction Co., of Galion, O. Mr. Felt was with the Cleveland City Railway Co.

MR. HARRY G. GRAMPP has been appointed manager of River-view Park, one of the summer resorts controlled by the Elgin, Aurora & Southern Traction Co., of Aurora, Ill.

MR. W. H. HOLCOMB has resigned the superintendency of the Fox River Valley Electric Railway Co., of Appleton, Wis., and will engage in the sporting goods business in Appleton.

MR. F. E. FITZGERALD, division superintendent of the Norfolk, Portsmouth & Newport News Railway Co., succeeds Mr. R. E. Hunt as general manager of the Lexington (Ky.) Railway Co.

MR. OREN ROOT, JR., until recently assistant general manager of the Metropolitan Street Railway Co., of New York, has been appointed general manager. Mr. Root has served this company for nine years.

MR. W. L. FULLER, of the Philadelphia Rapid Transit Co., was last month appointed general manager of the New York & Queens County Railway Co., of Long Island City, N. Y., vice Mr. Jacob R. Beeten, resigned.

MR. JOHN I. BEGGS, president of the Milwaukee Electric Railway & Light Co., addressed the Racine (Wis.) Business Men's Association on the relations of the city to corporations, at its second annual banquet held on March 25th.

MR. A. D. CAMPBELL has gone to Seattle, Wash., to assume the position of master mechanic of the Seattle Electric Co. He was connected with the Boston (Mass.) Elevated Railway Co., as multiple-unit-control and equipment expert.

MR. C. R. BELLAMY, general manager of the Liverpool (Eng.) Corporation Tramways, has sailed for home after a short visit to this side. His report to the Tramway Committee is expected to result in the placing of substantial contracts for equipment to be utilized for the extensions to the Liverpool system. While in New

York Mr. Bellamy addressed the national convention on municipal ownership, held under the auspices of the Reform Club, of that city.

MR. W. MILTON BROWN, of Johnstown, Pa., is in England in connection with the Lorain Steel Co.'s contracts with the Wolverhampton Corporation for the installing of the Brown system of surface contact for electric lines.

MR. J. N. VANDERGRIFF, vice-president of the Vandergrift Construction Co., of Philadelphia, has gone to Porto Rico to superintend the construction of the Porto Rico Railway & Power Co.'s system between Ponce and San Juan.

MR. D. SUTHERLAND, chief engineer at the power house of the Toronto Street Railway Co., of Toronto, Can., has been appointed chief engineer at the Batavia power house of the Aurora Elgin & Chicago Railway Co., Aurora, Ill.

MR. W. E. MOORE has resigned as general superintendent and engineer of the Augusta Railway & Electric Co., and the Gas Light Co. of Augusta, and is taking up similar work with the West Pennsylvania Railway & Lighting Co., of Pittsburgh.

MR. E. W. ALEXANDER, of Montours Falls, N. Y., has resigned as superintendent and purchasing agent of the Elmira & Seneca Lake Railway Co. His successor is Mr. Charles Murray, of Buffalo, formerly an official of the Buffalo & Depew Railway Co.

MR. W. K. MORLEY, of Louisville, Ky., has been elected vice-president and general manager of the Grand Rapids, Grand Haven & Muskegon Railway Co., Grand Rapids, Mich. Mr. Morley was superintendent of the St. Louis-Louisville division of the Southern Ry.

MR. EDWARD BLAIR has been appointed assistant superintendent of the Montreal (Que.) Street Railway Co., of which Mr. Luke Robinson is superintendent. Mr. Blair was assistant to the general manager of the Quebec Railway, Light & Power Co., of Quebec.

MR. F. G. WHIPPLE, who was until recently chief draftsman for the American Steel Foundry Co., of St. Louis, is now connected with the sales department of the Crocker-Wheeler Co., with headquarters at the Chicago office, which is under the management of Mr. Julian Roe.

MR. GEORGE S. SCHMIDT, secretary of the York Street Railway Co., the York & Dallastown Street Railway Co., the Dallastown, Windsorville & Red Lion Street Railway Co., the York & Dover Street Railway Co., the York Haven Street Railway Co., and several minor companies combined under the York Traction Co., transacts a large amount of important business for the corporations named, in addition to devoting time to a large and lucrative law practice. Mr. Schmidt was born at Carlisle, Pa., February, 1861. His parents removed to St. Paul, Minn., where he attended the public schools until 1873, when he came to York and entered the York Collegiate Institute. The years 1875-76 he spent abroad as a student in Germany. He returned to York, re-entered the Collegiate Institute, graduating in 1879, and was the valedictorian of his class. Shortly after his graduation he entered Princeton College, from which he graduated in 1881. He then went to Philadelphia where he read law in the office of Benjamin Harris Brewster, then attorney general of the United States. While a student in the law office he attended the law school of the University of Pennsylvania and graduated with honors in the class of 1884. Shortly after he engaged in the practice of law in York and is today among the leading attorneys of the York Bar. In 1885 when the York Street Railway Co. was organized, Mr. Schmidt was made one of its directors, and later was chosen as its secretary. Mr. Schmidt also looks after the securing of charters, rights of way, and is the counsel of the several companies he represents.

MR. THOMAS G. HAUSEN, formerly associated with the Northern Ohio Traction Co., and the Cleveland Electric Co., together with Mr. P. W. Davies, recently secretary of the British Electric



G. S. SCHMIDT.

Traction Co., Limited, of London, have formed a company styled the Railways & Tramways Inspection Co., for the purpose of acting in an advisory capacity to British electric roads.

MR. CHARLES H. HACKETT has been appointed superintendent of the Jacksonville (Fla.) Street Railroad Co., vice Mr. E. B. Kirk, resigned. Mr. Hackett first became connected with the company when it adopted electricity. Afterward he was employed by the Los Angeles (Cal.) Traction Co.

MR. A. L. SCOTT will remain general manager of the Ft. Wayne Traction Co., recently acquired by the Union Traction Co. of Indiana, and his staff will be augmented by the addition of Mr. C. D. Emmons, formerly superintendent, purchasing agent and chief electrician of the Lafayette (Ind.) Street Railway Co.

MR. E. P. BRYAN, vice-president and manager of the Interborough Rapid Transit Co., of New York, assumed entire charge of the Manhattan Railway Co. on April 1st. Mr. Bryan has had 38 years' continuous service in the railroad business. He has advanced step by step from the position of operator at Lebanon, Ky.

MR. H. A. EVERETT, of the Everett-Moore syndicate, will be associated with Mr. Charles W. Wason, of Cleveland, O., in promoting traction properties in the future. Mr. E. W. Moore will operate alone. Messrs. Everett and Moore will work together, however, so far as operations already begun by them are concerned.

MR. M. W. BORDERS, general attorney for the East St. Louis & Suburban Railway Co., has resigned to accept the position of general counsel for Morris & Co., Chicago. The management of the street railway company gave a banquet in honor of Mr. Borders, March 20th, which was attended by prominent East St. Louis citizens.

MR. C. V. WESTON, M. A. S. C. E. and W. S. E., of Weston Brothers, Chicago, has been chosen chief engineer of the contemplated extensions of the South Side Elevated Railroad Co., in that city. Mr. Weston directed the construction of the Union Elevated Railroad Co.'s loop and the Northwestern Elevated Railroad Co.'s system in Chicago, also.

MR. W. A. SATTERLEE has been appointed assistant general manager of the Metropolitan Street Railway Co., of Kansas City, Mo., and entered upon his new duties on April 1st. Mr. Satterlee entered the employ of the company in 1891 as a clerk and during the same year was made purchasing agent. In the following year he assumed the duties of assistant general superintendent of the company and in November, 1899, was appointed general superintendent, which position he held until his present promotion.

MR. CHARLES H. TENNEY, of Hartford, Conn., has been elected president of the New Hampshire Traction Co., Exeter, N. H., vice Mr. Howard Abell, resigned. Mr. Tenney was vice-president. Mr. Charles R. Fredericks, general superintendent, and Mr. Frank V. Dunham, director of the amusement resorts, both of Chicago, have also resigned. The management of the system devolves upon Mr. Franklin Woodward, general manager, who states that successors to Messrs. Fredericks and Dunham will probably not be chosen.

MR. R. E. HUNT, general manager of the Lexington (Ky.) Railway Co., has resigned to assume the management of the Augusta & Aiken Railway Co., of Augusta, Ga. Both companies are owned by the Railways & Light Co. of America, of Baltimore, and the transfer is really a promotion. Mr. Hunt was with the Lexington company a number of years and is intimately acquainted with every side of the street railway business. The employees of the Lexington Railway Co. presented Mr. Hunt a token of esteem in the form of a suitably-inscribed Elk charm, and chain.

MR. GEORGE B. LARRABEE, superintendent of the Hartford & Springfield Railway Co., Hartford, Conn., has gone to Peoria, Ill., to take charge of the Peoria & Pekin Terminal Ry., which is under the same management. Mr. Larrabee became identified with the Hartford & Springfield Company when it absorbed the Enfield & Longmeadow Electric Ry., and under his supervision that line was extended and the Somers & Enfield road constructed. Mr. Henry S. Newton, of the Beaver Falls Traction Co., Beaver Falls, Pa., succeeds Mr. Larrabee at Hartford.

MR. JOHN HARRIS, superintendent of the Cincinnati Traction Co., retired from that office April 10th. On April 14th he would have completed the 36th year of service with the street railways of Cincinnati. Mr. Harris was born in Lancaster, O., in 1841, and went to Cincinnati, taking horses for the market there. He commenced business, caring for horses, on the site of the present fed-

eral building and within 200 feet of the office occupied by him until his retirement. For more than 40 years Mr. Harris had been kept away from his office but a single day by sickness. He is the last official of the old Cincinnati Street Railway Co., which was leased by the traction company, to retire from active duties.

MR. WILLIAM LINTERN was appointed master mechanic of the Cleveland & Southwestern Traction Co., Cleveland, O., and entered upon his new duties April 1st. Mr. Lintern has been identified with street railway work for 15 years, beginning with the East Cleveland Railway Co. He was afterward connected with the Short Electric Co., going thence to the Citizens' Street Railway Co., Battle Creek, Mich. Later he was associated with the Cleveland City Railway Co., and resigned to join forces with the Cleveland, Elyria & Western Railway Co., where he remained nearly three years. He resigned that position to take up the duties of general manager of the Nichols-Lentern Co., manufacturer of pneumatic sanders, which business was recently taken over by a large engineering company.

MR. GEORGE E. FISHER, of Detroit, Mich., recently arranged with an eastern syndicate to finance electric railway, lighting and gas properties which he will undertake to organize, construct and operate. Mr. Fisher had a great deal of experience in this line when president of the Chase Construction Co., which built four interurban roads running out of Dayton, two of the Cleveland, O., lines, and several electric roads in Indiana and Pennsylvania. It also built and equipped 60 central station lighting plants in Michigan, Ohio and Indiana. Mr. Fisher secured the contract for the Grand Rapids municipal lighting plant, and he is president and two-thirds owner of the Pontiac Standard Lighting Co. It is understood that the syndicate formed by Mr. James T. Lynn, who recently removed to New York, will handle the new properties for Mr. Fisher. This syndicate controls gas and lighting plants in 26 cities.

MR. RICHARD H. PIERCE, president of Pierce, Richardson & Neiler, Incorporated, and one of the best-known electrical engineers in Chicago, will remove to Boston, Mass., about May 1st, to assume charge of a branch office of the company in that city, and to give his attention to important private interests. Mr. S. G. Neiler, vice-president and treasurer, and Mr. H. A. Robinson, secretary, will remain in the Chicago office. Messrs. Pierce and Neiler recently purchased Mr. R. E. Richardson's interest in the corporation. That gentleman has been appointed general manager of the Kansas City Electric Light Co. The partnership of Pierce & Richardson was founded Mar. 1, 1894. It was incorporated in 1897 and became Pierce, Richardson & Neiler in 1900. Mr. Pierce was born in Woonsocket, R. I., Nov. 20, 1860. He graduated from Yale with the degree of A. B., in 1882, and from the Massachusetts Institute of Technology with the degree of B. S., in 1885, being a member of the first class in electrical engineering graduated from that institution. He came to Chicago shortly afterward and became associated with the Western Edison Electric Light Co. During the World's Columbian Exposition Mr. Pierce was at first electrical engineer, under Mr. Frederick Sargent, and afterward electrical engineer in charge of the undertaking. Mr. Pierce is a member of the American Institute of Electrical Engineers and of the American Society of Mechanical Engineers, as well as a foreign member of the Institution of Electrical Engineers of Great Britain. For several years he served as local honorary secretary of the Institute in Chicago, which position he recently resigned.

MR. CHESTER P. WILSON, who was recently appointed superintendent of the Lackawanna & Wyoming Valley Railroad Co., of Scranton, Pa., was graduated from Cornell University with the degree of mechanical engineer in 1892. The following year he entered the employ of the Philadelphia Traction Co., as draughtsman, and was soon promoted to superintendent of the 33d and Market Sts. power station during construction and operation, for three years. The Westinghouse company installed its first large size direct connected, slow speed generators in this plant. Making their construction and operation the subject of an exhaustive investigation, Mr. Wilson pursued in this connection a course of study which enabled him to take his master's degree in mechanical engineering at Cornell University in 1896. For six months in 1896 Mr. Wilson was chief engineer at Swift & Co.'s East St. Louis plant, having charge of the refrigeration, power and lighting work at the time of the St. Louis cyclone, and the period of repairs and increase of plant immediately following. Abattoir work proving less attractive

than the street railway field, he resigned and was appointed general manager of the Sioux City Traction Co. for 1897-98. The succeeding two years he was chief engineer for the Milwaukee Electric Railway & Light Co., having charge of its nine power stations, aggregating 15,000 h. p. He also had supervision, under direction of Sargent & Lundy consulting engineers, of the machinery installation in the new power station, the civil engineering work, the securing of right of way, and as consultant in the determination of the standard car equipment adopted by the road, making for this latter purpose extensive tests on different types and combinations of equipment. The design of all the special track work was made under his direction, also. From 1900 to 1902 Mr. Wilson was general manager and chief engineer of the Camps Bay Tramway Co., Limited, engaged in constructing a scenic suburban tramway at Cape Town, South Africa. At various times he has undertaken expert work for Mr. F. W. Darlington, consulting engineer, of Philadelphia, in connection with coal and gold mining properties in West Virginia and Montana, and large illuminating fountains in England.

MR. W. B. TARKINGTON, for three years general superintendent of the Omaha & Council Bluffs Railway & Bridge Co., has been appointed general manager of the Detroit, Monroe & Toledo Short Line Co. He was connected with the Omaha company 13 years.

OBITUARY.

MR. JAMES A. STEWART, superintendent of the Utica & Mohawk Valley (N. Y.) Railway Co., died Tuesday, March 31st, at the home of his father-in-law in Fonda, N. Y., on the 40th anniversary of his birth. Mr. Stewart's health began to fail early last fall, but he kept at his work, which was unusually arduous, until shortly before Christmas, when he went to Atlantic City. For a while the sea air and rest were beneficial, but a relapse occurred and he failed rapidly. Kidney trouble was primarily the cause of his sickness. Deceased was born in Montgomery County and his earliest experience in street railway work was at Herkimer, N. Y. When the old car line there was discarded for the electric system Mr. Stewart was appointed superintendent, which position he filled most creditably for nearly five years. Last spring the Utica & Mohawk Valley company absorbed the Herkimer, Mohawk, Ilion & Frankfort Electric Ry., and Mr. Stewart was chosen to succeed Mr. George L. Radcliffe as general superintendent of the entire system.

MR. W. W. CARD, president of the Pittsburg Screw & Bolt Co., and first vice-president of the Westinghouse Electric & Manufacturing Co., was struck by a trolley car in front of his home in Wilkinsburg, Pa., April 5th, and fatally injured. He had stepped from one car and was struck by another going in the opposite direction.

WAGES INCREASED.

Beginning June 1st the motormen and conductors employed by the Tri-City Railway Co., of Davenport, Ia., will receive a 14-per cent increase in wages. The new schedule will be 18 cents an hour for the first year and 19 for the second, instead of 16 and 17½, respectively, and after two years the pay will be 20 cents an hour. The aggregate increase the company has voluntarily given its men since 1900, based upon the pay they were getting then, is 36 per cent.

A general raise of 1 cent per hour in the wages of all the conductors and motormen employed by the Sioux City (Ia.) Traction Co. went into effect April 1st. Following is the new scale: Extra list, 16 cents per hour; first year regulars, 17; second year regulars, 17 1-3; third, fourth and fifth years, 18; after five years, 19 cents per hour.

The Ottawa (Ont.) Electric Railway Co. has announced a voluntary increase of 10 per cent in wages to its employees.

The Winnebago Traction Co., of Oshkosh, Wis., has increased its employees' wages from April 1st. City motormen and conductors receive 16 cents an hour, instead of 15, and interurban motormen and conductors receive 18 cents an hour, instead of 17.

The Manchester (N. H.) Street Ry. has increased the wages of 125 motormen and conductors to \$14 per week each from April 1st. This is an increase of 15 per cent.

The employees of the Augusta, Winthrop & Gardiner Railway Co., of Augusta, Me., who have been in the service of the company more than one year, have been granted an increase of wages.

STRIKES OF THE MONTH.

On March 22d 100 motormen and conductors of the Tacoma (Wash.) Railway & Power Co. struck for an advance of two to five cents an hour, for a 10-hour day, and for recognition of the union. The company sent to Seattle and obtained men from the street railway company there. This precipitated a strike by 700 employees of the Seattle Electric Co., who went out at midnight, March 26th. The Tacoma strike was officially declared off April 1st. The company operated 15 or 20 cars during most of the interval.

The Seattle strike was much more serious. The service was practically at a standstill, there was considerable lawlessness, employees were made special policemen and armed, and power houses were guarded by deputy sheriffs. To add to the company's burdens, a counterbalance on Queen Anne's Hill broke away from its cable and damaged the track considerably. On March 29th a conference was held at the request of the business men, and on March 31st the strikers voted to go back to work. Mr. James B. Meikle, secretary of the Chamber of Commerce, was mainly instrumental in getting the strikers to submit their grievances to arbitration.

The strike in Waterbury, Conn., which was mentioned in the "Review" for March 20, 1903, is still on, but the Connecticut Railway & Lighting Co.'s entire system is in operation. Service on the main city line was resumed regularly March 11th. Lawlessness prevails to some extent. A citizens' alliance was formed for self-protection. On March 30th 18 men, seven of them strikers, were arrested, charged with complicity in an assault upon a motorman and conductor. Bail was fixed at \$2,000 in each case. Rewards offered for the arrest of the party or parties who shot and killed a policeman on March 8th aggregate \$13,450.

NORTH JERSEY RAILWAY OFFICIALS INDICTED.

The grand jury of Essex County, New Jersey, has indicted the principal officers of the North Jersey Street Railway Co., of Jersey City, including the executive committee of the board of directors, charging each with manslaughter in being responsible for the Clinton Ave. grade crossing disaster in Newark, February 19th, when nine pupils of the Newark High School were killed. This accident was described in the "Review" for Mar. 20, 1903.

INTERNATIONAL REGISTER CO. BUYS NEW HAVEN.

Announcement was made last month of the purchase by the International Register Co., of Chicago, of the business of the New Haven Car Register Co., of New Haven, Conn. The International takes over all the property, good will, patents, samples and registers shipped on approval by the New Haven company. All outstanding sales accounts due the New Haven company will be collected by John S. Bradley, trustee for the stockholders, who will pay all debts. The factory at New Haven has been closed and the stock and equipment shipped to Chicago, where the business will be henceforth conducted.

The International Register Co. will enlarge the plant to accommodate the additional equipment and will have about double the former output. The company also acquired the specialty business of the New Haven company, including badges, punches and cord.

HEIL COMPANY BUSY.

The Heil Railjoint Welding Co., of Milwaukee, is very actively engaged this season. In April a Heil welding outfit was put at work on the lines of the Pittsburg Railways Co. and it is probable that the work there will not be finished before the end of the season. Other contracts for rail welding have been received from railways in Illinois, on the Pacific Coast and one for over 100 miles of track in one of the southern states. The company is also doing a great deal of work in building large tanks and self-supporting steel stacks. Four 7½-ft. stacks 100 ft. high, of ¼-in. and 3-16-in. steel are now being put up for the Milwaukee Electric Railway & Light Co.

NEW PUBLICATIONS.

BULLETIN NO. 34 of the American Railway, Engineering and Maintenance of Way Association has been published for March, 1903. It contains the report of the committee on track; of the committee on records, reports and accounts, and of the committee on signs, fences, crossings and cattle guards. The bulletin is issued under the direction of Mr. C. L. Fritch, secretary of the association, and is edited by Prof. W. B. Pence, of Purdue University.

ELECTRICAL INVESTMENTS, A WEEKLY REVIEW OF THE ELECTRICAL INDUSTRY, a 12-page newspaper, 11 x 15½ in., published in London, Eng. This is just what its title implies and contains, among other pertinent data, a share list of electrical undertakings at home and abroad, as well as the English weekly market report. Communications may be addressed to "Electrical Investments," Mowbray House, Norfolk St., London, W. C. Subscription price 6s. 6d. per annum.

GENERAL SPECIFICATIONS FOR ELECTRIC RAILWAY BRIDGE SUPERSTRUCTURES. Issued by the Osborn Engineering Co., Osborn Building, Cleveland, O. This company also issues "General Specifications for Bridge Substructures," "General Specifications for Railway Bridge Superstructures," "General Specifications for Highway Bridge Superstructures," newly revised and brought up to date, and "Tables of Moments of Inertia, and Constants for the Calculation of Stresses in Swing Bridges."

HOW TO BECOME A COMPETENT MOTORMAN, a practical treatise on the proper method of operating a street railway motor car; also giving details how to overcome certain defects. By Virgil B. Livermore, chief instructor, and James Williams, shop foreman, of the Brooklyn Rapid Transit Co. Published by the D. Van Nostrand Co., New York City, in a convenient form so as to be carried in the pocket. It contains 232 pages, is comprehensively illustrated and is written in as plain and simple a manner as possible, so that any one can readily understand every word. Price \$1.00.

OUR CONTEMPORARY, *Le Mois Scientifique et Industriel*, 8, Rue Nouvelle, Paris, France, advises us of its intention to publish under the title of "Supplement" four monographs on divers subjects. Each of these Supplements will contain a bibliographical index which cannot fail to be of much value to any one looking into the subject on which the pamphlet treats. The first Supplement appeared March 25th and is devoted to a study of Electro-Metallurgy of Iron (*Fabrication des Fontes, Aciers et Fers par la Haut Fourneau Electrique*), with many illustrations and critical analysis by competent engineers. The second Supplement will appear June 25th and be devoted to Industrial Application of Cold Producing Machinery.

COMMUNICATION FROM EMPLOYEES OF THE NEW ORLEANS RAILWAYS CO., AND THE ANSWER OF THE COMPANY, with Findings of the Anthracite Coal Strike Commission on the Question of the Recognition of the Union, Exclusive Employment of Members of the Union, and Discrimination, Lawlessness, Boycotting and Blacklisting. This is a 16-page, 6 x 9 in. pamphlet published by the New Orleans Railways Co., the occasion thereof being the submission by the employees, under date of Mar. 31, 1903, of a proposed agreement conveying the conditions and stipulations of their employment for the coming year. The company's answer embodies some clear reasons why it cannot enter into the agreement submitted.

THE INDUCTION MOTOR. By Boy de la Tour. Translated from the French by C. O. Mailloux. Cloth, 250 pages, 75 diagrams. Published by McGraw Publishing Co., New York. Price \$2.50. This work is intended to explain the theory and design of the induction motor by a practical method of calculation which is simple and effective. The author states that the book is written expressly for the assistance of those who have not taken special courses and are not able to profit from all that has appeared in the scientific papers. The original work consisted of eight chapters covering the following subjects: The revolving field; the electro-motive forces induced by the revolving field; the electro-magnetic couple; the magnetizing effects of windings; the resistance of the short circuiting rings of squirrel-cage motors; recapitulation of preceding chapters; performance diagrams of induction motors and practical applications. The translation contains an additional chapter (IX) on the Heyland motor which was written especially for the American edition. All of these subjects are treated within the

bounds of elementary mathematics. The translator has been careful to retain, as perfectly as possible, the individual style of the author as far as is consistent, and with this end in view has added an introduction on nomenclature which defines exactly the sense in which various technical terms are used. The work will be especially valuable to the designer who is looking for simple rules and methods whereby the modifications in design and in details necessary to meet particular requirements may be predetermined.

TRAMWAY BOOKKEEPING AND ACCOUNTS, with Forms of Revenue Account, Capital Account and Balance Sheet; complete list of General Ledger and Subsidiary Accounts, and Items chargeable thereto. By Donald McColl (Glasgow Corporation Tramways). 226 pages. Cloth. Gee & Co., Printers and Publishers, 34 Moorgate St., E. C., London, Eng. Price 10s. 6d. (\$2.50) net. This work is the 15th in a series of handbooks published under the style of "The Accountants' Library." It contains a full description of each section of tramway accounting work and specimens of forms and books; also notes on annual balance, with examples, stock-taking, audit, sinking fund, depreciation, renewal and reserve funds, insurances, valuation for local assessments, friendly society and superannuation fund. It presents a complete working system, fully and sectionally described, to suit the requirements of junior as well as principal officials.

CONDUCTORS FOR ELECTRICAL DISTRIBUTION, Their Materials and Manufacture, the Calculation of Circuits, Pole-line Construction, Underground Working, and Other Uses. By F. A. C. Perrine, A. M., D. Sc., formerly professor of electrical engineering at Leland Stanford, jr., University, and a member of the American Institute of Electrical Engineers. 8 vo. Cloth. 280 pages, exclusive of index. Price \$3.50. D. Van Nostrand Co., New York, and Crosby, Lockwood & Son, London, publishers. This book represents the results of more than 10 years of work as manufacturer, engineer and teacher, and more than eight years was consumed in actually writing and revising. There is a chapter on wire manufacture, data for which were obtained from the leading manufacturing companies, and also one on alternating current distribution, which is timely. The work will be found extremely valuable by all who have to consider the questions of which it treats.

RAILROAD CONSTRUCTION. By Walter Loring Webb, C. E. Second edition, 675 pages, 232 figures, half tones and folding plates. Published by John Wiley & Sons, New York. Morocco, \$5. The author's aim has been to produce a text book for students and the contents have been cut down to that which may properly be required of students in the time allotted to a civil engineering course. The present edition has been published in pocket-book size for the reason that the octave edition first published limited the use of the book in field work. The original text has now been nearly doubled by the addition of chapters on structures, train resistance, rolling stock, etc., and several chapters concerning the economics of railroad location. The book covers the field of railroad engineering very thoroughly, including surveys, alignment, earthwork, trestles, tunnels, ballast, rails and rail fastenings, switches and crossings, block signaling, rolling stock, train resistance, cost of construction, etc. It also contains tables of logarithms and logarithmic functions, and trigonometrical formulae which will be found valuable in practical railroad work. The book also contains a complete topical index.

UNITED RAILWAYS AND ST. LOUIS TRANSIT REPORTS.

The report of the United Railways Co. of St. Louis for the year ending Dec. 31, 1902, shows its income to have been \$1,000,111.25, including rental receipts from the St. Louis Transit Co. amounting to \$810,737.50. Dividends on the preferred capital stock paid to Oct. 10, 1902, amounted to \$790,068.75. Accrued rental due from St. Louis Transit Co., payable Jan. 10, 1903, amounted to \$209,442.50. There has been expended since the organization of the company, on the properties now leased to the St. Louis Transit Co., \$9,939,866.52. The electric mileage owned by the company is 360.09 miles.

The report of the St. Louis Transit Co. for the year ending Dec. 31, 1902, shows a deficit in operation of \$268,083.49, against \$525,630 in 1901. The gross earnings in 1902 were \$6,452,218.90; in 1901, \$5,783,912.72. Operating expenses and taxes in 1902 amounted to \$3,997,721.42, in 1901, \$3,092,400.58.

THE CURTIS STEAM TURBINE.*

BY W. L. R. EMMET

The development of the paper described is based upon the original ideas and invention of Mr. C. G. Curtis of New York, whose ideas were first made the subject of patent application about 1895. Since that time these inventions have been the subject of experimental investigation at Schenectady under the direction of Mr. Curtis and of the General Electric Co's. engineers, the object of these experiments being to establish data and laws which would form a basis for the correct design of commercial apparatus. The difficulties of such an investigation are very great. All new facts must be established by the test of different machines or parts which are difficult and expensive to produce. About two years ago the results of these experiments gave us data which showed great commercial possibilities, and since that time work has gone on on a large scale in the production of commercial machines. The contracts for these machines now aggregate 230,000 h. p. in turbine-driven electric generating units, the largest size so far built being 7,500 h. p. Thus a great industry has been brought into existence in a very short time, and since the work has all been done in one place and by a few persons very little information concerning it has reached the public. This paper is the first printed matter which has appeared on the subject.

The reason for this immense demand and production without publicity and in so short a time, is that the improvements effected are radical in economy, simplicity, and efficiency of action.

All improvements in prime movers are of great importance to the engineering world. The steam turbine is destined to effect the first really great improvement since the days of Watt, and the forms of Curtis turbine here described make the first great stride in advance of other steam engines.

Every efficient steam engine must provide means by which a fair proportion of the expansive force of steam can be converted into useful work. In the engines of James Watt and his successors this result is accomplished in various degrees by the application of pressure from the steam to moving pistons. In steam turbines the expansive force imparts motion to the steam itself, and this motion is given up to a revolving part by impacts of the moving steam upon it.

The idea of the steam turbine is quite simple, and is similar to that of the water turbine or impulse wheel. The practical difficulty which has heretofore prevented the development of good steam turbines lies in the very high velocity which steam can impart to itself in expansion, and the difficulty in efficiently transferring this motion to wheels at speeds practicable for construction or practical use. Steam expanding from 150 lb. gage pressure per sq. in. into the atmosphere is capable of imparting to itself a speed of 2,950 ft. per second, and if it is expanded from 150 lb. gage pressure into a 28-in. vacuum it can attain a velocity of 4,010 ft. per second. The spouting velocity of water discharged from a nozzle with 100 ft. head, is 80 ft. per second. These figures illustrate the very radical difference of condition between water turbines and steam turbines. In both water and steam turbines the theoretical condition of maximum economy exists when the jet of fluid moves with a velocity equal to about twice that of the vane against which it acts. In water wheels this relation is easily established under all conditions, while with steam the total power produces a velocity so high that the materials available for simple wheels and vanes are not capable of sustaining a proper speed relation to it under practicable conditions.

Before the appearance of the Curtis turbine two practical methods of accomplishing fair economy had been devised, namely, the turbines of Carl De Laval, of Sweden, and of Hon. Charles Algernon Parsons, of England, both of which were brought out more than fifteen years ago.

In the De Laval turbine, the total power of the steam is devoted to the production of velocity in an expanding nozzle which produces velocity very efficiently. The jet so produced is delivered against a set of vanes on a single wheel which, by an ingenious construction and method of suspension is adapted to operation at a very high peripheral velocity. The very high rotative speed which this construction entails is made available for dynamo driving by very perfectly made spiral-cut gears which effect a 10 to 1 speed reduction. The

peripheral velocity of the wheel in the largest De Laval turbines is about 1,200 ft. per second, while the velocity which energy can impart to steam is over 4,000 ft. per second. Thus the wheel falls far short of the theoretically economical speed.

In the Parsons turbine the steam is carried in an axial direction through the space provided between a succession of internal revolving cylinders and external stationary cylinders which enclose them. Both the internal and the external cylindrical surfaces are covered by many successive circles of vanes so arranged that the steam has to pass alternately through rows of moving and stationary vanes. In passing through this turbine the steam never acquires a speed which approaches the velocity which it attains in the De Laval nozzle; but instead, moves along alternately, acquiring velocity by expansion, and partially giving it up by impact with the moving vanes.

Both of these turbines have attained some success, but neither, as thus far developed, affords sufficient advantage over the steam engine to cause any very rapid or radical change in engineering conditions.

The important disadvantages of the De Laval type are, that it is limited by the imperfections of high-speed gearing, that its efficiency is not particularly high, and that the design is not conveniently applicable to large sizes. The Parsons type is principally limited by

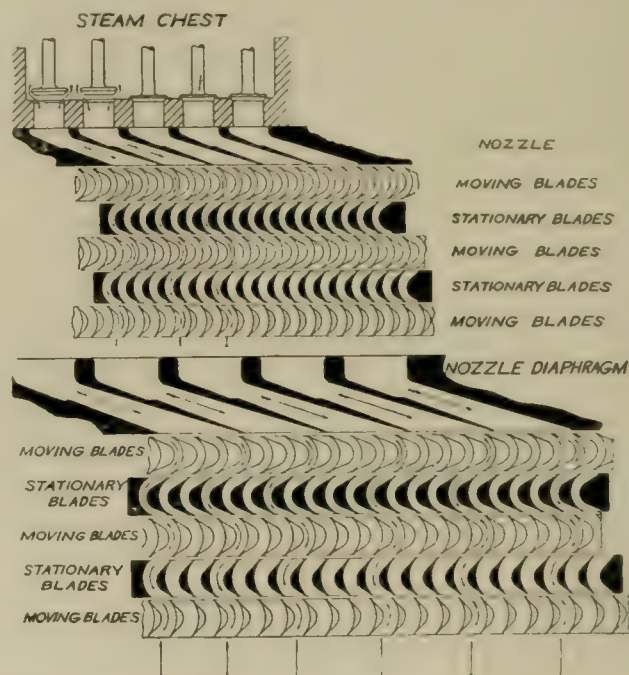


FIG. 1 DIAGRAM OF NOZZLES AND BUCKETS IN CURTIS STEAM TURBINE.

the multiplicity and weight of its parts, and the high cost of construction.

The Curtis turbine retains some of the features of its predecessors, but introduces new ideas which make possible a much lower speed, less weight, fewer and simpler parts, higher economy, less cost, and other important advantages.

The general arrangement of a turbine generating unit of this type is shown by the drawings which accompany this paper. Its functions may be briefly described as follows, and are illustrated by Fig. 1.

Velocity is imparted to the steam in an expanding nozzle so designed as to efficiently convert nearly all the expansive force, between the pressure limits used, into velocity in the steam itself. After leaving the nozzle, the steam passes successively through two or more lines of vanes on the moving element, which are placed alternately with reversed vanes on the stationary element. In passing successively through these moving and stationary elements, the velocity acquired in the nozzle is fractionally abstracted, and largely given up to the moving element. Thus the steam is first thrown against the first set of vanes of the moving element, and then rebounds alternately from moving to stationary vanes until it is brought nearly to rest. By this means a high steam velocity is made to efficiently impart motion to a comparatively slowly moving ele-

*Read before the American Philosophical Society, Apr. 2, 1903, to form part of the Proceedings of the Society, Vol. XLIII.

ment. The nozzle is generally made up of many sections adjacent to each other, so that the steam passes to the wheels in a broad belt when all nozzle sections are in flow.

This process of expansion in nozzle and subsequent abstraction of velocity by successive impacts with wheel vanes is generally repeated two or more times, the devices for each repetition being generally designated as a stage. There may be various numbers of stages and various numbers of lines of moving vanes in each stage. The number of stages and the number of lines of vanes in a stage are governed by the degree of expansion, the peripheral velocity which is desirable or practicable, and by various conditions of mechanical expediency.

Generally speaking, lower peripheral speeds entail more stages, more lines of vanes per stage, or both. Our general practice is to so divide up the steam expansion that all stages handle about equal parts of the total power of the steam.

The losses and leakages of the earlier stages take the form of more heat or more steam for the later stages, and are thus in part regained. Much water of expansion, which might occasion loss by re-evaporation, is drained out of each stage into that which succeeds it.

The governing is effected by successive closing of nozzles and consequent narrowing of the active steam belt. The cut shows part of the nozzle open and part closed; the arrows showing space filled by live steam. In the process of governing, the nozzles of the later stages may or may not be opened and closed so as to maintain an adjustment proportional to that of the first stage, which is always

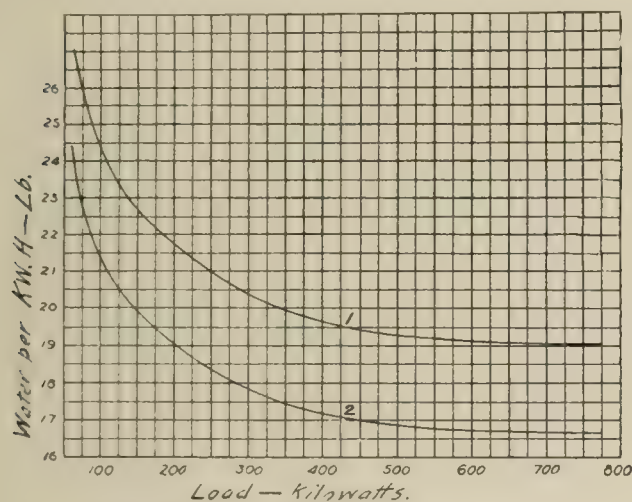


FIG. 2.

Water consumption in pounds per kw. h. of 600-kw. Curtis steam turbine running at 1500 r. p. m., 140 lb. pressure, vacuum 28.5 in. 1. without superheat. 2. with 150° superheat.

the primary source of governing. Some improvement of light load economy may be effected by maintaining a relative adjustment of all nozzles; but in many cases the practical difference in economy is not great, and automatic adjustment of nozzle opening in later stages is dispensed with in the interest of simplicity. In some machines an approximate adjustment is maintained by valves in later stages, which open additional nozzles in response to increase of pressure behind them. These are used as much for limiting the pressures in stage chambers as for maintaining the light load economy.

The principle of the Curtis steam turbine is susceptible of application to a variety of purposes. Within the scope of this paper I intend to give only a general idea concerning existing designs for its application to electric generators. Its development, even for this purpose, is very recent, and will doubtless be subject to important future improvements. In its present state, however, it embodies many important advantages, as has already been stated. The most important of these advantages is the high steam economy which it affords under average conditions of service. This economy is shown by the accompanying curves, which are derived from actual tests of the first commercial machine of this type which was completed. The machine developed a dynamo of 600 kw. capacity. The turbine gave it performance at a speed of 1,500 r. p. m., which is a safe and practical speed for commercial operation, and which cor-

responds to a peripheral velocity of about 420 ft. per second. The results, with superheat, given in these curves are not derived actually from tests of this turbine, but are plotted from data obtained on smaller turbines. They correspond to the results obtained on turbines of other types, and are undoubtedly reliable.

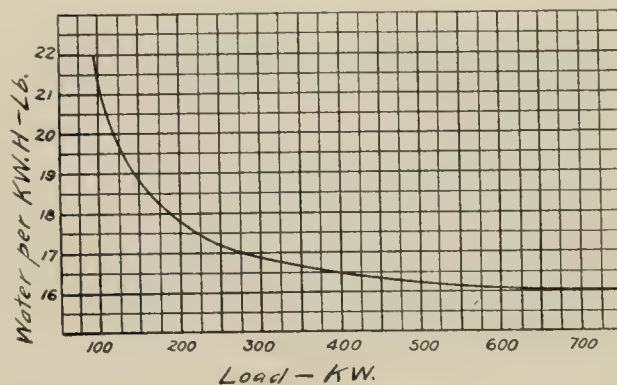


FIG. 3.

Water consumption in pounds per kw. h. of 600-kw. Curtis steam turbine running at 1500 r. p. m., vacuum 28.5 in., pressure 200 lb. superheat 150° F.

Fig. 2 shows the steam consumption of this machine in pounds per kilowatt-hour at various loads and under the conditions stated, the lower curve giving the steam consumption at various loads with 150° superheat.

Fig. 3 shows the results which could be obtained from this turbine if it were operated with high pressure and a high degree of superheat, these conditions of operation being perfectly practical with the machine, while with steam engines the use of such high temperatures would with ordinary construction be prohibitive.

The results shown by these curves are better than any heretofore produced by steam turbines of any make or size, and are very much better than those obtainable from the types of steam engines generally applied to the production of electricity.

It should be noted that these curves show a very high efficiency at light loads, as compared with results obtainable from steam engines, and that the efficiency does not fall off at overload as it must necessarily do with all engines which operate economically under normal full-load conditions. This light-load and overload economy is an important feature of the Curtis turbine, and arises from the fact that the functioning of its working parts is virtually the same under all conditions of load.

Figs. 4, 5 and 6 show the effect upon steam consumption of changes in the steam pressure, the degrees of superheat and in the vacuum. It will be observed that the superheat and vacuum curves are straight lines so inclined as to indicate a great advantage by the use of all degrees of superheat and also an immense advantage in the use of very high vacuum. The most important reason why the Curtis turbine so greatly surpasses the steam engine in economy is that it is adapted to use effectively the highest possible degrees of ex-

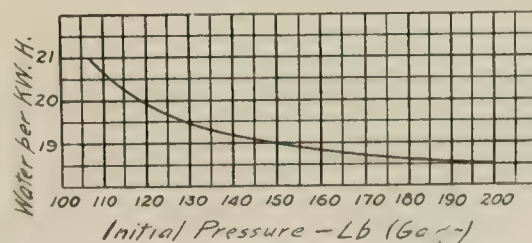


FIG. 4.

Water consumption in pounds per kw. h. of 600-kw. Curtis steam turbine at different initial pressures running at 1500 r. p. m., vacuum 28.5 in. and delivering 600 kw.

pansion, while in the steam engine it is practically impossible to provide for high degrees of expansion. As the exhaust pressure approaches a perfect vacuum, the volume naturally increases at a rapid rate—the volume of steam with a 29-in. vacuum being double that with a 28-in. vacuum. To handle high degrees of expansion, it

would therefore be necessary to make cylinders of steam engines very large and the amount of iron and weight of parts fixes a point of exit which cannot be passed without excessive cost and complication. In the turbine, the highest degrees of steam expansion are easily provided for, and consequently a much larger proportion of the total work in steam can be utilized by turbines than by steam engines.

There are other conditions in the Curtis turbine which make high degrees of vacuum more easily attainable than they are under ordinary conditions. The machine is so constructed that leakage of air into the vacuum chamber is easily rendered impossible. The

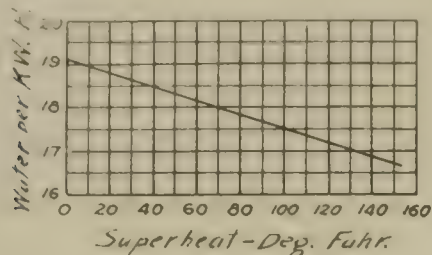


FIG. 5.

Water consumption in pounds per kw. h. of 600-kw. Curtis steam turbine at different degrees of superheating, running at 1500 r. p. m., pressure 140 lb. and delivering 600 kw.

leakage of air into condensing engines is considerable, and is generally not checked owing to the small value of improved vacuum to an engine.

With turbines of the type here described, no oil comes into contact with the steam, and, consequently, condensed water can be taken from surface condensers and returned to boilers. The use of surface condensers under such conditions renders unnecessary the introduction of air either in feed or circulating water, and consequently makes possible a very high vacuum with small air-pumping apparatus.

The results shown by these curves are obtained from a machine of 600-kw. capacity, and are naturally inferior to results which are expected from the very large units which are now being built. It is hoped that very soon after the reading of this paper a 5,000-kw. unit, which is now complete, will be put into operation in Chicago. This machine is expected to give considerably better steam economies than are shown by the accompanying curves, and will be superior particularly in the matter of light-load performance. The variation

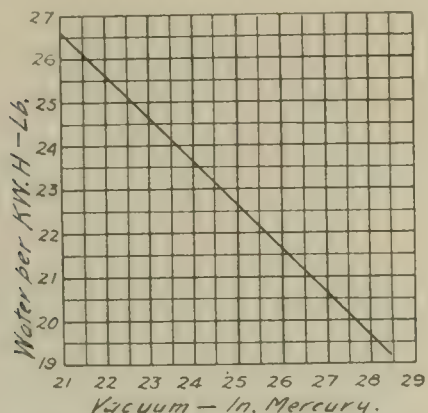


FIG. 6.

Water consumption in pounds per kw. h. of 600-kw. Curtis steam turbine for different vacua, running at 1500 r. p. m., pressure 140 lb. and delivering 600 kw.

of efficiency in this machine from half load to 50 per cent overload, will not exceed 3 per cent.

The external appearance and dimensions of this 5,000-kw. unit are shown by one of the drawings which accompany this paper, and another drawing shows this unit compared with an engine-driven generating unit of similar capacity. Each unit is shown as complete with prime mover and generator, one being the machine for Chicago, above mentioned; the other, one of the units which are operating in the Manhattan Railway Co.'s power station at New York. The

comparison sufficiently illustrates the improvement which the turbine has introduced. The respective weights of these complete units, exclusive of foundation, are in the ratio of 1:8, and the saving in foundations alone is a very important item. Other drawings which accompany this paper show a 500-kw. unit recently installed at Newport, and also a comparison drawn to the same scale between this 500-kw. unit and a cross-compound engine unit of equal capacity designed to operate at 100 r. p. m. The contrast here is even more striking.

If the extreme simplicity of the Curtis turbine is considered in combination with these figures and comparisons, it is easy to appreciate that a very great engineering advance has been accomplished. It has been conservatively estimated that engine units, like those in the Manhattan company's station, can be replaced by turbines like that in Chicago, and that the cost of such replacement can be paid for by saving in operating expenses in three years.

Whenever an improvement has been effected in prime movers, the influence upon engineering and business conditions has been very marked. When the release cut-off principle was introduced by Corliss, a certain improvement in engine economy was effected, and although this improvement was accompanied by no diminution in cost, the change resulted in a very great activity in engine building, and the renewal of most of the large mill engines in the country. It is, therefore, safe to predict that the influence of the steam turbine will be of radical importance. The steam turbine is, on account of its high speed, particularly adapted to the driving of electric generators, and its introduction will consequently stimulate the use of electricity rather than other power transmitters.

In the past the most economical use of steam has been confined to the most expensive and elaborate plants, while in the future it will be within the reach of all where condensing water is available.

[The drawings showing the external appearance and general dimensions of Curtis turbines are not reproduced here, and our readers are referred to the "Review" for Feb. 20, 1903, page 77, where a Curtis steam turbine plant for the Massachusetts Electric Companies is illustrated.

The drawings comparing a 5,000-kw. Curtis turbine unit with the Manhattan engines show the rectangles circumscribing the machines in end elevation to be about as 1 to 6 in area.

Comparisons between a 500-kw. Curtis turbine unit and a 500-kw. cross-compound engine unit show ratios for corresponding circumscribing rectangles as follows: End elevation, 1 to 3.3; plan, 1 to 9.5.—Ed.]

The Lincoln (Neb.) Traction Co. has settled the judgment which the city held against the old Lincoln Street Railway Co. for \$54,868.72. The city at one time secured judgment for \$108,000.

The Carlisle & Mt. Holly Railway Co., of Carlisle, Pa., will install electric lights at all cross roads, railroad crossings and other stopping points and will allow the lights to burn all night for the benefit of the residents. The company reports a very prosperous season.

The conductors and motormen of the Portland & Brunswick Street Ry. gave their first concert and ball in the Town Hall at Freeport, Me., Tuesday evening, March 10th. Special cars accommodated guests from out of town, and altogether it was voted a genuine success.

The Tyrone Electric Railway Co., of Tyrone, Pa., has been sold to the American Railways Co., of Philadelphia, owner of the Altoona & Logan Valley Electric Railway Co., and the City Passenger Railway Co., of Altoona, Pa. Extensive improvements will be made. Mr. D. S. Closs, president of the Tyrone company, will be retained at its head. The road was built by Tyrone capital.

The Rochester & Eastern Rapid Railway Co., of Rochester, N. Y., is being rapidly constructed between Rochester and Geneva via Canandaigua. At Geneva it will connect with the Geneva, Waterloo, Seneca Falls & Cayuga Lake Traction Co. Work is also progressing on the Auburn Interurban Electric Railroad Co. extensions, so that Auburn and Syracuse will soon be connected, and work has commenced on a line to extend from Auburn toward Cayuga, to cross Cayuga Lake and connect with the present line operated there.

NEW CONSTRUCTION.

ARKANSAS.

Citizens Electric Railway Co., Eureka Springs, Ark. The company has enlarged its power house adding 1,500 sq. ft. of floor space and placed contracts for a 120-kw. Westinghouse alternator with a 600-h. p. feed water heater and separator to be supplied by the St. Louis Machine & Supply Co., and the St. Louis Car Co. is building two 8-bench summer cars, each of which will be equipped with two G. E. 67 motors and K controllers. M. D. Gordon, manager.

CALIFORNIA.

United Railroads of San Francisco, San Francisco, Cal. Is building 50 new cars designed after the big cars in the service of the Huntington system in Los Angeles.

COLORADO.

Denver & Northwestern Railway Co., Denver, Col. Will extend its lines to Boulder and Golden at a cost of \$750,000.

Pueblo & Suburban Traction & Lighting Co., Pueblo, Col. Is extending its Mountain Division transmission line a distance of 34 miles, to be completed in June. Reservoir No. 1 on Beaver Creek, 40 miles from Pueblo, is being raised, doubling the present storage capacity. The General Electric Co. is building two 300-kw. rotary converters and two 300-motor generator sets for transmitting current into Pueblo from Station A on the west slope of Pike's Peak. In Pueblo six miles of extensions of 70-lb. rail have been completed and the lighting department has added 21 miles of additional lines.

CONNECTICUT.

Connecticut Railway & Lighting Co., Bridgeport, Conn. Has awarded contract for new power house to the H. Wales Line Co., Meriden, Conn.

ILLINOIS.

Cassidy Commission Co. has in charge the organization of a light and power company for Quincy, Ill. C. E. Mead is manager of the new company and advises us that it is expected to begin work at once.

INDIANA.

Evansville & Princeton Traction Co., Princeton, Ind. Will complete its line at once, the material being on hand and the grading done. The electrical equipment has been ordered from the Westinghouse company and five interurban cars have been ordered.

Indianapolis Traction & Terminal Co., Indianapolis, Ind. Is building a new passenger station and contemplates building several freight stations along the Kentucky Ave. extension, which will be completed this summer.

Union Traction Co. of Indiana, Anderson, Ind. Will build a waiting station in Marion this spring.

Madison Light & Railway Co., Madison, Ind. This company will probably rebuild about three miles of its main track but this depends upon whether the city decides to pave the street on which it is laid. In event of the track being built the company will be in the market for four switches, frogs, new ties and rail bonds. C. R. Johnson, jr., general manager.

IOWA.

Cedar Rapids, Iowa City & Southern Railway Co., Cedar Rapids, Ia. Will build its line this season. Contracts for construction and equipment have been awarded.

Union Electric Co., Dubuque, Ia. Will install two 2,300-volt 3-phase alternators, each of 500 kw. capacity, and two direct current 500-kw. railway units. A new station building and a new car house will be built. F. L. Dane, general manager.

KENTUCKY.

Louisville Railway Co., Louisville, Ky. Will extend its Second St. line to the Central Stock Yards and build a loop at that point.

LOUISIANA.

Shreveport Traction Co., Shreveport, La. The company now has before the city council applications for franchises which will enable it to extend some of its suburban lines, but no definite statement can be made concerning the work that will be done.

MANITOBA.

Winnipeg Electric Street Railway Co., Winnipeg, Manitoba. Is developing power on Lac du Bonnet and the Winnipeg River and

building a power house. Will construct a double track line to River Park.

MASSACHUSETTS.

Hoosac Valley Street Railway Co., North Adams, Mass. Will extend its line in North Adams, using 60-ft. T-rails, 1,400 lb. each. F. S. Richardson, president.

MICHIGAN.

Detroit United Ry., Detroit, Mich. Will build a brick car house to shelter 200 cars. Will rebuild more than two miles of track within the city limits and is installing a number of new double truck cars.

Jackson & Suburban Traction Co., Jackson, Mich. Contemplates costly improvements to its Michigan Center line and may extend it to Duryea's Point, 1/2 mile beyond the present terminus.

Grand Rapids, Grand Haven & Muskegon Railway Co., Grand Rapids, Mich. Will build a branch from Coopersville to Ravenna, a distance of 12 1/2 miles.

Grand Rapids Railway Co., Grand Rapids, Mich. Will extend its lines to Valley City and Oak Hill Cemeteries and double track its line to Ball Park.

Houghton County Street Railway Co., Hancock, Mich. Has ordered a number of new cars for summer traffic.

Jackson & Battle Creek Traction Co., Jackson, Mich. Will build a depot at Parma, 20 x 80 ft., to be used for passenger waiting room, sub-station and freight warehouse.

MINNESOTA.

Twin City Rapid Transit Co., Minneapolis, Minn. Contemplates laying 14 miles of conduit in Minneapolis for feed wires. Will extend tracks to Lake Minnetonka and establish a popular resort.

MISSOURI.

Metropolitan Street Railway Co., Kansas City, Mo. Is constructing a double track line on Jackson Ave., and is building a line to the Jockey Club race track.

NEW JERSEY.

Camden & Suburban Railway Co., Camden, N. J. Has awarded contracts for the extension from Palmyra to Riverton to the Latta & Terry Co., Philadelphia, and for a line in Pensauken to T. S. Drake & Co., of Philadelphia.

NEW YORK.

Rochester Railway Co., Rochester, N. Y. Will build a 13-mile branch through Lincoln, West Walworth, Macedon Center to Macedon village.

Rochester & Eastern Rapid Railroad Co., Canandaigua, N. Y. Is building its line between Canandaigua and Rochester and a power house at Victor. Is grading at Victor and Pittsford. Bridge building at Bushnell's Basin is being pushed. J. E. Holmes, roadmaster of the Lake Shore Electric Railway Co., Cleveland, has charge of track work.

Albany & Hudson Railroad Co., Albany, N. Y. Will equip its lines with a block signal system.

United Traction Co., Albany, N. Y. Will remodel one of its old horse car barns for use as an electric car house. An extension will be added increasing the capacity from 70 to 90 cars.

Binghamton Railway Co., Binghamton, N. Y. The company has declared its intention, as required by the state law, to build four extensions to its property. It cannot be stated definitely how much of this work will be done through the coming season, but the company will do all the construction work for which satisfactory financial arrangements can be made. It is intended to build a chain of suburban lines connecting all near-by villages of any size with Binghamton. J. P. E. Clark, general manager.

International Railway Co., Buffalo, N. Y. Will build two miles of new track and rebuild 5 or 10 miles. An addition will be made to the steam power plant of the company increasing the capacity 3,000 kw.; 2,000 h. p. h. will be added to the capacity of the storage battery plant making a total of 6,500 h. p. h. A new car house to accommodate 250 cars will be built, 50 new cars purchased and 60 trailers rebuilt. Of the new cars 32 will be fitted with G. E. 74 motors and the General Electric multiple control system.

Hudson Valley Railway Co., Waterford, N. Y. Has awarded contracts for new power house at Wilton to Charles Bremer, of Ballston.

OHIO.

People's Railway Co., Dayton, O. Will rebuild its track on First St., and relay its rails on Jefferson St., using T-rails.

Springfield Railway Co., Springfield, O. Is making extensive improvement at Spring Grove Park and has ordered four double truck cars.

Ohio Valley Traction Co., Cincinnati, O. Will construct an extension to Ironton early in the season.

Toledo & Monroe Ry., Toledo, O. Has begun its northern extension to Detroit, work being done by Detroit & Toledo Construction Co., for which W. C. Sterling & Son, of Monroe, furnished 100,000 poles. Overhead equipment and electrical appliances are on hand and the rails have been ordered.

Northern Ohio Traction & Light Co., Akron, O. Will double track its lines between Silver Lake and the power house at Cuyahoga Falls and add two miles of double track to the Akron, Bedford & Cleveland division.

Zanesville Railway, Light & Power Co., Zanesville, O. Will erect a brick power house, 75 x 150 ft., to be completed by July 15th. F. E. Gribbon, of Cleveland, contractor.

Dayton, Springfield & Urbana Electric Railway Co., Springfield, O. Is to double track its line from Dayton to Springfield, a distance of 27 miles.

Hamilton, Eaton & Richmond Traction Co., Hamilton, O. Contemplates building 48 miles of track to Richmond, Ind., together with a new power station and a new car barn. It is not definitely decided upon. W. D. Riddell, Xenia, O., engineer.

Eastern Ohio Traction Co., Cleveland. Will build a car barn 150 x 80 ft. and a combined car barn and shop 90 x 40 ft., to replace the barn burned in February. Ten double truck cars were ordered in February to replace those lost in fire. The company has under consideration the adoption of alternating current distribution and also the building of a 14-mile extension to Leavittsburg to make a connection with the Sharon-Youngstown system. R. L. Andrews, general manager.

Cleveland & Southwestern Traction Co., Cleveland, O. will complete the road between Wooster and Cleveland, it being contemplated to build 25 miles of track this season.

Cleveland Electric Railway Co., Cleveland, O., will rebuild six miles of track. A recent addition has been made to the storage batteries on this system the new battery having a capacity of 1,000 amperes for two hours.

Columbus, Buckeye Lake & Newark Traction Co., Columbus, O. Rails are on the ground for the extension from Newark to Zanesville and work will be begun as soon as the weather permits. A new car house and shops and a rotary converter station will be erected at Newark and two other sub-stations between Newark and Zanesville. More extensions to the city line in Newark will also be made. Two 60-ft. excursion cars and two 60-ft. closed passenger cars have been ordered of the Jewett Car Co. J. R. Harrigan, Newark, general manager.

Cleveland, Painesville & Ashtabula Electric Railway Co., Cleveland, O. Has awarded the contract for its power house near Painesville to Speaker & Co., of Toledo.

Rapid Railway Co., Cincinnati, O. Is completing its 22-mile line between South Lebanon and Mason. Has just completed its power house at South Lebanon.

PENNSYLVANIA.

Pittsburg, McKeesport & Connellsville Railway Co., Pittsburg, Pa. Has ordered 15 cars, 15-bench, four 55-h. p. motors, of the J. G. Brill Co. The new power house near Connellsville will be completed about June 1st, at which time the entire road, or 54 miles of track, will be in operation.

Lock Haven-Oak Grove Street Railway Co., Lock Haven, Pa. Has asked the Westinghouse Electric & Manufacturing Co. to prepare estimates for electrical equipment.

Stroudsburg Passenger Railway Co., Stroudsburg, Pa. Will build a new car barn and a bridge 160 ft. long. Will also build $\frac{1}{2}$ mile of new track and rebuild $\frac{1}{4}$ mile of old. F. H. Smith, president.

Pennsylvania & Mahoning Valley Railway Co., New Castle, Pa. A number of extensions have been authorized by the board of directors but it is doubtful whether the lines will be built this year.

TENNESSEE.

Nashville Ry., Nashville, Tenn. Has purchased land in West Nashville to erect a \$10,000 stone crusher upon. Will re-ballast all its lines and lay heavier rails on two lines.

Rapid Transit Co. of Chattanooga, Chattanooga, Tenn. Will build

an extension from Alton Park to Rossville. Has received authority from the War Department to build across the Hooker Road in Chickamauga Park.

Morgantown Electric Railway Co., Morgantown, W. Va. Has begun construction work on line that will extend from Buckhannon to Pittsburg, upwards of 200 miles.

LAKE SHORE ELECTRIC REORGANIZATION.

The Lake Shore Electric Railway Co., Cleveland, O., was formally taken out of the receiver's hands March 31st. Mr. A. E. Lang was the receiver. On March 30th the stockholders met and the following directors resigned: J. B. Hoge, J. B. Hanna, C. W. Wason, W. J. Gawne, of Cleveland; W. H. Price, of Norwalk, and J. H. Harding, of Philadelphia. The following new directors, representing the bondholders, were elected: Horace E. Andrews, president of the Cleveland Electric Railway Co.; H. P. McIntosh, president of the Guardian Trust Co.; E. G. Tiltson, executive officer of the Cleveland Trust Co.; E. V. Hale, secretary and treasurer of the American Trust Co.; S. F. Hascroft, president of the Prudential Trust Co.; J. R. Nutt, secretary of the Citizens' Savings & Trust Co. H. A. Everett, E. W. Moore and B. Mahler, of the Everett-Moore syndicate, were re-elected directors. The recent issue of \$150,000 preferred stock has been taken up and paid for at \$60 a share. Messrs. Moore, Mahler and Everett each took 3,000 shares.

The new directors voted to raise the pay of all motormen and conductors one cent per hour, to take effect immediately. It was also decided to handle freight at night only. Ten new, large-size passenger cars will be put in service, making 43 in all. Passenger earnings reported for March were approximately \$40,000, a gain of 30 per cent over March, 1902.

The Lake Shore Electric Railway Co. was financed, after more than 15 months of receivership, by a syndicate headed by the American Trust Co. taking \$1,750,000 of the 4 per cent consolidated bonds at 85. The sale of these bonds and the money received from the sale of the preferred stock has satisfied all the debts and leaves over \$400,000 in the treasury for improvements. One of these improvements will be the double tracking of the road from Cleveland to Lorain and possibly as far as Ceylon Junction. An effort will also be made to build a line from Elmore on the Toledo branch to Port Clinton and Cedar Point. The funded debt of the road is \$4,892,000. The capital stock consists of \$3,000,000 5 per cent cumulative preferred and \$4,500,000 common stock. None of the stock has voting power during the next five years. The gross earnings of the property for 1902, compared with 1901, showed a gain of \$97,171.39; net, \$33,070.

The company was incorporated Sept. 25, 1901. The complete system consists of 160 miles of single track, of which about 130 miles is built on private right of way. The company is a consolidation of the Lorain & Cleveland Railway Co., the Sandusky & Interurban Railway Co., the Sandusky, Norwalk & Southern Railway Co., and the Toledo, Fremont & Norwalk R. R. By the addition of about 20 miles of line to these properties the company has completed an electric line connecting Cleveland and Toledo. One of the first things to be inaugurated by the new management will be through service between these cities without change of cars at Norwalk, as at present. The general offices have been removed to Cleveland from Toledo, the headquarters being in the Electric Building.

NEW FACTORY FOR PAWLING & HARNISCHFEGGER.

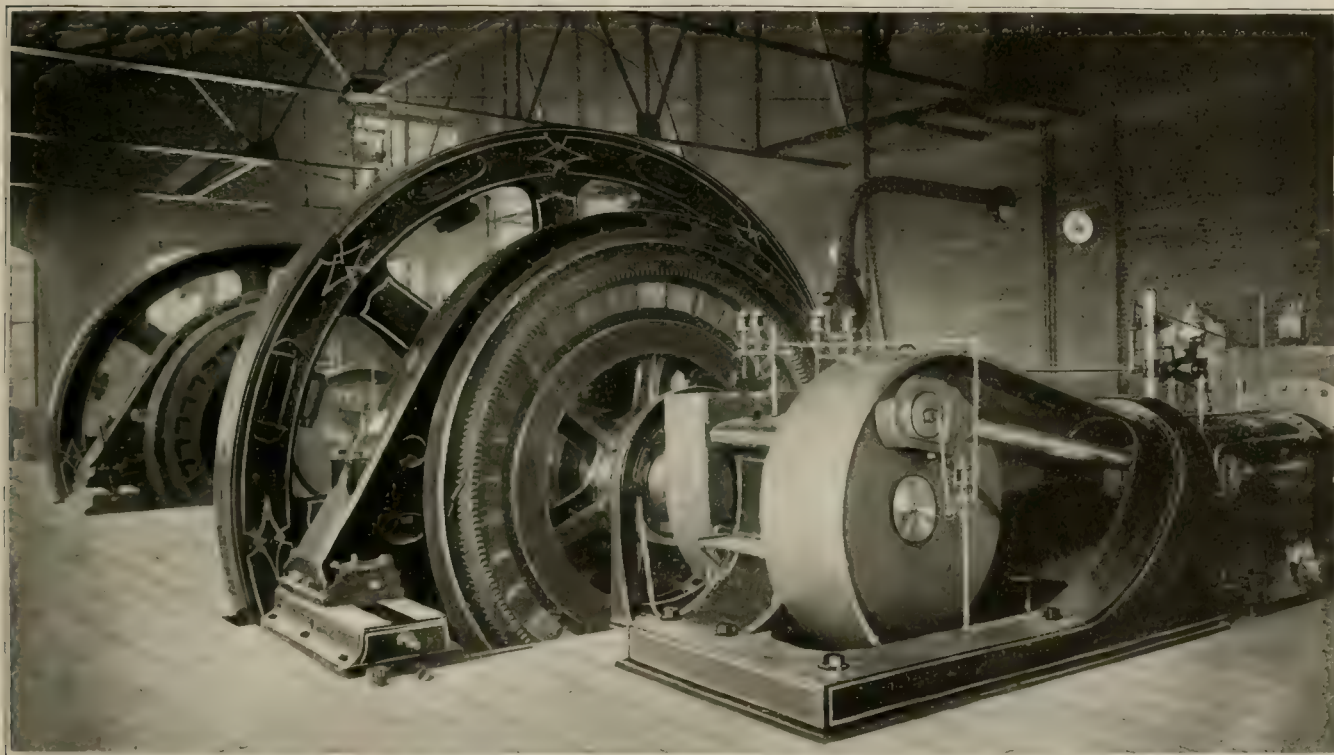
Pawling & Harnischfeger, crane and hoist builders, Milwaukee, Wis., have bought a new site comprising 19 $\frac{1}{2}$ acres, on National and 38th Sts., Milwaukee. The property has a north and south frontage of 2,800 ft., and is contiguous to the Chicago, Milwaukee & St. Paul and the Chicago & Northwestern railways. A modern plant is to be built upon it, to be used for the time being in conjunction with their old plant on Clinton, Oregon, Barclay and South Water Sts. Eventually their entire works will be transferred to the new location. A fire occurred in the company's shops April 15th, which was fortunately confined to one building, the remaining buildings offering ample facilities for building cranes.

CONSOLIDATING INDIANA LINES.

The stockholders of the Union Traction Co. of Indiana voted to merge with that company the Indianapolis Northern Traction Co., the capital of the combined companies being \$9,600,000. The distribution of stock took place April 4th and all of the Union Traction Co. stock participated proportionately. The two roads have 450 miles of interurban track. George F. McCulloch is president. Mr. McCulloch has also been elected president of the reorganized Fort Wayne Traction Co., recently sold for \$2,000,000 to the interests that control the Union Traction Co., referred to locally as the McCulloch-Murdock syndicate. It has practically bought all the lines along the route of the old Wabash & Erie Canal, near Fort Wayne. It obtained an option on the Fort Wayne & Southwestern Traction Co., with franchise rights to Marion, Ind., where it will connect with the Union Traction Co. It also has options on the Boyd syndicate lines between Wabash, Peru and Logansport, is building the Fort Wayne and Lima route, and proposes to build between Lafayette and Logansport.

THE CINCINNATI, GEORGETOWN & PORTSMOUTH RAILROAD.

The line of the Cincinnati, Georgetown & Portsmouth Railroad Co., organized in 1872, was built as a narrow gage railroad between Cincinnati and Georgetown. October, 1901, the road was purchased by A. W. Comstock, of Detroit, Mich., and W. R. Todd & Co., of Cincinnati, O., and plans were immediately made for changing the road to standard gage and equipping it for electrical operation. The change of equipment has been going on during the past year and several extensions have been added. One of these is a branch from the main line to Coney Island, and another branch has been built to Batavia, O., connecting the main line with the Norfolk & Western Ry. The road now comprises 50 miles of standard gage track about half of which is laid with 70-lb. steel rails and the rest with 60-lb. New ties have been put in throughout and the roadbed is ballasted with an excellent quality of washed gravel. There were a number of heavy cuts and deep fills along the road and 37 wood



INTERIOR OF POWER HOUSE OF THE CINCINNATI, GEORGETOWN & PORTSMOUTH R. R.

METROPOLITAN ELEVATED EARNINGS.

The statement of the Metropolitan West Side Elevated Railway Co., Chicago, for the fiscal year ending Feb. 28, 1903, shows gross earnings of \$2,040,000; total operating expenses, \$952,707; net earnings, \$1,087,298. The report shows a surplus of \$9,785 exclusive of the three per cent paid on the preferred stock and all expenses and charges of the year. The gross earnings for the previous year were \$1,753,313, and the operating expenses \$737,209. Passenger receipts last year showed an increase of \$281,083, or 16.6 per cent, but the cost of conducting transportation increased over 27 per cent, bringing the ratio of operating expenses up to 46.7 against 42 the year before. The company in three years has paid 9½ per cent in dividends on its preferred stock.

Recently officials of the Illinois Valley Traction Co., of La Salle, Ill., entertained seven aldermen from Ottawa (Ill.) and four from Marseilles at dinner, afterward taking them on a tour of inspection of the recently completed line between La Salle and Ladd. It is intended to make Ottawa an important station on a trunk line between La Salle and Utica.

and steel trestles. Nearly all of the wooden structures have been filled up with earth, 400,000 cu. yd. of material having been used.

The right of way is 60 ft. wide with ample sidings and facilities for handling freight in all of the towns en route. The company owns valuable terminals in the city of Cincinnati, where it has connections with the Pennsylvania Railroad, and it also has terminal facilities in the new Cincinnati Water Works, Amelia, Batavia, Bethel and Georgetown. The road is to be extended to West Union, O., a distance of 23 miles from its present terminus, for which the right of way has been secured. The average grade of the main line is less than 1 per cent and the road runs through a productive country which will furnish a large freight traffic. It is expected that an average speed of about 40 miles an hour will be easily maintained. At Olive Branch, where the power house is located, the company owns about 50 acres of ground which will be laid out as a pleasure park. A lake covering 10 or 12 acres has been constructed and a large summer hotel will be built at this place.

The power house is built of brick and concrete and is thoroughly modern in its equipment. The boiler house is arranged for four batteries of boilers of 500 h. p. each, there being two 250-h. p. water-tube boilers in each battery. Three of these batteries are already installed, with a separate stack for each battery. The engine room

contains two cross-compound condensing Hoover, Owen & Root roller Co. Hamilton cross engines, 24 and 44 x 42 in. in cylinder dimensions, operating at a speed of 90 r. p. m. These are direct connected to Westinghouse 600-kw. three phase alternators giving 3,000 alternations at 360 volts. There is also one Harrisburg exciter engine direct connected to a 50-kw. Westinghouse generator and a motor-driven exciter set, and two 250-kw. rotary converters, together with a complete switchboard. In addition to the converting apparatus in the main power house there are three sub-stations located at Mt. Washington, Bethel and Sunshine. These sub-stations feed the line for a distance of 5 miles each way and are also designed to be used as freight and passenger stations.

The long distance transmission lines are supported on 35 ft. poles with special heavy cross arms, pins and insulators, all of the overhead work being of the most substantial character.

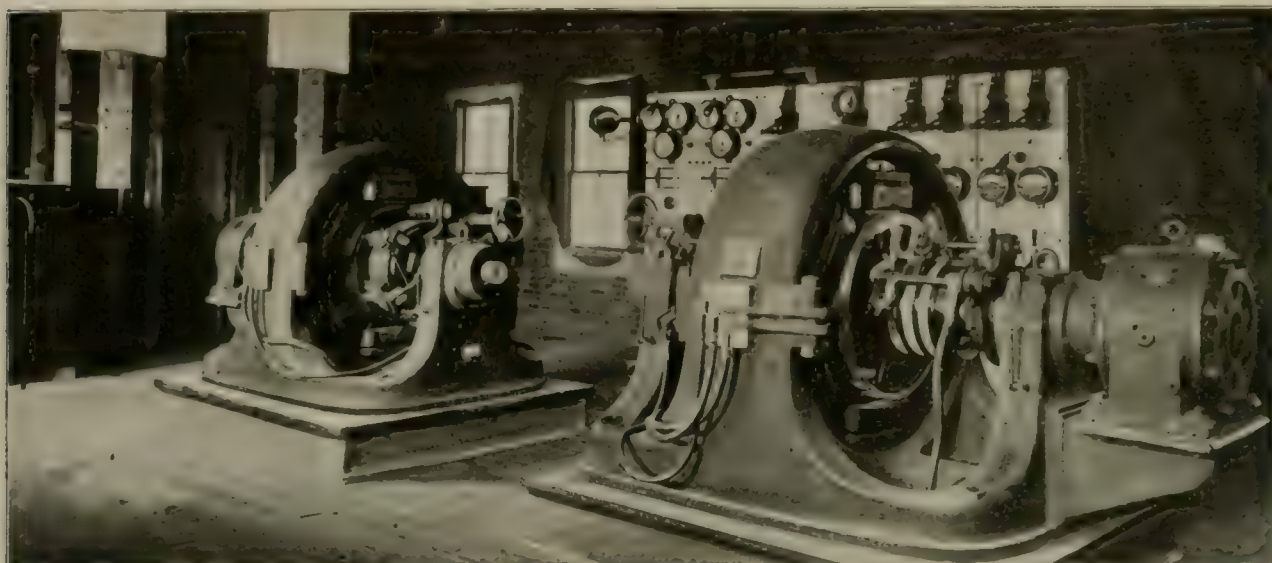
The rolling stock consists of ten 50 ft. closed passenger cars

and is very extensive. On Dec. 3, 1901, the stockholders authorized an issue of \$1,500,000 new stock and \$1,000,000 bonds, all of the old bonds and stock being cancelled on the same date.

The officers of the Cincinnati, Georgetown & Portsmouth Railroad Co. are: President, A. W. Comstock; vice-president, W. R. Todd; secretary and treasurer, R. E. Field; general manager, E. W. White; superintendent, P. T. Dunn; chief engineer, W. J. Bryan.

Earnings of the C. G. & P. R. R. for years ending June 30, 1900 to 1902:

| Year. | Freight. | Passenger. | Mail. | Express. | Misc. | Total. |
|-------|-------------|------------|----------|------------|----------|-------------|
| 1897 | \$15,302.40 | \$3,105.72 | \$400.00 | \$5,819.20 | \$621.70 | \$24,248.80 |
| 1898 | 19,170.02 | 33,768.70 | 1,063.82 | 6,064.35 | 249.97 | 63,117.11 |
| 1899 | 21,842.55 | 37,010.83 | 4,004.95 | 6,645.32 | 588.00 | 70,092.55 |
| 1900 | 25,784.02 | 42,856.02 | 4,127.40 | 7,300.84 | 1,303.60 | 81,371.97 |
| 1901 | 26,027.80 | 46,149.73 | 4,158.80 | 8,244.57 | 752.80 | 85,333.70 |
| 1902 | 41,541.74 | 52,866.92 | 4,091.00 | 9,107.88 | 2,470.11 | 110,076.75 |



INTERIOR OF SUB-STATION.

equipped with four 60-h. p. Westinghouse motors; these cars are of the Pullman type, and were built by the St. Louis Car Co. There are six 40-ft. open cars equipped with four No. 68 Westinghouse motors and six 40-ft. closed cars built by the Cincinnati Car Co. In addition to these passenger cars there are two express, mail and baggage cars, equipped with four 60-h. p. Westinghouse motors, one combination baggage and passenger car, 10 standard flat cars, 10 standard coal cars, 10 standard box cars and 10 standard stock cars.

By means of an arrangement with the Cincinnati Traction Co. the cars of the Cincinnati, Georgetown & Portsmouth Railroad are permitted to run into the heart of Cincinnati. All the freight handled by the company is received by the P., C., C. & St. L. R. R. for delivery in Cincinnati. There is an enormous amount of freight handled daily by the road for this city for use in the construction of the new waterworks and the volume of this freight is constantly increasing. The company has entered into a contract with the city of Cincinnati, which runs for 35 years, under which its branch running into the grounds of the waterworks is being operated.

Electric cars were first run on a regular schedule Dec. 1, 1902, and the receipts to date have been 25 per cent more than during the corresponding period a year ago, although the fare has been reduced 1 cent per mile. The present rate is 2 cents per mile with a slight reduction for mileage, trip tickets, etc.

The operating expenses and taxes during 1901 were \$69,508, or about 81½ per cent of the gross earnings. The net earnings were \$17,826, of which \$10,080 were used in payment on bonds and \$7,778 in meeting other charges. The common stock paid in is \$400,000 and the preferred stock and the funded debt, \$252,000 at 4 per cent.

The business of the company in freight, express and passenger traffic has shown a steady increase which has been marked within the last year. The accompanying table shows the revenue of the road for the past 6 years and the increase under the improved serv-

TRADE MARK FOR THE INDIANAPOLIS & NORTHWESTERN.

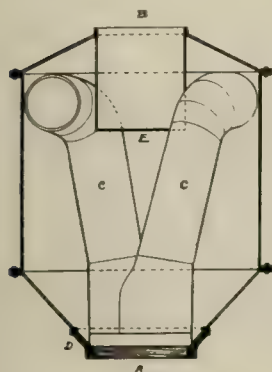
The Indianapolis & Northwestern Traction Co., which is now building an electric railway between Indianapolis and Lafayette, Ind., with a branch from Lebanon, has issued a pocket folder containing a diagrammatic map of the road which is to be known as



the "Lebanon Route." The company has adopted as its trade mark the device illustrated herewith. The officers of this company are: President, George Townsend; vice-president, Philip L. Saltonstall; secretary, Winthrop Smith; treasurer, Chauncey Eldridge. The headquarters of the company are in the Stevenson Bldg., Indianapolis, Ind.

STERLING EXHAUST PIPE HEAD.

Avoidance of back pressure while effecting complete separation of entrained water and oil from exhaust steam is aimed at in the design of the Sterling exhaust pipe head, whose construction is illustrated in the accompanying engraving. The designers maintain that the most effective principle upon which to separate from



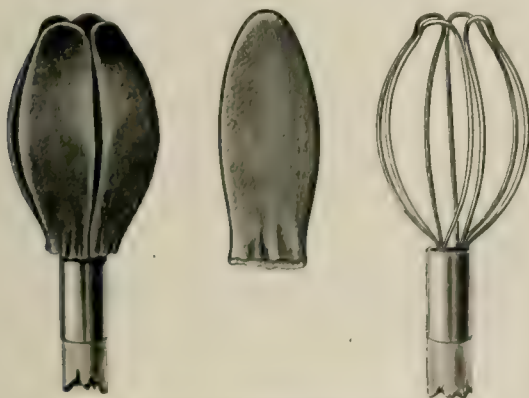
STERLING EXHAUST HEAD.

a light vaporous or gaseous body, like steam, the heavier liquids, such as water and oil, entrained by it in its rapid flow, is that of centrifugal force. Accordingly the exhaust entering at A is divided into the two pipes C, whose upper ends are bent in opposite directions so as to give the exhaust a motion of rotation about the interior of the head, the entrained water and oil being thrown outward by centrifugal force, caught upon the surface of the head body, flowing downward and out at the drain D, while the steam, freed of its entrainments, passes to the atmosphere through E B. The absence of baffles, partitions, or other obstructions is held to avoid all possibility of back pressure.

Durability is a feature of the construction, the heads being entirely of galvanized sheet steel, except the bottom connection, which is of cast-iron and tapped to fit the top of the exhaust pipe, and also for the attachment of the drain pipe at D. All joints are riveted and soldered. The maker is the Sterling Blower & Pipe Manufacturing Co., 590 Huyshop Ave., Hartford, Conn.

FOR CLEANING INCANDESCENT LAMP GLOBES.

The McCreary Electric Co., 136 Liberty St., New York City, maker of electric specialties, is putting on the market an ingenious device for cleaning incandescent lamp globes, especially in cars and in and about electric railway car houses, power stations, etc. It consists of four resilient wire fingers covered with mittens for cleaning the lamps, and is also furnished with rubber fingers for removing and replacing globes. The fingers are mounted on the end of a 3-ft. rod to which may be added extensions as in a jointed fishing rod. With the rod, lamps at any height can be reached and cleaned or removed. One man with the cleaner can pass through all the cars



MC CREARY INCANDESCENT LAMP CLEANER.

at a barn, cleaning the lamps as he goes, andasmuch as one day's accumulation of dust on a lamp globe frequently means a loss of 5 per cent in light, the device should prove an economical tool as well as a convenient labor saving device.

The Hoosac Valley Street Railway Co., of North Adams, Mass., is establishing a complete telephone system on its three branches, covering the entire road from Briggsville to Williamstown and as far south as Cheshire.

STORAGE BATTERIES FOR LOS ANGELES.

The Electric Storage Battery Co., of Philadelphia, manufacturer of the "Chloride" accumulator, has closed a contract with the Los Angeles Railway Co. for three storage batteries, two consisting of 264 cells of 1,000 ampere-hours capacity each and one of 264 cells with a capacity of 2,000 ampere-hours, to be operated in connection with differential boosters for regulation and for emergency use. The Pacific Electric Railway Co. has also contracted for a battery of "Chloride" accumulators, consisting of 264 elements of 1,000 ampere-hours capacity, to be operated with a differential booster for regulation, peak work and for emergencies. Batteries are being installed for the Oakland Transit Co., the Los Angeles Pacific Railroad Co., and the North Shore R. R.

THE KNUTSON TROLLEY RETRIEVER.

The Knutson trolley retriever shown in the accompanying illustration is small in size, but is claimed to be very effective in operation. The case is 8½ in. in diameter by 6 in. deep over all. It is placed on the dash of a car and should be located as low as possible to enable the operator to lock the machine with ease. The device has a heavy and a weak spring, an actuating disk and reel, and is adjustable to different trolley pole tensions. It is controlled



CAR EQUIPPED WITH KNUTSON TROLLEY RETRIEVER.

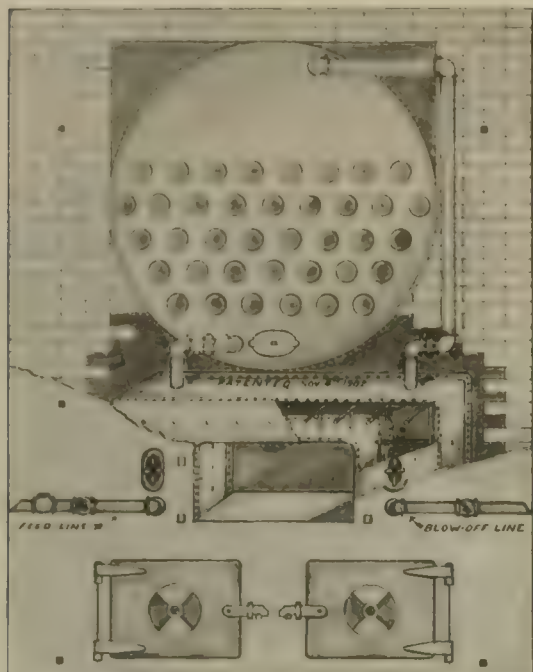
by an automatic locking and releasing mechanism. At whatever height the trolley pole may be when the trolley jumps the wire a sudden upward pull of three to four inches will throw the governors out, this action tripping the heavy retriever spring, which will at once bring the trolley pole down six to eight feet below the trolley wire. To reset the trolley and wind up the retriever spring the rope is pulled out slowly until it is stopped by the automatic action of a locking bolt, when, by releasing the rope, the heavy spring is locked, leaving the weaker spring only in action to keep the slack out of the rope. As soon as the locking device is tripped the reel will rotate in the opposite direction and bring down the trolley. The tension of the weak spring is adjustable and should be set just strong enough to keep the slack out of the rope. It is claimed that this retriever will positively prevent any damage to the overhead system, trolley poles, wheels, harps, etc., and wet or frozen rope, rail, sleet or snow do not affect the action of the machine. The machine can be furnished with retriever springs of either 40-lb., 55-lb. or 70-lb. tensions to take care of corresponding trolley tensions.

An important feature of the machine is that its action is entirely automatic both in locking and tripping. It has been in use on several railway lines in Northern Ohio for two to three months past and is highly endorsed by those who have given it a trial. This device is made by the Trolley Supply Co., Canton, Ohio.

In New York a claim for \$30,000 damages against the Metropolitan Street Railway Co. was successfully defended, the company alleging that it had never received any report of the accident, and that therefore it could not have happened.

COMBINATION FEED WATER HEATER AND WATER ARCH.

The device illustrated in the accompanying engraving is designed to improve the boiler economy by heating the feed with heat that would otherwise be taken up by the front wall of the boiler setting



COMBINATION HEATER AND WATER ARCH.

and at the same time to reduce the cost of maintenance, and avoid delays that often come from the failure of the brick arch work in the boiler front. The combination arch may be applied to any boiler requiring a brick arch or front. The arch is constructed of steel plates riveted and braced to comply with the requirements of flat surfaces, and it is guaranteed to stand the working pressure of the boiler to which it is applied.

One of the strongest claims made for this arch is that the addition to the capacity of the boiler is gained without the loss of space and without disturbing any of the fixtures or parts of the original installation. Besides the gain in efficiency due to the high temperature of the feed (which in some cases is equal to that of the steam, in cases where heaters of the ordinary type are used and the water supplied to the arch at from 180° to 200° F.), the effect upon the boiler is beneficial in that strains due to the changing temperature are less when the feed is introduced at a high temperature.

This device is known as the Neil W. MacIntosh "Combination" feed water heater and water arch and is controlled by Neil W. MacIntosh & Co., No. 56 John St., New York City.

RAIL BONDS FOR NEW YORK SUBWAY.

The Interborough Rapid Transit Co., of New York, has awarded the contract for rail bonds to the Mayer & Englund Co., of Philadelphia, for its well-known "Protected" bonds. The "Protected" bonds are used on the Manhattan elevated, over 150,000 of them having been installed on that system, and as the engineering staff

of the Rapid Transit company is to a considerable extent the same as for the Manhattan, the order recently placed speaks well for the results on the elevated lines.

TO HANDLE RAILWAY EQUIPMENT.

A railway equipment department has been organized by the Federal Manufacturing Co., of Cleveland, O., with Mr. George I. Black, manager of the Cleveland factory, at its head. The com-



pany has also contracted with the Shelly Steel Tube Co. to handle the latter's trolley pole product and trolley retracting device in this country and Canada. The eastern and Canadian territory is in charge of Mr. E. S. Ludlow, the central territory is looked after by Mr. William Culver and the western territory by Mr. Frank Germane. The retracting device referred to serves to withdraw the pole about 15 inches in case it leaves the trolley wire.

TRACK GAGE INDICATOR.

The accompanying illustration shows a new device manufactured by the United States Track Gage Co. of St. Paul, Minn., which is designed for the examination of track in regard to the spreading or closing of the rails. These defects which are caused by heavy trains, rotted ties, bad weather conditions, etc., are of constant occurrence and are frequently undetected until made known by an accident. The indicator is intended for the use of section foremen and



TRACK GAGE INDICATOR.

is designed to be secured to the front of a hand car to which it is attached by adjustable brackets. The gage is supplied with two arms on the lower ends of which rollers are carried. These rollers run along the inner edge of the rail heads and are held continually against the rails by means of a spring. The upper ends of the arm are connected to an indicating dial so that as the car moves along the track the dial finger indicates constantly the slightest variation in the gage. It indicates a variation as small as 1-16 in.

The gage costs nothing to operate it and it does not interfere with any other use of the hand car. It runs readily through switches and frogs and operates as well on curves as on the tangents.

INCANDESCENT LAMPS FOR HEADLIGHTS.

There is no question as to the necessity for effective headlights on electric cars, and it is well recognized that to be called effective a headlight must throw a brilliant light for a distance of at least 100 feet.



G. E. HEADLIGHT LAMP.

A parabolic reflector is the type desired for projecting the light, and for good service with such a reflector the filament of the incandescent lamp should be compactly formed so as to concentrate the light as far as possible at a point.

The General Electric Co. is producing a lamp with a special fila-

ment wound in the form of a close conical spiral, which has been designed for this special purpose. This filament is supplied in several types of bulbs, made to fit the various types of headlights.

A plan, adopted by several companies with excellent results, is to make the socket in the headlight adjustable both vertically and laterally. By the movement of a pair of thumbscrews, this enables the motorman to focus the lamp positively and accurately.

These headlight lamps have been in use on a number of street railways for the past two or three years, during which time they are reported to have given thoroughly satisfactory service, and are regarded with much favor because of their low cost and simplicity of application and operation.

WESTERN ELECTRICAL SUPPLY CO.' CATALOG.

The Western Electrical Supply Co., of St. Louis, Mo., has just issued its general supply catalog No. 50, illustrating a complete line of general supplies and construction material. It contains 702 pages and is bound in maroon cloth boards; the subjects treated comprise practically everything in the electrical line, and it is profusely illustrated. It also contains wiring tables, tables of dimensions and resistances of copper wire and other valuable information along this line; also a list of electrical books. Regarding street railway supplies, it is announced that the company is prepared to furnish everything from rails to generators, and that this department is conducted under expert management. Those interested in street railway work should also apply for the company's special catalog upon the subject. The No. 50 is one of the most complete and elaborate catalogs ever issued and will prove of lasting value as a reference work.

COMBINATION SWEEPER AND WATER CAR.

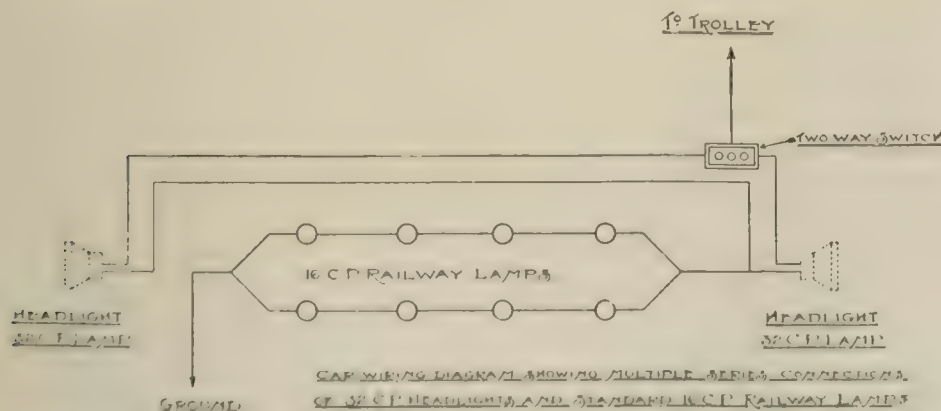
In the course of a description of the municipal tramways of Ilford, England, the Electrical Engineer, of London, describes an interesting accessory to the system which consists of a combined sweeper and water car built by the British Electric Car Co., of London. The body of the car is carried on two maximum traction trucks which are equipped with British Thomson-Houston motors and controllers. In addition to the two car motors there is a third one of the G. E.-54 type used for driving the sweeping brushes. This motor is arranged to drive a diagonal cross-shaft which is parallel

to the brushes and on which clutch gear is arranged so that either the fore or rear brush can be driven as desired. The direction and speed of rotation of the motor and cross shaft is regulated by means of a controller. The brushes are driven by chain gearing from the diagonal cross shafts through a single reduction gear, and the brushes can be raised and lowered by means of a lever. The gearing is enclosed but can be inspected through doors at the side or end of the gear case.

In addition to the sweeping gear the car contains an 1,800-gallon tank which is used for supplying water to the track. The tank is built of ¼-in. iron plate and is thoroughly cross-braced. Inside of the tanks are ranged baffle plates to prevent

the surging of the water due to sudden changes in speed. The car can be operated by two men.

A resolution has been adopted by the Columbus (O.) City Council ordering every street car of the city thoroughly fumigated every 24 hours.



ment wound in the form of a close conical spiral, which has been designed for this special purpose. This filament is supplied in several types of bulbs, made to fit the various types of headlights.

The company's standard type of headlight lamp is the round bulb 32-c. p. size here illustrated. This requires the headlights to be wired in multiple series connection with two circuits each of four

KANSAS CITY NOTES.

The work of changing the 14th St. cable line into an electric line is progressing rapidly and it is intended to have the change completed by June 1st. The wages of all the motormen and conductors will be increased one cent per hour beginning April 1st. This will make the rate from 16 to 21 cents per hour, and the first raise from 16 to 17 cents will be given after the men have worked six months instead of one year, as heretofore. On the same day all the



TEMPORARY TRESTLE AND TRACK DURING BRIDGE REPAIRS

trackmen and other day laborers will receive an increase from 15 cents to 17½ cents per hour. These increases are entirely voluntary on the part of the company and form a part of the very liberal policy which the company has adopted.

A switch is being built into a stone quarry to enable the company to haul rock after midnight from the quarry to the new power house for use in the concrete foundation walls. This large structure is being pushed to completion day and night.

The accompanying illustration shows the plan adopted by the engineers for the reconstruction of one of the company's bridges. This bridge is shown on the right of the illustration, and the temporary trestle was built as shown on the left-hand side, the cars being diverted to the temporary trestle while the new bridge is being built. This will be a double track steel structure set on concrete abutments. The trestle is 350 ft. long and 25 ft. high and it was estimated that it would be cheaper to build this than to attempt to rebuild the bridge while the cars were being operated over it.

Considerable controversy has taken place in regard to setting poles in Independence Boulevard, but this has been settled by permitting the company to use center poles. Some of the residents along the boulevard demanded that the company use either storage battery or underground conduit cars in this street, but the company decided to remove the line from the street altogether rather than submit to either of these plans. The present line in this street is operated by cable.

The standard color of all of the company's cars is being changed from yellow to green and the newly-painted cars present a very attractive appearance.

A NEW LUBRICANT FOR RAILWAY BEARINGS.

The Hanna solid oil, a comparatively new product of the Hanna Oil Co., 14 S. Water St., Chicago, is especially fitted for railroad

journals and all kinds of heavy bearings and high speed machinery. It is endorsed by many street railway and other users. One car that was packed with it ran 54,000 miles with one greasing. It is a hard oil, but contains neither alkali nor rosin. It is made in various grades. In packing journals ordinary wool waste is used and it is not necessary to renew the packing on the longest run.

NEW COMBINATION CAR.

The accompanying engraving shows the combination car "Maranacook" built by the Laconia Car Co. for the Augusta, Winthrop & Gardner Street Ry., of Augusta, Me. This car is 35 ft. over body, with passenger compartment about 23 ft. long and baggage compartment about 12 ft. long having sliding door on each side, and also slatted seats arranged to fold, which can be used by smokers. It has seating capacity for 32 passengers.

The car is finished in cherry with oak ceilings, polished plate glass and "Crown" curtains. The seats are Wheeler No. 42 type



LACONIA CAR FOR AUGUSTA, ME.

with offset backs, having bronze grab handles on back and upholstered in rattan. There are eight double sash windows on side, both sash arranged to drop flush with window stool. This car is mounted on the Laconia No. 9-B-2 double truck with patented swing bolster, and fitted with Laconia double plate wheels, and is equipped with Christensen air brakes, Westinghouse motors and Consolidated heaters.

TRADE NOTES.

THE NERNST LAMP CO., of Pittsburg, Pa., opened an office in the National Life Building, Chicago, on April 1st.

SANDERSON & PORTER, engineers and contractors, of New York, will remove their offices on May 1st from 31 Nassau St. to 52 William St., corner of Pine St., that city.

THE WHITNEY CAR WHEEL CO., successor to A. Whitney & Sons, will soon erect a large plant in South Camden for the purpose of manufacturing car wheels for both steam and electric roads.

THE NEW PROCESS RAW HIDE CO., of Syracuse, N. Y., has just purchased a site for a new factory in that city, and this will be built within a year. The increased business made it necessary that the company have more room and better facilities.

MR. C. J. HARRINGTON, 15 Cortlandt St., New York, advises us that he has closed a contract for several thousand Chase-Shawmut flexible rail bonds and also for all of the overhead material for the Waynesboro (Pa.) Ry. The feature of the Chase-Shawmut bond is



LORD'S WATER PURIFYING CHEMICALS

ARE NOT A FIXED COMPOUND BUT PREPARED AS REQUIRED
TO REMOVE THE PARTICULAR SCALE FORMATION ANALYZED.

WE MAY BE ABLE TO TELL YOU HOW TO KEEP YOUR BOILERS FREE FROM SCALE
SEND US A SAMPLE WE'LL ANALYZE IT FREE OF COST.

GEO. W. LORD CO.,

2238-50 N. 9th Street,

PHILADELPHIA.

that it makes a solid contact with the rail, being soldered to the latter. Mr. Harrington has arranged to represent the Chase-Shawmut Co. on rail bonds throughout the Middle States. He will be pleased to forward catalog and further information upon request.

THE BROWNLEE LUMBER CO., of Meridian, Miss., has the largest cross arm factory in the South and also owns and operates four saw mills. It makes a specialty of cross arms and bridge timber for electric railway work. Genuine long leaf yellow pine is used for cross arms, which are made any size, length or boring, and prompt shipments are guaranteed.

J. B. D'HOMERGUE, manager of the "Keystone" hair insulator department of the H. W. Johns-Manville Co., 100 William St., New York City, sailed on March 30 for England, where he will make a comprehensive investigation of the trade for asbestos and sound-deadening materials in that country. Upon his return in May he will be permanently located in New York.

THE HUNTER AUTOMATIC FENDER CO., of Cincinnati, has been awarded the contract to equip with its fenders 450 of the cars of the St. Louis Transit Co., now under construction by the St. Louis Car Co. Some recent accidents in St. Louis have demonstrated the reliability of these fenders, in one case a young child being picked up without injury by a car running at full speed.

THE BROWN CORLISS ENGINE CO., of Corliss, Wis., has received an order from the Middlesex & Somerset Traction Co., of Brunswick, N. J., for one 16 and 30 by 42-in. horizontal cross-compound engine and one 18 and 32 by 36-in. vertical cross-compound. Among other orders is one from the American Locomotive Works, Dunkirk, N. Y., for a 26 and 42 by 42-in. tandem compound.

LUMEN BEARING CO., Buffalo, N. Y., issues a very pretty monthly calendar suitable for home or office. That for April shows a reproduction of Rosati's "Camel Traders," a typical desert scene, the picture being 3x4 in., surrounded by a deep olive mat. Surmounting the picture, in silver letters that do not detract from its attractiveness, is the company's address; under it the calendar for the month.

THE ALLIS-CHALMERS CO. reports the following partial list of engine sales for railroad purposes for March, 1903: South Side Elevated Railway Co., Chicago, one 34 and 70 by 54 1890 horizontal cross-compound Reynolds corliss; International Traction Co. of New Jersey, Jersey City, two 34 and 68 by 48 1890 cross-compound condensing Reynolds corliss; Pennsylvania R. R., Philadelphia, one cross-compound Riedler air compressor, 15 and 24 by 36.

WILLIAM B. SCAIFE & SONS CO., Pittsburg, Pa., manufacturer of the Scaife and We-Fu-Go systems of water softening and purification, has appointed Mr. H. Clay Moore sole agent for the southeastern part of the United States, with offices at No. 816 Empire Building, Atlanta, Ga. Mr. Moore is well-equipped, having not only given the subject in hand considerable attention, but also having had several years' experience in practical engineering in the South.

G. M. GEST, the conduit and sub-way contractor, has been awarded a large contract for the underground conduit work in and around the L St. central station of the Edison Electric Illuminating Co., of Boston, which will involve very heavy construction, having 186 ducts in one trench. He has also been awarded additional contracts by the Brooklyn Heights R. R. for underground conduit work along Flatbush Ave., Brooklyn, which will be a large piece of work and will amount to many thousands of dollars.

THE ENGINEERING AGENCY, Monadnock Bldg., Chicago, which has made a business of finding positions for technical men during the last ten years, reports that it has secured positions for over 5,000 technical men in this time, and although the registrations for the past two years have exceeded 3,000 the agency has difficulty in securing enough competent men to supply all of the demands made upon it. The agency is under the management of F. A. Peckham, president, A. B. Gilbert, treasurer, and A. G. Frost, secretary.

THE MAYER & ENGLUND CO., of Philadelphia, general sales agent for the Protected Rail Bond Co., has recently closed a number of very large and most important contracts for the well-known "Protected" rail bonds. During the past month orders aggregating over 300,000 bonds have been secured for early spring delivery. Some of the principal contracts are with the following companies: Interborough Rapid Transit Co. (New York Subway); Scioto Valley Traction Co., Columbus, O.; Massachusetts Electric Companies, Boston; Brooklyn Heights Railroad Co.; International Railway Co., Buffalo; Union Traction Co., Anderson, Ind.; United Gas Improvement Co., Philadelphia; Rochester & Eastern Rapid Railway Co.; Vandegrift Construction Co., Philadelphia; York County

Creaghead Flexible Brackets

ARE STANDARD

CREAGHEAD ENGINEERING CO.
ENGINEERS
and MANUFACTURERS
OVERHEAD LINE MATERIAL.

For Single
and Double
Wire.



West End Cap
and Cone and
Solid Types of
Insulators.



Trolley Spileers,
Strain Ears, Feeder
Ears, etc.



Solid Type
Insulators.



Ears for Round Figure 8,
and Groove Forms of
Trolley Wire



No. 200.



No. 404.



No. 430.

Type D For Single
and Double Wire.



No. 210.



No. 345.



No. 435.

Complete Equipment for
Overhead Construction.

THE CREAGHEAD ENGINEERING CO.

ENGINEERS AND
MANUFACTURERS


WRITE FOR
CATALOGUE

CINCINNATI,
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**ARMATURE
AND
FIELD COIL
VARNISH**

STANDARD FOR 15 YEARS



WATER-PROOF ACID-PROOF

**WILL NOT MELT OR PEEL.
A PERFECT INSULATOR.**

**The Highest Grade Varnish on
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THE

STANDARD PAINT COMPANY

NEW YORK 100 William Street
CHICAGO 188-90 Madison Street

HAMBURG Doyenhof 93
PARIS 20 Rue St. Georges
LONDON 59 City Road, E. C.

Traction Co., York, Pa. Notwithstanding these many large orders on hand, Meyer & England Co. states that it can fill any additional order of ordinary size within 10 days or two weeks, as the manufacturing facilities are extensive and complete.

THE BURT MANUFACTURING CO., Akron, O., recently sent two large Cross oil filters to the United States Steel Corporation, making 114 now in its mills. The American Tinplate Co. forwarded its 28th order for filters, the American Sheet Steel Co. its 18th; the Baldwin Locomotive Works its 16th order for exhaust heads and the Edison Phonograph Works its third. Orders for filters have been received from the B. F. Goodrich Co., Pittsburg Steamship Co., Eastern Shipbuilding Co., International Harvester Co., and a large electric lighting plant in Mexico City, Mex. The Cross filter will be used at the World's Fair, St. Louis, also.

ADAM COOK'S SONS, 313 West St., New York City, sole maker of "Albany Grease," recently received a request from the Iowa City Electric Light Co., Iowa City, Ia., to express at once an Albany grease cup to replace one that had got broken. Geo. S. Carson, general manager, writes: "We are using them on a nine-inch shaft with your Albany grease to replace one of the best makes of self-oiling bearings which, on account of the shaft being driven by gear, would throw out the oil as fast as it could be put in and gave trouble. Your cups and grease run the bearings as slick as grease, and keep them cool. It was a very agreeable surprise to us, we can assure you."

THE DUFF MANUFACTURING CO. advises us that a great many of the leading street railway companies in this country have adopted the Barrett jack as their standard, and are using it both for car work and in track construction. The announcement which was made recently in the "Review" to the effect that the Pittsburg Railways Co. had placed an order for sufficient No. 2, Barrett jacks to equip all of the company's cars serves to remind us that similar action was taken by the Cape Town Tramways Co., Cape Town, S. A. The Barrett motor armature lift made by the Duff Manufacturing Co. is meeting with a very large sale among street railways and is pronounced adapted in every way to the requirements of the work for which it is intended.

THE C. & G. COOPER CO., Mt. Vernon, O., closed contracts for corliss engines during the past few weeks as follows: The Ingersoll-Sergeant Drill Co., New York, four cross-compound engines for its new shops at Phillipsburg, N. J.; National Cash Register Co., Dayton, O., one 1,250-h. p. cross-compound, direct-connected engine duplicating the one in operation; American Cement Co., Egypt, Pa., 28 x 48 mill engine; Merrimack Manufacturing Co., Huntsville, Ala., one 2,000-h. p. cross-compound condensing engine; Naumkeag Steam Cotton Co., Salem, Mass., one 28 and 56 by 60 cross-compound condensing engine; Indianola Heating & Lighting Co., Columbus, O., one 20 and 36 by 42 cross compound engine direct connected to 400-kw. alternating current generator; Brandon Mills, Greenville, S. C., one 52 x 48 low pressure side of a cross-compound engine; Aetna Paper Co., Dayton, O., one 16 and 32 by 42 cross-compound condensing engine, and one simple girder engine; Quaker Portland Cement Co., Easton, Pa., two 18 and 40 by 42 cross-compound engines direct connected to 400-kw. generators, two 22 and 44 by 42 cross-compound mill engines and two 18 and 36 by 42 ditto; Old Colony Street Railway Co., Boston, Mass., one 32 and

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64 by 48 cross-compound condensing engine direct connected to an 1,800-kw. generator; New York & Long Island Traction Co., Hempstead, N. Y., two 20 and 40 by 42 tandem compound condensing engines direct connected to 500-kw. alternating current generators; Terre Haute Electric Co., Terre Haute, Ind., one 24 and 44 by 48 cross-compound engine direct connected to a 600-kw. generator; Anstad & Burk Co., Springfield, O., one 14 and 26 by 42 cross-compound condensing girder engine; Cincinnati & Columbus Traction Co., Cincinnati, O., two 26 and 30 by 48 cross-compound condensing engines direct connected to 800-kw. alternating current generators.

THE BROWN & SHARPE MANUFACTURING CO., of Providence, R. I., has issued a complete catalog of the well known Brown & Sharpe machinery and tools. The catalog is of the familiar pocket size, contains 458 pages and is devoted to descriptions, illustrations and price lists of the wide variety of machines and tools which this house makes. The list includes milling machines, grinding machines, automatic gear cutters, screw machines, cutters of various kinds, test tools and machinists' tools of every description. A copy will be forwarded on request. The business now conducted by the Brown & Sharpe Manufacturing Co. was founded in 1833 by David Brown and his son Joseph R. Brown. David Brown retired in 1841, and the business was continued by Joseph R. Brown until 1853, when Lucian Sharpe became his partner, and the firm of J. R. Brown & Sharpe was formed. The Brown & Sharpe Manufacturing Co. was incorporated in 1868. The works of the company are situated one-half mile from the business center of Providence, the total floor area of the buildings comprising the plant being 367,760 sq. ft., or about 8½ acres.

THE VILTER MANUFACTURING CO., builder of refrigerating and ice-making machinery, corliss engines, brewers' machinery and bottling outfits, Milwaukee, Wis., has recently closed the following contracts: Arbogast & Bastian Co., Allentown, Pa., 50-ton refrigerating machine; Schmulbach Brewing Co., Wheeling, W. Va., 70-ton plate ice plant; Goesen & Leonards, Rayne, La., 8-ton ice plant; Bridgeman & Russell, Duluth, Minn., 20-ton refrigerating machine; Clarinda State Asylum, Clarinda, Iowa, 4-ton ice and 18-ton refrigerating plant; Kalispell Malting & Brewing Co., Kalispell, Mont., 25-ton refrigerating machine; Home Brewing Co., Brad-dock, Pa., 75-ton refrigerating machine; Robt. Palestine, New Orleans, La., for export, 6-ton refrigerating machine with 3-ton ice tank; Goenner & Co., Johnstown, Pa., ice-making tank; Star Brewing Co., St. Joseph, Mo., 10-ton refrigerating machine; Ward-Corby Co., Providence, R. I., 10-ton refrigerating machine; Ward-Corby Co., Chicago, Ill., 10-ton refrigerating machine; Du Bois Brewing Co., Du Bois, Pa., 100-ton refrigerating and 30-ton plate ice plant; John Heberling, Warrensburg, Mo., 20-ton refrigerating machine; Saltzman Brewing Co., Oil City, Pa., 50-ton refrigerating and 5-ton ice plant; Chapin-Sacks Manufacturing Co., Washington, D. C., 50-ton plate ice plant; Reno Brewing Co., Reno, Nev., 10-ton refrigerating machine; Ingersoll Packing Co., Ingersoll, Ont., 75-ton refrigerating machine; Port Arthur Ice & Cold Storage Co., Port Arthur, Tex., 40-ton ice plant; Hygeia Ice & Coal Co., Port Chester, N. Y., 20-ton plate and 10-ton can ice plant; J. P. Baden Produce Co., Winfield, Kan., piping for ice tank; Pittsburg Brewing Co. (Baerlein Branch), Bennett, Pa., direct expansion ammonia

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| 1200 " Indianapolis & Greenfield, Indianapolis, Ind. | 1000 " |
| 500 " Mississippi Valley Transit Co., St. Louis, Mo. | 550 " |
| 500 " Wichita Railroad & Light Co., Wichita, Kas. | 1000 " |
| 500 " Kokomo Railroad & Light Co., Kokomo, Ind. | 600 " |
| 800 " Toledo, Eostoria & Findlay Ry., Eostoria, Ohio | 800 " |
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pipng. Theo. Hamm Brewing Co., St. Paul, Minn., ammonia condenser; Eric W. Jones Brewing Co., Manchester, N. H., ammonia condenser and piping; Geo. J. Renner, Jr., Youngstown, O., direct expansion ammonia piping; Union Brewing Co., Sharon, Pa., piping; Plankinton Packing Co., Milwaukee, Wis., 12-coil counter-current ammonia condenser; Ruemmel-Dawley Manufacturing Co., St. Louis, Mo., for customers, one 60-ton, one 25-ton, one 35-ton, one 40-ton, two 50-ton, two 75-ton, two 10-ton, one 15-ton and one 150-ton refrigerating machine; also one 12 x 36-in. compressor to be fitted to existing Pictet refrigerating machine. Corliss engines have been ordered by the following: Shawmut-Clay Manufacturing Co., Shawmut, Pa.; Garland & Williams, Devers, Tex.; W. Toepfer & Sons, Milwaukee, Wis.; W. W. Cargill Co., Green Bay, Wis.; Racine Trunk Co., Racine, Wis.; Great Northern Moulding Co., Chicago, Ill.; Hartman Trunk Co., Racine, Wis.; Winnebago Paper Mills, Neenah, Wis.; B. D. Eisendrath Tanning Co., Racine, Wis.; Wisconsin Bridge & Iron Co., North Milwaukee, Wis.; P. Becker & Co., Chicago, Ill.; Skandia Furniture Co., Rockford, Ill.; Milwaukee Rubber Works Co., Cudahy, Wis.

FORD, BACON & DAVIS will on May 1st remove their New York offices to the Blair & Co. Building, 24 Broad St., New York.

JOHN A. MEAD & CO., of New York City, have received the order for the coal and ash handling machinery in the new power house to be erected by the General Electric Co., at Schenectady, this machinery to include two lines of coal and ash conveyors and coal crushers. Among other large orders secured recently for McCaslin conveyor machinery is a second order from the Denver Tramways, and a second and third order from the Commonwealth Electric Co., of Chicago.

ADVERTISING LITERATURE.

THE SPRAGUE ELECTRIC CO. has issued recently Bulletin No. 101, on "Direct-Current Generators of the Single Field Coil Type," and Bulletin No. 102, on "Direct-Current Generators of the Split-Pole Type."

THE H. W. JOHNS-MANVILLE CO., New York, N. Y., is sending out a leaflet describing the long service of its asbestos high pressure packing rings, being "a life story" of packing that remains in excellent condition after six years of perfect service.

THE MAYER & ENGLUND CO., Philadelphia, Pa., says some things in "The Keystone Traveller" for March which should interest every purchasing agent of every electric street railway. In this crisp, breezy booklet attention is called to two books about two important parts of the company's business—protected rail bonds, and the gen-



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eral line of street railway supplies. It is suggested that "the man at the heart of a street railway business who has not seen these books had better ask for them."

THE PEERLESS ELECTRIC CO., of Warren, O., has issued bulletins A, B. and C., exploiting direct current desk fans, direct current ceiling fans and alternating current desk fans, respectively. The western distributor of this company is the Western Electrical Supply Co., of St. Louis, Mo.

THE BALDWIN LOCOMOTIVE WORKS of Philadelphia has issued a handsomely printed pamphlet of 40 pages entitled "Some Notable Trains" in which are illustrated a number of the well-known fast trains on railroads in all parts of the country that are drawn by Baldwin locomotives.

THE SPRAGUE ELECTRIC CO. has issued Bulletin No. 411, "Iron-Armored Conduit, Junction Boxes, Fittings, Tools, etc.," and Bulletin No. 412, "Flexible Conduit Conductors and Cords, with Junction Boxes, Fittings, Tools, etc." Both of these are 7 x 9 in. in size and each contains 48 pages.

THE WESTINGHOUSE ELECTRIC & MANUFACTURING CO. has issued recently three supplements to its Detail Catalog No. 300. Supplement No. 1 is on "Westinghouse Type D Knife Switches Rear Connections 600 Volts"; No. 2, on "Westinghouse Oil Switches and Circuit Breakers"; No. 3, (superseding pages 298 and 299), on "Diverters; Ventilated Cell and Grid Types for Street Railway Equipment."

THE KIRKPATRICK & BINDER CO., Philadelphia, Pa., has just issued its 1903 catalog of mouldings, cross-arms, insulator pins and brackets, and ceiling blocks. The information contained therein is clear, concise and comprehensive. Several entirely new tables are incorporated, giving the outside dimensions of all the prominent makes of wire. Also, there are given the sizes of wire each size of molding is adapted for.

THE JOSEPH DIXON CRUCIBLE CO., of Jersey City, N. J., has something interesting to say in the April number of Graphite, issued in the interests of Dixon's graphite productions. Appropriate to the season, space is devoted to spring roof painting, and an editorial on "Adulterated Linseed Oil" is reprinted from a New York technical paper. Steel construction is also discussed and graphite products prominently featured.

THE CROCKER-WHEELER CO., Ampere, N. J., has issued a 28-page circular giving the names and addresses, alphabetically arranged, of 375 Chicago users of Crocker-Wheeler motors on Jan. 1, 1903, together with the number and horse-power capacity of motors installed. Armour & Co., Anglo-American Provision Co., Chicago University, R. R. Donnelley & Sons Co., John Alexander Dowie, Marshall Field & Co., are some of the largest users noted. The

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Union Traction Co., South Side Elevated Railway Co., Metropolitan Elevated Railway Co., and Calumet Electric Street Railway Co. are also named.

THE CROCKER-WHEELER CO., Ampere, N. J., has issued Bulletins Nos. 33 and 34, for February and March. No. 33 is devoted to "Electricity as a Motive Power for Machine Shops," with special reference to the electrical equipment of The William R. Frigg Co., Richmond, Va. No. 34 is entitled "Cement Making with Electric Power," being an abstract from an article in a technical paper descriptive of the Alston's American Portland Cement Works.

THE WESTINGHOUSE ELECTRIC & MANUFACTURING CO., Pittsburg, Pa., has issued special publication No. 7,006 and folder No. 4,011, illustrating a few of the many adaptations of Westinghouse fan motors for alternating and direct current circuits. They are replete with useful information appropriate to the proximity of the summer season. The company has placed upon the market an improved series of fan motors and it would be well to send for one or both of these publications at once.

THE STANDARD VITRIFIED CONDUIT CO., of New York City, has issued a handsome 65-page catalog with unique, patented covers that represent sections of the conduit for which the company is favorably known. The contents include carefully prepared data as to the manufacture, use and care of the conduit, half-tone illustrations of the salient features, much useful general information, and a section devoted to third rail insulators. A list of references completes the work, which it would pay those interested to send for.

PAWLING & HARNISCHFEGGER, Milwaukee, Wis., issued for April an unique folder containing a list of users of cranes and hoists made by them. The list not only contains a very large number of representative concerns of this country, but likewise presents a creditable showing on foreign business. The customers are quoted alphabetically to permit easy reference, the types of the machines are classified and the exact service and the capacity of each are given. Pawling & Harnischfeger cranes and hoists in service number nearly 1,000.

THE GENERAL ELECTRIC CO. has issued the following publications: Bulletin No. 4308, "Generators for Electroplating, Electrotyping and other Electrolytic Work." Bulletin No. 4311 (Super-

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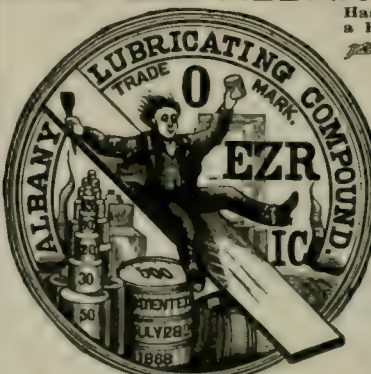
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sedes Bulletin No. 4233), "Rotary Converters for Railway Systems," Bulletin No. 4312, super-sedes Bulletin No. 4257, "Fuse Plug Cabinet Panels," Bulletin No. 4314, "Meridian Lamp," "Fan Motors," a pamphlet of 60 pages illustrating various types of fan motors and fans made by the company. Catalog and price list No. 7572, "Parts of L-4 Controller," "Index to Flyers," to Feb. 20, 1903. Flyer No. 2111, "Commutator Brushes for Brush Arc Generators," "Index of Price Lists," to Feb. 23, 1903.

THE FARR & FOSTER CO., 186 East Jackson Boulevard, Chicago, Ill., has just issued a 60-page illustrated catalog of railway ticket cases, tariff cabinets and pigeon-holes, punches, employes' cap and coat badges, baggage checks, daters, ticket perforators, map cases and numerous other railway office and station supplies made and dealt in by this company. Attention is also called to ticket-printing, of which the company makes a specialty of every kind of ticket, coupon or transfer used by street railways.

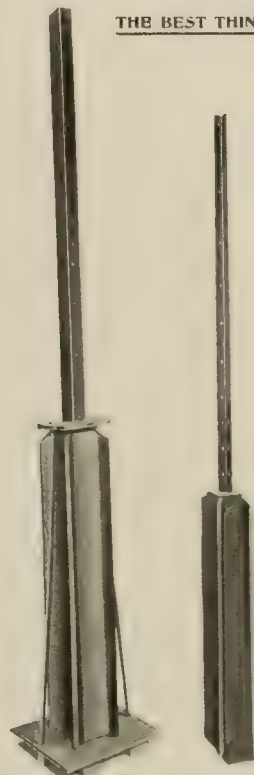
"HOW TO PACK GAS ENGINE CYLINDER HEADS" is an interesting leaflet, giving full directions for cutting gaskets, preparing the flange and applying the gasket, so that the most efficient service may be obtained. The difficulty of packing cylinder heads of gas engines for stationary, launch, and motor service, has been one of the discouraging features in the use of these engines. The methods described in the leaflet have been proved by years of experiment to be successful in avoiding the difficulties and secure the best results. Anyone interested can secure this leaflet from the H. W. Johns-Manville Co., 100 William St., New York, or its branch offices in Milwaukee, Chicago, St. Louis, New Orleans, Pittsburg, Cleveland, Boston, Philadelphia and London.

The Lake Shore Electric Railway Co., Cleveland, O., has been discharged from receivership.

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To avoid loss by reason of its employees being held up, the Metropolitan Street Railway Co., Kansas City, Mo., has arranged to have conductors turn in their receipts frequently, so the bulk of the money will be in the company's safes before 9 p. m.

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STREET RAILWAY REVIEW

Vol. XIII

MAY 20, 1903

No. 5

The Los Angeles and the Pacific Electric Railway System, Los Angeles, Cal.* I.

Organization of the Pacific Electric Railway Co. and the Los Angeles Railway Co.—List of the Companies Consolidated—Territory Covered—Power Plants—Sub-Stations.

The city of Los Angeles and its suburbs to the north, east and south are served by two large street railway systems which are operated in harmony under practically one management. Both companies are owned by the same interests and the entire system has a trackage of somewhat over 300 miles measured as single track. The territory covered by the interurban divisions is shown on the accompanying map.

The Los Angeles Railway Co. was organized Mar. 20, 1895, by

quired all the street railways in the city operated by animal power. The control of the Los Angeles Railway Co. was acquired by the present owners Oct. 1, 1898. The system now includes about 173 miles of track, nearly all of which is double track, all located within the city limits of Los Angeles.

In 1898 the Pacific Electric Railway Co., operating in Los Angeles, purchased the Los Angeles & Pasadena Electric Ry., the Pasadena & Mt. Lowe Electric Ry., the Temple Street Cable Ry.,



POWER HOUSE AND CAR BARNS, CENTRAL AVE., LOS ANGELES.

the purchase and consolidation of the Los Angeles Railway Co., the Main Street & Agricultural Park Railway Co., and the San Pedro St. line. The corporations had acquired by consolidation and purchase at various times, the Los Angeles Cable Railway Co., the Los Angeles Consolidated Electric Railway Co., the Mateo Street & Santa Fe Avenue Street Car Co., the Los Angeles & Vernon Street Car Co., and the Depot Railway Co. These various corporations, particularly the Los Angeles Cable Railway Co., had ac-

* Besides the Pacific Electric Railway and the Los Angeles Railway companies there are in Los Angeles four other companies: 1. The Los Angeles Traction Co., operating three lines, aggregating 26 miles in Los Angeles. 2. The California Pacific, the Traction company's interurban road between Los Angeles and San Pedro. 3. Los Angeles Pacific R. R., operating several lines 62 miles in all from Los Angeles to the ocean beaches. 4. Los Angeles and Redondo Railway Co., operating an electric line from Los Angeles to Redondo via Belvidere and a steam road via Gardena.

the Santa Ana & Orange Motor Co., of Orange; the Brookline Ave. and the East Ninth St. lines of the Los Angeles Ry., and the Fifth St. line of the Pacific Electric Railway Co., of Arizona. It has a total of 20 miles of track within the city of Los Angeles, not including the interurban lines. The company was reorganized in 1901 with a capital stock of \$1,000,000 by the Huntington-Hellman syndicate.

The officers of both the Los Angeles Railway Co. and the Pacific Electric Railway Co., as well as the relations of the companies and the division of authority of the operating departments are shown in the organization diagram herewith.

Tracks.

The track of the Los Angeles Railway Co., which as previously stated, lies entirely within the city limits, is laid with 60 and 62-lb. T-rail, all of which has cast welded joints. The company owns a

east welding equipment made by the Falk Co. and does its own welding. During the last six months the company has rebuilt 20 miles of track, most of which was old cable track. The rails are laid on hewed redwood ties spaced 2 ft. between centers. When the road was acquired by the present company nearly all of the track was single, but all lines have been double tracked under the present management. The company also makes its own special work. During the coming summer it contemplates building 25 miles of new road within the city.

The Pacific Electric Railway Co. is putting its suburban lines in first-class physical condition. The Mt. Lowe line between Altadena and Rubio has been relaid with new 60-lb. T-rails and the road has been considerably straightened. This line has a rise of 600 ft. in two miles. From Echo Mountain to Alpine Tavern a new survey is being made and new track is to be laid with heavy rail to be used with double truck cars. On this line there is a rise of 1,500 ft. in four miles.

Nearly all the track of the Pacific Electric Co. outside of Pasadena and Los Angeles is built upon private right of way owned by the company. During the past year 65 miles of new track have been laid and 8 miles of old track have been relaid with 60-lb. T-rail. Of this track about 27 miles have cast welded joints. The ties used throughout are of redwood and are spaced 2 ft. between centers. The overhead line is substantially built, the poles being of cedar and the trolley wire of No. 000 double groove copper. The overhead material was made by the General Electric Co. and insulated crossings made by Albert & J. M. Anderson are used.

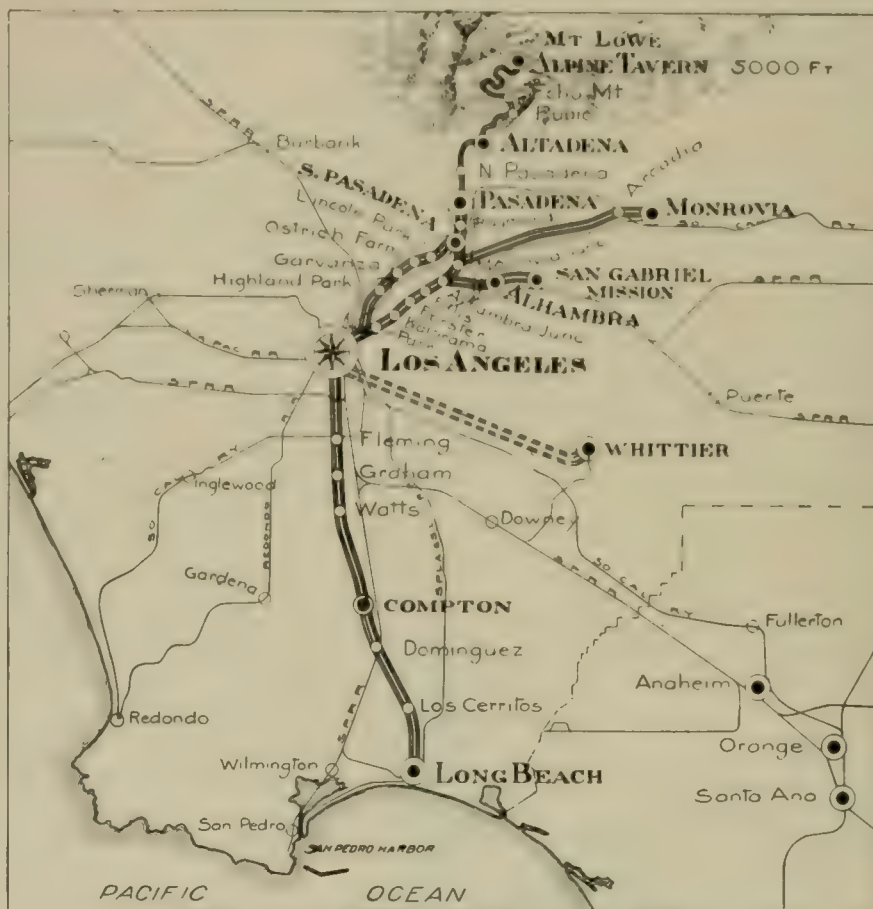
The total mileage of the company including sidings, turnouts, etc., measured as single track is 147.72 miles, as shown by the accompanying table. All the interurban lines of the Pacific Electric Railway Co. are double track standard gage lines with the exception of the old Pasadena Line, which will shortly be changed from narrow gage (3 ft. 6 in.) to standard.

PACIFIC ELECTRIC RAILWAY CO.

May 1, 1903.

| | Length in Miles. | Equivalent Length Single Track Miles. |
|--|------------------|---------------------------------------|
| Los Angeles & Pasadena Ry. (Main & Macy Sts. to Chestnut St.)..... | 10.56 | 10.31 |
| Altadena Line (Chestnut St. to Rubio)..... | 5.62 | 6.22 |
| Mt. Lowe Ry. (Rubio to Alpine Tavern)..... | 4.08 | 4.10 |
| West Colorado St. (Pasadena)..... | 0.58 | 0.58 |
| East Colorado St. (Pasadena)..... | 1.65 | 2.57 |
| North Loop (Pasadena)..... | 1.67 | 1.67 |
| South Loop (Pasadena)..... | 2.20 | 2.50 |
| Short Line (First & Los Angeles Sts. to Raymond)..... | 8.67 | 17.42 |
| Alhambra Line (Junction to San Gabriel Mission)..... | 3.54 | 6.60 |
| Monrovia Line (Junction, Eastward)..... | 9.80 | 12.08 |
| Long Beach Line (9th and Tennessee, South)..... | 19.40 | 39.41 |
| Long Beach Line (Alamitos Extension)..... | 5.70 | 7.50 |
| Long Beach Line (14th St. and Magnolia Ave.)..... | 1.63 | 1.63 |
| Santa Ana and Orange (Motor Road)..... | 4.47 | 4.47 |

| | | |
|--|------|------|
| Temple St. Line (Spring St. to Hoover St.).. | 2.98 | 4.71 |
| Belt Line (1st and Broadway to Echo Park Road and Temple Including Jalgowere Road) | 2.48 | 4.15 |



INTERURBAN SYSTEMS CENTERING AT LOS ANGELES.

| | | |
|---|-------|--------|
| Brooklyn Ave..... | 1.68 | 2.25 |
| Fifth St. (1st and Main St. to Arcade Depot. Sole Owner) | 0.175 | 0.35 |
| Fifth St. (1st and Main St. to Arcade Depot. Joint owner with Los Angeles Ry.)..... | 0.915 | 1.83 |
| Ninth St. (Main St. to Santa Fe Ave.)..... | 1.86 | 3.20 |
| First St. (Los Angeles to Broadway. Joint owner with Los Angeles Ry.)..... | 0.23 | 0.46 |
| Pacific Electric Railway Co.'s yards..... | | 4.71 |
| Total Length in Miles | 89.84 | |
| Total Miles Single Track (Including Cross-overs, Turnouts, Sidings, etc.)..... | | 147.72 |

Rolling Stock.

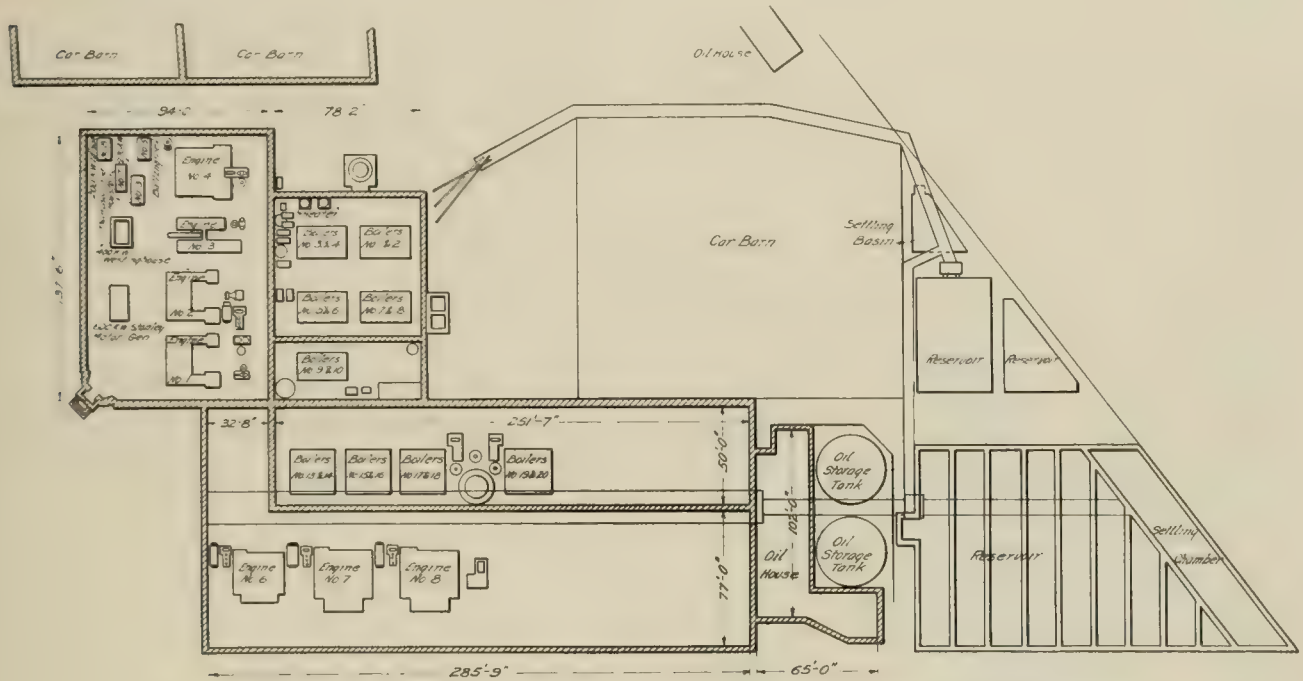
The Los Angeles Railway Co. operates normally about 150 cars. It has a total of 217, of which 176 are mounted on double trucks. The single truck cars are from 25 to 30 ft. long, and the others from 30 to 40 ft. There are 59 cars used on the lines between Los Angeles, Pasadena, San Gabriel and Monrovia, and 8 cars on the Long Beach line. These are double truck cars from 36 to 48 ft. long. In the Los Angeles local service are 8 double-truck and 7 single-truck cars, and on the Mt. Lowe division 9 cars. The cars are all equipped with No. 38-B Westinghouse motors and Westinghouse electro-magnetic brakes are being placed on the cars which operate over heavy grades, some of which reach 13 per cent.

The Los Angeles company has just purchased 35 new cars from the St. Louis Car Co., and ordered 30 more for August delivery. These are 39 ft. long mounted on double trucks and equipped with Westinghouse No. 38-B motors. The headlights and interior lights are arc lamps, a new type invented by Mr. S. H. Anderson, chief

electrician of the Pacific Electric Ry. The cars are to be equipped with Westinghouse motor driven air brakes; all cars of this company are now equipped or are to be equipped with air brakes.

The company has recently installed 60 Ohmer fare registers to be used on the lines east of Los Angeles. In addition to these passenger cars, the company operates a 42-ft. combination baggage and mail car, and 5 motor cars have been fitted up for the use of

each other and are electrically connected so that either company can obtain power from the other. The Los Angeles Railway Co's. power plant was built in 1891 and is a brick structure of ornamental design with steel roof trusses and a corrugated iron roof. The engine and dynamo room is 94 x 137 ft. and it is divided into four bays, each of which is spanned by a 10-ton traveling crane. This room contains two Allis-Chalmers horizontal cross-compound con-



PLAN SHOWING GENERAL ARRANGEMENTS OF POWER HOUSES IN LOS ANGELES.

the construction department. These are double truck cars, 4 of which are equipped with four 50-h. p. motors and the others with four 75-h. p. motors.

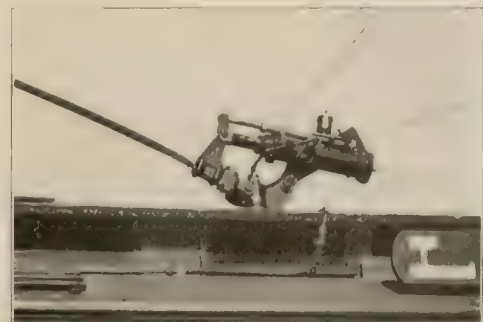
The company is now preparing plans for some new 36-bench open cars, 60 ft. long which will be quite a novelty.

All of the suburban cars of the Pacific Electric Railway Co. are being equipped with the Greenmeyer trolley base. This is a pneumatic device which has been severely tested on the Long Beach division under the direction of the consulting engineer and the heads of the mechanical and electrical departments. It has been recommended as practically perfect. In 20 days' continued service without a moment's attention on a car running at 50 miles an hour requiring a current of from 200 to 300 amperes while running, and as much as 800 amperes on starting the engineer reported that the trolley did not leave the wire but once and that was due to a loose, inverted bell hanger. After traveling over 5,000 miles the trolley wheel was not scored or burned and no sparking was ever visible at the contact of the wheel and wire. This trolley has also repeatedly carried 350 amperes during a run of seven miles at 60 miles per hour and with 27 lb. pressure at the trolley wheel a volt meter showed less than five volts drop across the contact of the wire and wheel. In his report on this trolley the consulting engineer states that the trolley never runs off the wire at any speed up to 60 miles an hour on standard overhead construction work unless there is decided defect in the overhead work, and if it does come off it instantly lowers itself automatically below any span. When released it goes up to the wire with very light pressure and assumes its normal pressure on throwing back the motorman's valve. It works at any pressure above 60 lb. and the air is taken from the regular brake system, a hardly perceptible amount of air being required for the trolley.

Power Houses

The systems of the Los Angeles Electric Railway Co. and the Pacific Electric Railway Co. are operated at present from three power houses, two of which are in Los Angeles and the third in Pasadena. An extensive water power plant is also being installed on the Kern River. The two power houses in Los Angeles adjoin

condensing engines, each of which is direct connected to an 800-kw. Walker generator; one 500-h. p. I. F. Thompson slide valve corliss condensing engine connected through a rope drive to one 200-kw. Edison generator and one 300-kw. Westinghouse generator; one 750-h. p. corliss condensing engine built by the Risdon Iron Works of San Francisco, connected by rope drives to two Thomson-Houston generators of 270 kw. each; one 250-h. p. Ball condensing engine of the vertical cross-compound type, belted to a 200-kw. Edison generator. One of the Allis engines is connected to a surface condenser and all the other engines are operated with jet condensers. The condensers, pumps, and auxiliary steam apparatus are located in the



VIEW OF PNEUMATIC TROLLEY BASE.

basement between the engines and the boiler room, and the switch board is located in front of the row of engines with wire tunnels running from it to each of the machines.

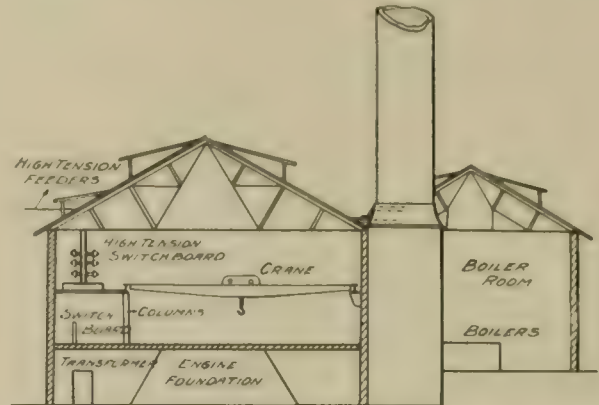
In addition to the generating, power and lighting panels the switchboard contains 32 feeder panels of the General Electric Co. type. The feeders are run from the wire tunnels up the front wall of the engine room and carried out to a steel pole from which they are distributed to three main lines. A lightning arrester is tapped into each feeder just as it leaves the building. In one corner of the

engine room is a 600-kw. Stanley motor generator set with switch-board and transformers constituting a sub-station set. This is known as sub-station No. 1.

The boiler room is located in the rear of the engines and is divided from the engine room by a brick partition wall. It is 78 x 107 ft. and is equipped with 10 Stirling boilers of 250 h. p. each, arranged in batteries of two.

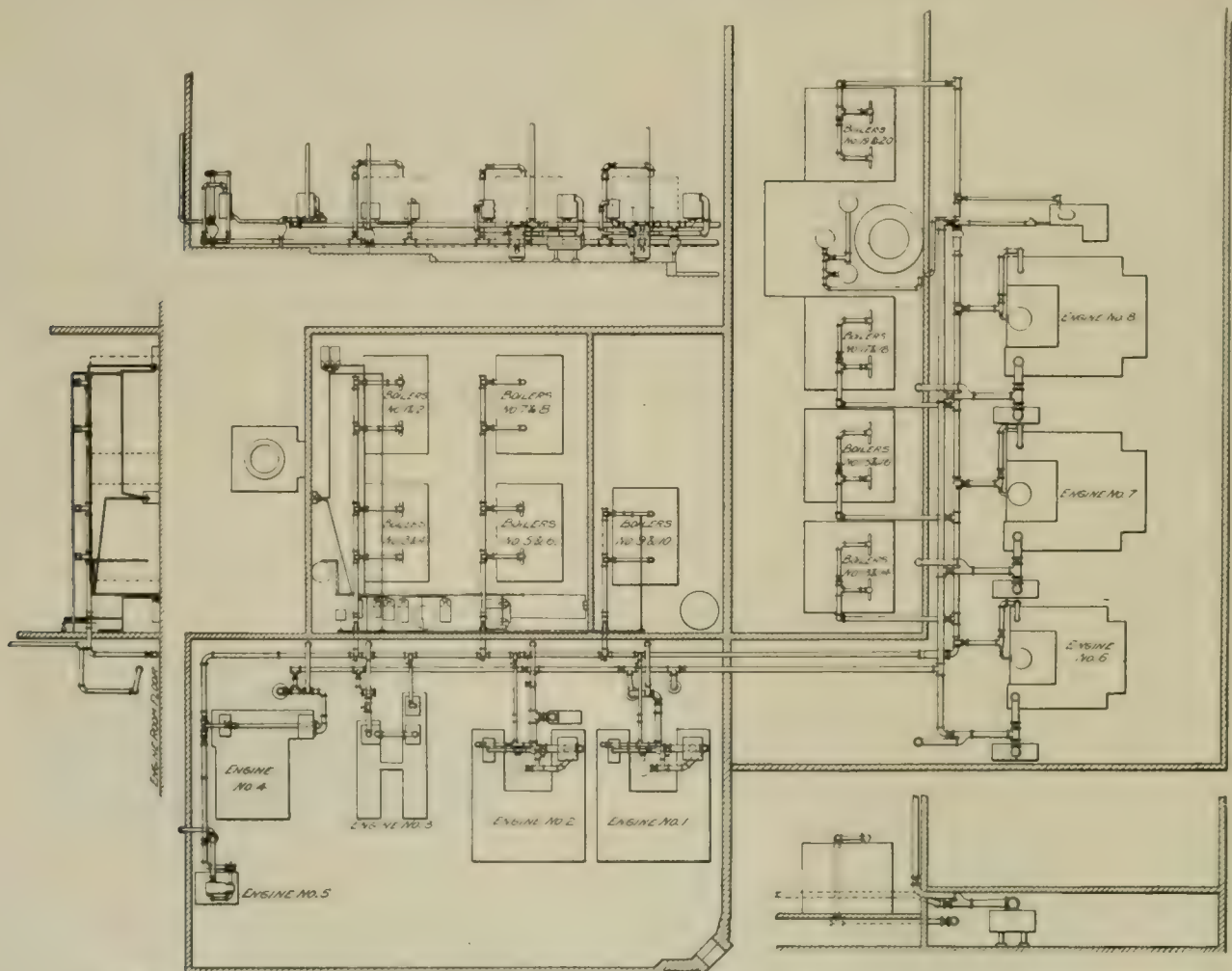
The power house of the Pacific Electric Railway Co. immediately adjoins the one just described, the south wall of one boiler room forming the north wall of the other. The boiler room floors of both buildings are on the street level and the engine room floors of both buildings are about 7 ft. above grade, both being on the same level. A pit about 8 ft. deep is excavated under the floor of the latter engine room giving a basement 15 ft. in height which contains the condensers, pumps, piping and transformers. The foundations and walls up to grade are of concrete and above this are of brick. The boiler and engine rooms are under separate roofs and are divided by a brick wall. The roof trusses are of wood and steel and the roof is of 2-in. plank tongued and grooved, covered with tar paper. Both roofs have large ventilators running nearly their entire length, provided with adjustable sash. The construction of this power house was begun in the spring of 1902 and the machinery is not all installed at the present time. The engine room is 76 ft. 6 in. by 285 ft. and the boiler room is 50 x 52 ft. At one end of the building 32 ft. are cut off from the boiler room to form a passageway of the engine rooms of the two houses. The engine room floor beams are of steel, supported on cast iron columns; the permanent floor is to be of concrete. A 30-ton traveling crane having a 60 ft. span runs the

compound condensing engine of 1,700 h. p. capacity, direct connected to a Westinghouse, 1,050-kw. generator; one engine of the same type of 2,500 h. p. capacity direct connected to a Stanley three-phase, 50-cycle alternating current generator of 1,500 kw. capacity. A dupli-



DIAGRAMMATIC CROSS SECTION OF POWER HOUSE, PACIFIC ELECTRIC RAILWAY CO.

cate of the latter unit is now installed. These three engines run at a speed of 120 r. p. m. Beyond these units is an engine-driven exciter of 60 kw. capacity generating current at 110 volts. This is

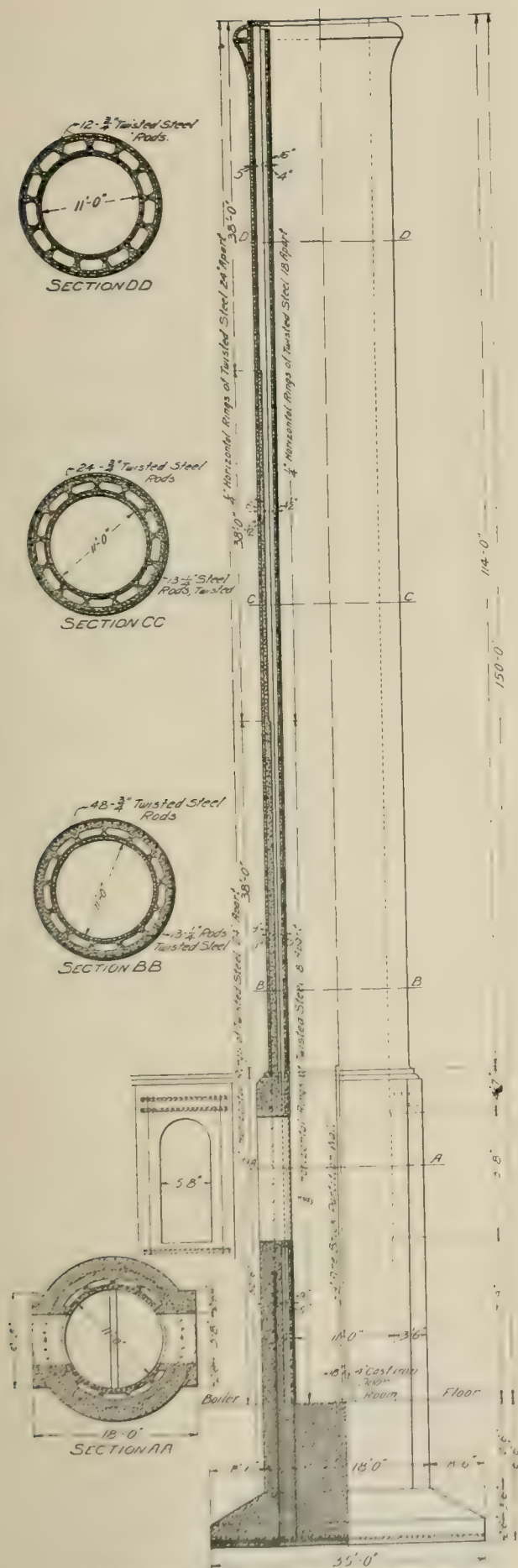


PIPING PLAN OF LOS ANGELES RAILWAY AND PACIFIC ELECTRIC RAILWAY POWER HOUSES.

entire length of the engine room and is supported on columns, 15 ft. of the width of the room being reserved for the high-tension wire gallery.

The machinery thus far installed consists of one horizontal cross

driven by a tandem compound engine. There is also a motor-driven exciter of the same capacity, the motor being a 500-volt machine built by the Northern Electric Co., of Madison, Wis. The generators and both exciters are also of the same make. This com-



prises all of the generating apparatus which is now installed. These engines are arranged in a row along the center of the engine room and spaces of 14 ft. 6 in. are left between the concrete foundations. In these spaces are located the condensers, air pumps and condenser pumps.

The pumps are driven by Westinghouse electric motors some of which are 2,200-volt induction motors and the others 500-volt direct current motors. The condensers are the Wheeler "Admiralty" type. The receivers are located between the high and low pressure cylinders of the engine and all of the space in the condenser pit on one side of the row of foundations is given to piping and all on the other side, exclusively to transformers and wiring.

Provision has been made in the engine room for another engine-driven exciter and three more engine-driven alternators each of 1,500 kw. capacity. Specifications are out for this apparatus and the contract for the generators has been let to the Bullock Electric Manufacturing Co. The Westinghouse Electric & Manufacturing Co. is to furnish the transformers and also ten 400-kw. motor-generator



CHIMNEY CONSTRUCTION.

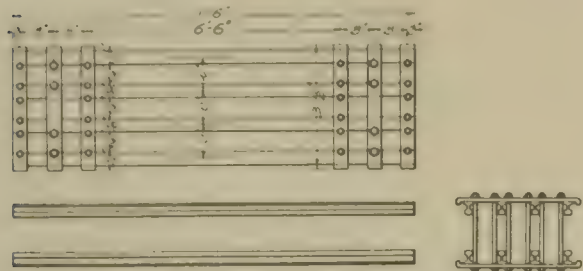
sets for the sub-stations. Contracts for Edwards triplex suction valveless air pumps, Wheeler "Admiralty" condensers, etc., have been let; also for the engines, one of which will be a Nordberg-Corliss.

The boilers of this plant are arranged in a single row along the engine room partition wall, and on account of the traveling crane the steam headers are run under the engine room floor and a tee left at each engine. Eight Babcock & Wilcox boilers of 400 h. p. each are now installed in batteries of two boilers each and there is space for six more boilers in this row. An additional boiler room has been planned and the contract for 10 more boilers of 400 h. p. has been awarded to the Edge Moor Iron Works. The steam headers of the two plants are arranged so that they can be connected together or cut up into sections, so as to give ample opportunity for repairs to boilers and piping.

The stack is located about midway of the row of boilers and the space around it is used as a heater pit. It contains three heaters built by the Llewellyn Iron Works, of Los Angeles; two circulating pumps each direct connected to a 75 h. p. Westinghouse 500 volt motor, and a steam driven slump pump.

Plans for the electrical details of this station are not yet completed, but the general arrangement will probably be to have each engine operate as an independent unit, that is, it will feed a certain

set of lines through its own transformers. Connections will be provided for changing one machine to any other set of feeders and for running in parallel. Aside from the excitors there is but one direct current generator in this power house. This is the 1,050-kw. Westinghouse railway generator. All the other machines are to be three-phase alternators generating at about 2,250 volts. In the space under the engine room floor previously mentioned as reserved for electrical equipment are the transformers and 2,200-volt oil switches for cutting machines in or out. The transformers are of the Stanley 500-kw. oil-cooled type provided with coils for circulat-



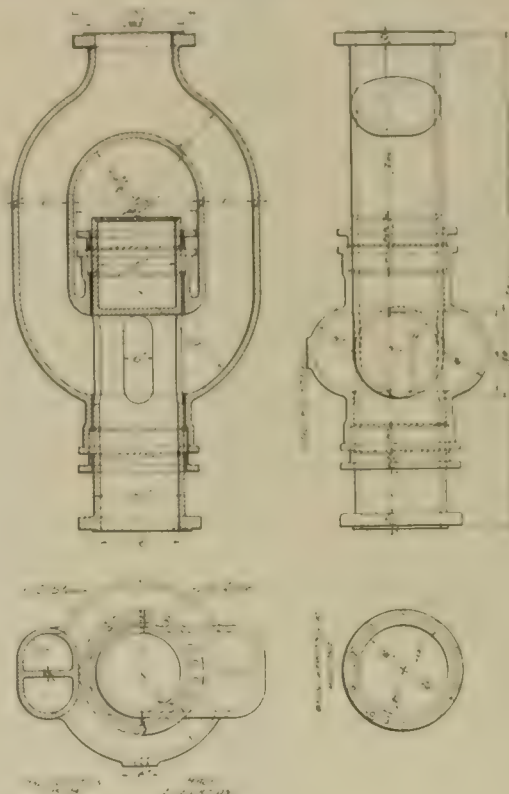
RAILS SUPPORTING ARCHES IN STACK.

ing cooling water. The ratio of transformation is 2,250 volts to 15,000 volts, and in the proposed unit system the transformers and machine switches will be located near each machine.

The switchboards are to be located on the main floor and a system of bell crank levers will connect the operating handles on the board to the oil switches below so that the operators will not be in proximity to high voltages. The machine switches will be arranged in tiers of three each.

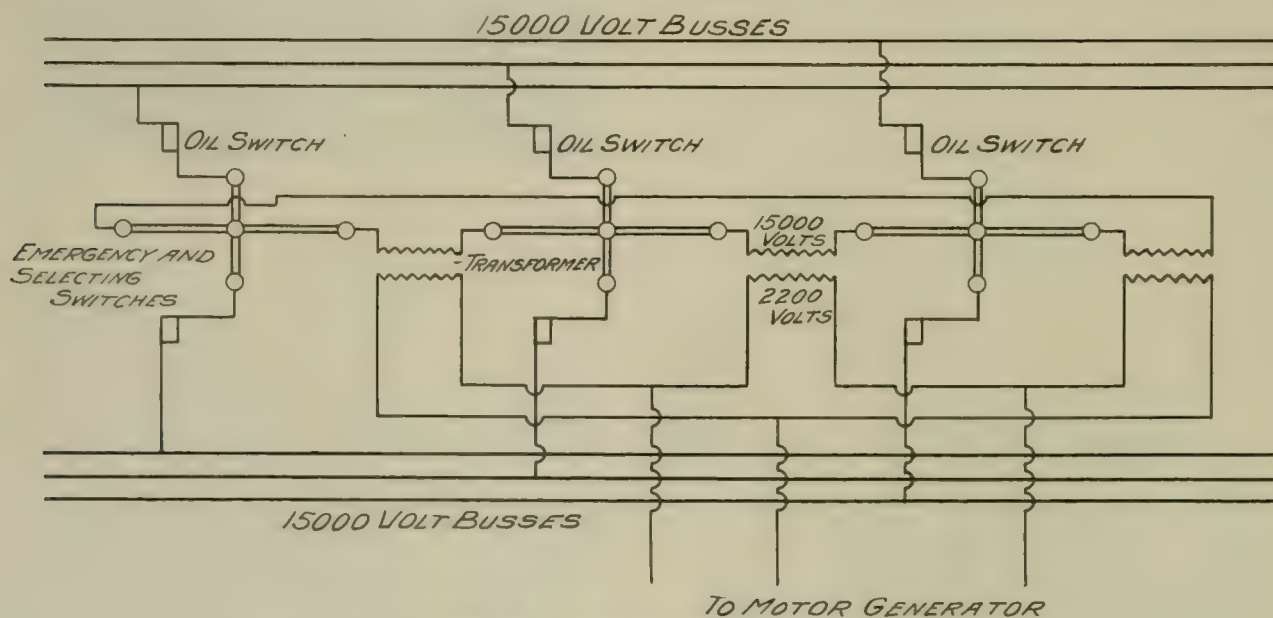
A high tension gallery 15 ft. wide is erected on the south side of the engine room and extends the entire length of the room. This gallery has a cement floor supported on steel I-beams which are bolted to the columns supporting the traveling crane on one side and by the brick walls of the building on the other. Along the center of this gallery is a concrete partition about 4 in. thick built up by plastering the concrete onto expanded metal. This partition is about 8 ft. high and is supported at the top of the lower chord of the roof trusses. It constitutes a high tension switchboard and

high tension oil switches are supported on 1½-in. angle iron frames and the box which holds the oil is fastened to a slate or marble slab 24 x 30 in. in size through which the terminals are run. A



EXPANSION JOINT.

vertical piece of angle iron 26 in. long is fastened to the floor 26 in. from the board, and at the top a horizontal piece is run to the board and cemented into it. Two of these frames form the support for one



WIRING OF HIGH TENSION GALLERIES.

will be used for controlling the 15,000-volt feeders. It is planned, as far as possible, to have everything in duplicate and sets of high tension bus bars and oil switches are run on each side of the board. The busses are three bare copper rods ¾ in. in diameter and they are divided into sections so that the unit system, or multiple system may be used as desired. The sections are connected by switches. The

oil switch, the marble slab overhanging the oil box by several inches and resting on the angle iron supports in a horizontal position. The high tension wires are run up from the transformers in the pit along the wall of the building on insulators and are connected to the busses on the high tension board. From here the feeders are tapped off and are controlled by the oil switches just described.

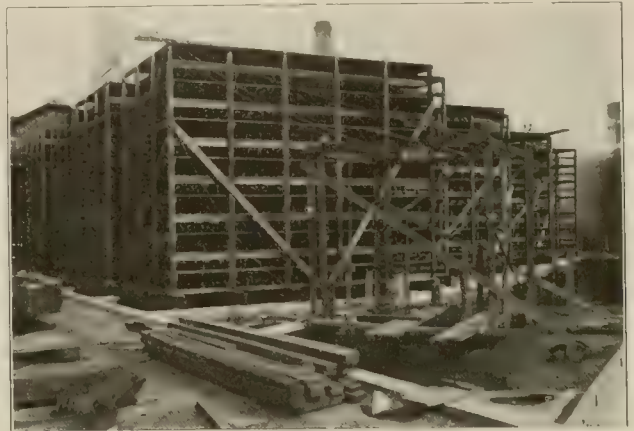
The present equipment of the switchboard, switches, and transformers, was furnished by the Stanley Electric Manufacturing Co., of Pittsfield, Mass. A series of bell-crank levers and rods connects the high tension switches with operating handles below, so that all switches are controlled from the main floor. In addition to these



SECTION OF ORNAMENTAL CHIMNEY TOP.

hand switches it is planned to have the switches capable of being operated by a single operator by means of electric or hydraulic power. A new operating board is being planned at which a single operator will be able to control the plant and can keep in touch with the sub-stations.

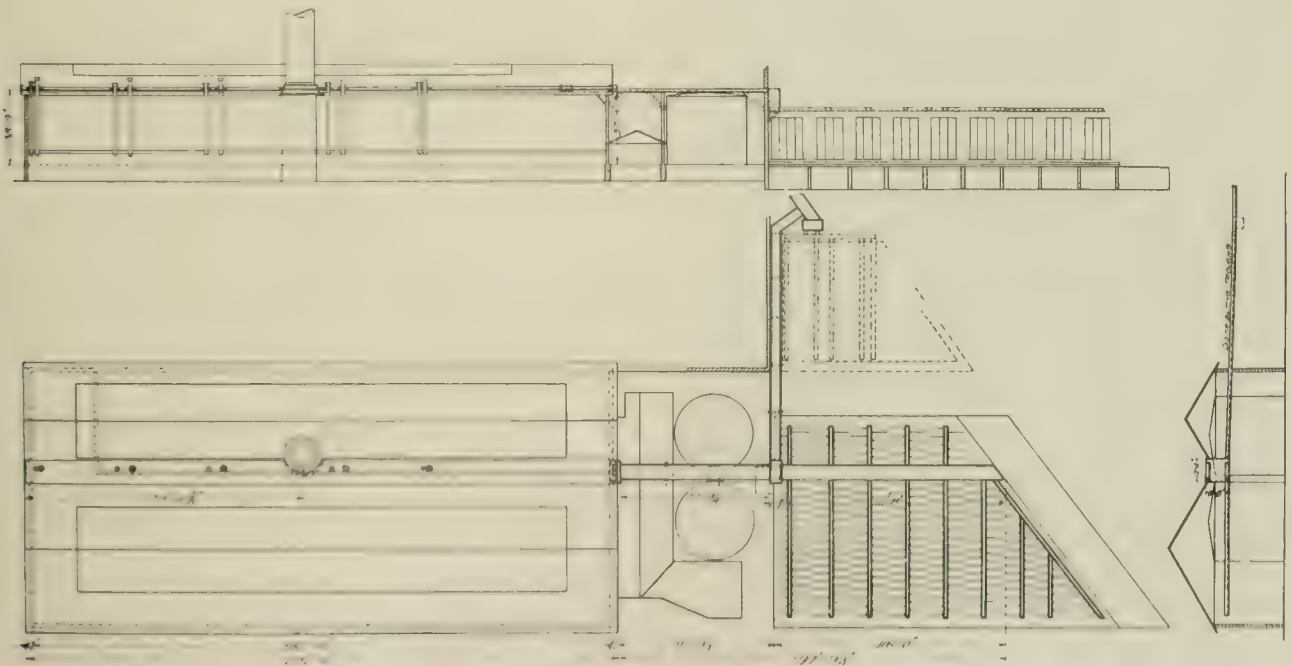
been made by the California Portland Cement Co., of Colton, Cal. It is designed to provide draft for 6,000 h. p. of boilers and to withstand a wind pressure of 50 lb. per sq. ft. There were 3,000 sacks of cement used in its construction and its estimated weight is 2,000,000 lb. It is 159 ft. high above the boiler room floor and 175



VIEW OF COOLING TOWER.

ft. 6 in. high above the base. As previously stated it is located at the center of the row of boilers and the flues enter from opposite sides. The Los Angeles Railway Co. has a brick stack which is a little smaller than this one and there is a connecting flue between them so that either stack can be cut out of service.

To support this weight of concrete a foundation 35 ft. in diameter at the base was constructed which rises perpendicularly 2 ft. 6 in. In this base are two layers of old rails laid at right angles to each other. For the next 3 ft. 6 in. the foundation tapers to 18 ft. in diameter and continues 10 ft. 6 in. higher in this diameter, old rails being imbedded in a vertical position and bent at the bottom. From this point, which is at the level of the boiler room floor, and at a height of 16 ft. 6 in. above the base the stack is hollow. A 9-in.



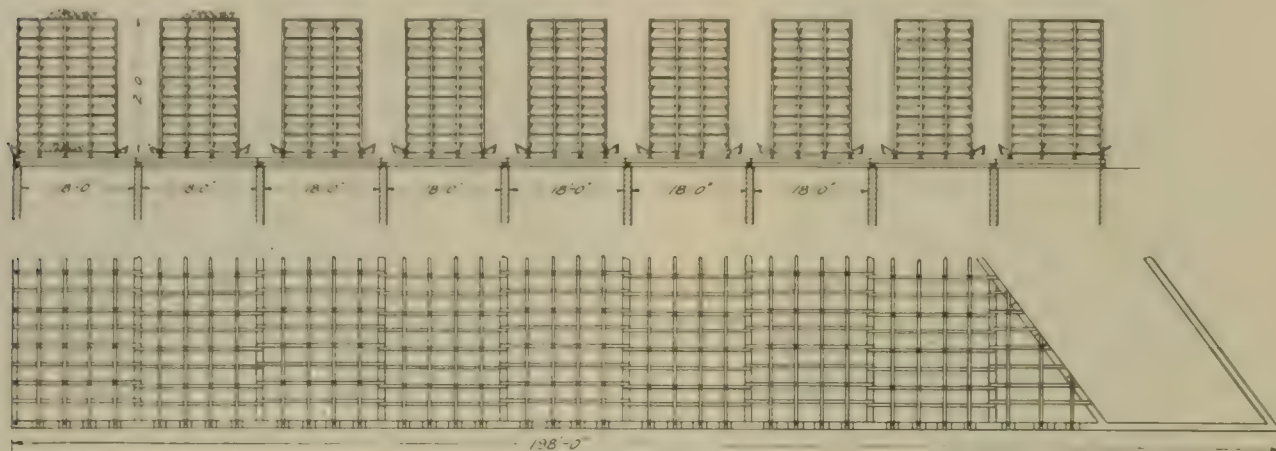
GENERAL ARRANGEMENT OF WATER COOLING PLANT.

The electrical work is in charge of Mr. R. S. Mason, consulting engineer for both companies.

The cement stack recently erected at this power house is one of the distinctive features of the plant. It is a distinctly southern California product, the cement of which it is composed, having

fire brick partition is carried up above the flue openings and as will be seen by reference to one of the accompanying illustrations the stack and its lining come in contact in 13 places. To add to its strength and prevent cracking a series of twisted steel rods are set vertically in both the stack and the lining. The number, size and

location of these rods, varying according to the height above ground, are shown in the illustration. The flue openings are 17 ft. 9 in. above the boiler room floor and are 5 ft. 8 in. by 13 ft. 8 in. in size. Old rails were also used to strengthen the arches at these openings. The rails in these arches are tied to the rails in the foundation by means of 1¼-in. rods bent like hairpins with threaded ends.



PLAN AND ELEVATION OF COOLING TOWER.

At a height of 52 ft. 6 in. above the base the stack contracts slightly to 15 ft. 2 in. in diameter. The inside diameter of the stack is 11 ft. throughout its whole height and the outside diameter remains at 15 ft. 2 in. from the point mentioned up to the ornamental top, but as the height increases the weight is diminished by making the air space larger. The width of the air space is increased at four successive sections. Below the flue openings the air space is 9 ft. thick, the outside shell being 28 in. thick and the lining 5 in. thick. Above this for a distance of 40 ft. the air space is again 9 in., the thickness of the stack and lining being respectively 11 in. and 9 in. For the next 38 ft. the air space is 14½ in. thick with the stack and lining 6 in. and 4½ in. thick respectively. From the latter point to the top of the stack the air space is 16 in. thick and the stack is 5 in. and the lining 4 in. Additional strength was given to the stack by imbedding horizontal rings of ¾-in. twisted steel every 18 in. in height. The ornamental top is made in 32 sections which are hollow to reduce their weight. The sections were made in a wooden mold with ¼-in. twisted steel rods imbedded in the concrete. They are held together on the stack by horizontal rings or twisted steel and there are also steel connections between the top of the stack. The concrete was held in place during construction by means of concentric wooden frames into which the material was rammed and the rods and rings were inserted as the work progressed.

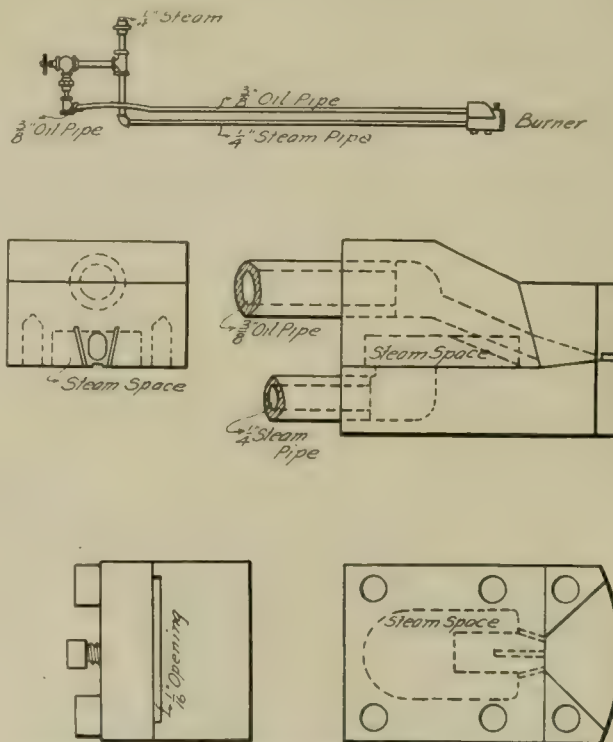
Crib work was built inside the stack as fast as the walls were built and ladders were secured to this. The concrete was raised through the inside of the stack by an electric hoist after being mixed in motor-driven concrete mixers. The stack was kept in line by means of a large plumb bob immersed in a tub of water at the bottom. The forms were centered by the plumb line and adjusted by long screws held above them by posts supported by the inside cribbing. By means of these screws the forms were first adjusted to the line of the stack and gradually raised as the concrete was put in. This method of building the stack was originally proposed by Mr. J. R. Atchison, superintendent of the power department of the company. It was designed by Mr. Charles Harter, also of the power department and was erected by Mr. C. Leonardt, contractor.

Each of the companies has a reservoir back of its power house for storing a supply of condensing water and above these reservoirs are built large cooling towers. The reservoir of the Pacific Electric Railway Co. is 107 ft. wide and 198 ft. long on one side, and 117 ft. long on the other. It is 12 ft. deep except at one end where the settling basin is located, and is built entirely of concrete. Its capacity is about 1,500,000 gallons. The cooling tower covers the whole of the reservoir except the settling basin. The tower is supported by 12 in. concrete walls running entirely across the reservoir and dividing it into compartments, large arches being left in the parti-

tion to permit free circulation of the water. The cooling tower is built in sections 100 ft. long by 15 ft. wide, and the sections are spaced 4 ft. apart. The cooling surface consists of strips of wood 1 in. by 2 in. laid 25 strips to every 5 ft., leaving spaces of from ¾ in. to ½ in. between them. Each section consists of 14 layers or floors of cooling strips 18 in. one above the other with the strips in one

layer laid at right angles to those of the layer below. The bottom floor is laid with 2 in. tongued and grooved plank. It has sides 4 in. high and is water tight so the water can be run off into troughs at the side when cleaning the reservoir, or for any other purpose. The area of one horizontal section of the cooler deducting the air spaces between sections is about 9,500 sq. ft., making the area of the 14 sections about 133,000 sq. ft.

The Los Angeles Railway Co. has a reservoir and cooler some-



PIPING AND DETAILS OF HAMMEL OIL BURNER.

what smaller than the one described but it is similar in construction and adjoins it. Computed on the same basis as before the cooling surface of this tower is 36,000 sq. ft., making a total surface for the two cooling towers of 169,000 sq. ft. The two cooling towers are connected and it is estimated that their combined capacity is suf-

ficient to take care of 20,000 horse power for short periods of two or three hours.

Water is taken from the condensers and pumped into the distributing troughs which run to the top of the coolers. From these main troughs a number of smaller ones are run to various parts of the upper layer of the cooling towers. The ends of these troughs



SUB-STATION AT WATTS.

are closed and the water escapes by overflowing and trickles down through the 14 layers of cooling surface into the reservoir below from which it is again drawn for use in the condensers. In the plant of the Pacific Electric Railway Co. the depression between the engine and the boiler room roofs is utilized as a main trough, and the pipes from the condenser pumps discharge into it. From the end of the roof the water is led away in a flume 10 ft. wide by 2 ft.

The third power house of the companies is located at Pasadena and was built in 1894 to operate the Los Angeles & Pasadena Electric Ry. This house is constructed of brick with wooden roof trusses supporting a corrugated iron roof. It is divided into an engine room and a boiler room, the former being 110 ft. by 100 ft. in size and the latter 60 ft. by 40 ft. A space of 50 ft. on the south side of the engine room is at present unused, but is intended for a sub-station.

The equipment of the engine room includes three Ball & Wood horizontal cross compound condensing engines belted to five generators. The first of these engines has a capacity of 250 h. p. and drives a 225-kw. Westinghouse generator. The second engine is of 450 h. p. belted to an Edison 200-kw. generator and to a Westinghouse 100-kw. generator. The third engine has a capacity of 600 h. p. and drives two Westinghouse generators, one of 200 kw. and the other of 225 kw. capacity. There is a booster set composed of a 500-volt Westinghouse motor with two small dynamos on the ends of the motor shaft which is used to maintain the voltage on long feeders, particularly the one running to Altadena. There is also installed a 400-kw. two-phase Westinghouse rotary converter supplied with current through two Westinghouse transformers of the Scott phase-changing type. Standard General Electric switch-board panels are used for machine and feeder panels.

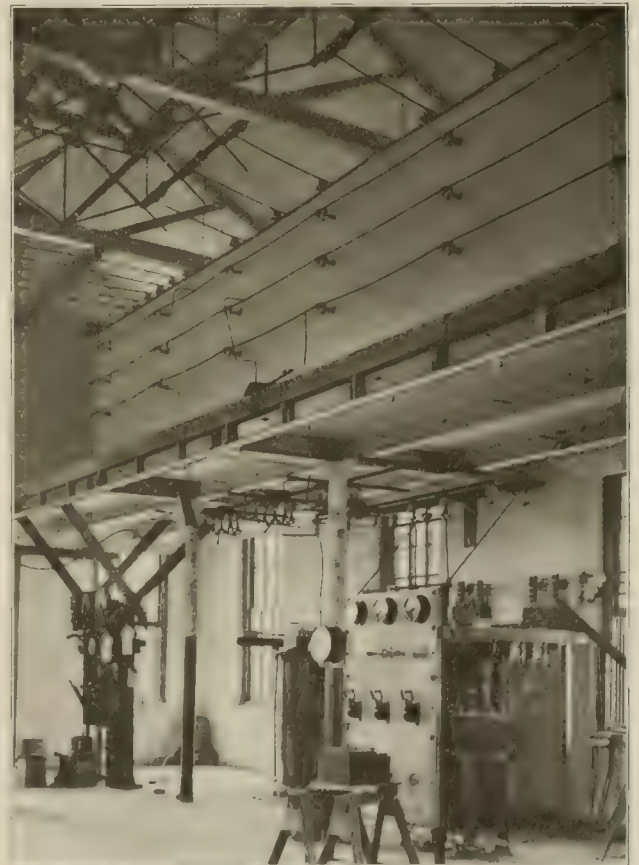
The boiler room contains four Stirling boilers and the steam piping and auxiliary apparatus are of conventional design and present no special features to be described. This plant also contains a cooling tower 25 x 125 ft. in area, and on the north of the power house is a car barn 140 ft. long by 100 ft. wide containing eight tracks. In the rear of this is a storeroom. There is also a machine shop adjoining the boiler room which are respectively 24 x 80 ft. and 20 x 24 ft. in size. Before this company was acquired by the Pacific Electric Railway Co. it maintained its own shops and did its own repairing, but these are but little used now as the companies' shops in Los Angeles are better equipped for this work. A conductors' and motormen's room is located in one corner of the power house and the dispatcher's room is situated in a small tower directly above this room.

Fuel.

Oil only is used for fuel in all of these power houses, the daily consumption at Los Angeles being between 450 and 500 barrels, for

the two plants and at Pasadena about 110 barrels. Fuel oil is found in abundance within the city of Los Angeles and the railway companies own several oil wells, lease others, and have contracts with other producers for supplying them with oil. For conveying oil from the companies' wells to the Los Angeles power houses special tank cars are used. These cars are of the same general appearance as the passenger cars, being of the same finish and color, except that the windows are painted black on the inside. Inside the cars is a tank of a capacity of from 40 to 50 barrels and tracks of both standard and narrow gage enter the power house yards where there is a special track for unloading oil cars. The oil furnished by the local producers is hauled in tank wagons and unloaded at the same place as are the cars. From the unloading track a pipe line runs to the oil house which is situated immediately behind the power houses. This house has a cement floor which is on about the same level as the condenser pit in the power house. The lower walls of the building are of concrete for a height of about eight feet, above which they are of brick. This building is provided with oil pits divided into several compartments and the oil from the unloading track is allowed to settle in the first one of these. The top oil is then run off into the next compartment and this operation is repeated three times. From the last compartment the oil is pumped into the storage tanks. There are two of these storage tanks outside of the oil house each of which is 40 ft. in diameter and 35 ft. high. They are constructed of iron plates ranging in thickness from 7-16 in. to ¼ in. and each tank has a capacity of 7,800 barrels.

Inside of the oil house are three "burning tanks" each having a capacity of 675 barrels, which is an ample supply for one day's run. The oil from the storage tanks flows by gravity into the burning tanks. Each time that the oil is allowed to settle and the top



INTERIOR OF SUB-STATION.

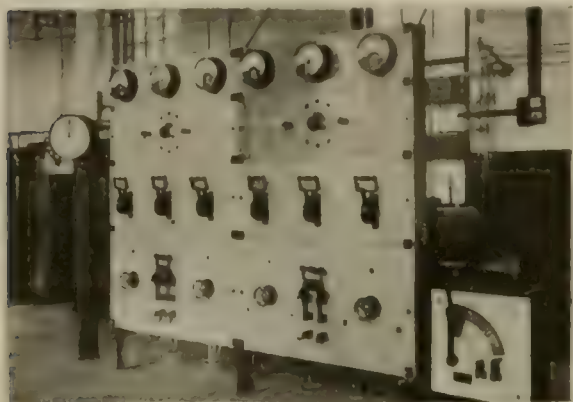
drawn off, a cleaner and lighter oil is obtained and it is burned with better economy if it is supplied to the burners hot. To effect this each burning tank is fitted with a steam coil which maintains the temperature of the oil between 130° and 140° F. These tanks also have deflecting plates riveted to their sides to secure a circulation of the oil. There are also steam coils in the settling compart-

ment, to heat the oil and render it less viscous, for the purpose of making it more easily handled and allowing the dirt to settle.

From the burning tank the oil is pumped into a supply main which is run in front of the boilers and which is provided with an outlet at each boiler. There is also a return line and the oil is kept in constant circulation and under a pressure of about 30 lb. per sq. in. at which pressure it is supplied to the burners.

The companies have experimented with several types of burners the general principles of which are all about the same, the object of all being to atomize and distribute the oil as widely as possible.

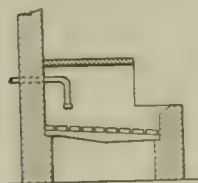
In order to burn oil economically it must be thoroughly atomized



HIGH TENSION SWITCHBOARD.

by means of steam, air, water, or otherwise. The most usual means is with steam, which is the method employed in these plants. The burners may be divided into two general classes, namely, those in which the oil and steam are mixed inside the burners and those in which the mixing takes place outside of the burners. Burners of the first class generally have two pipes, one inside of the other, the outer pipe having only a small opening at the end through which the jet issues. The inner pipe does not reach quite to the end of the outer pipe and is generally fluted on the outside to give the steam a whirling motion. Oil is admitted to the inner pipe and steam to the outer, and the oil coming in contact with the whirling steam is thoroughly atomized, the mixture leaving the burner in a whirling

spray. The oil thus finely divided is completely burned, provided the supply of air is properly adjusted.



POSITION OF BURNER

In the second class of burners the steam and oil pipes enter the fire box separately and terminate in one casting, the steam issuing in a thin sheet from a slot in the casting. Just above this slot is a row of holes from which the oil flows, and on coming in contact with the sheet of steam the oil is atomized and distributed in the fire box. The proper quantities of oil, steam and air are adjusted by valves until the desired fire is attained. Too much oil causes smoky fires and the unburned oil runs down into the ash pit. Too much steam causes the fire to jump, that is, to go out and light up again, or it may put it out entirely. It will be readily seen that the fire may be adjusted through a wide range by simply adjusting the supply valves.

The construction of the furnaces for burning oil differs but little from that where coal is used. When the change is made from coal to oil all that is done, generally, is to put a layer of fire bricks over the grates, allowing a slight air space between the bricks and insert the burner into the fire box. The accompanying illustration shows the details of the Hammel burner which is used at the plants of these companies. The supply of steam and oil is controlled by valves located just outside of the fire box. The burner with its pipes is so arranged that it can be readily taken out of the furnace and another one substituted in case it is found necessary. While these burners are often used in a horizontal position they are arranged in these plants to stand vertically as shown in the accompanying sketch. The supply pipes leading to the burner are turned downward soon after entering the fire box so that the flames from the

burner impinge upon the fire brick and are deflected upward, giving a more uniform distribution of heat than where the burner is used horizontally. This position of the burner is also to be recommended from the fact that no unburned oil gets on the tubes to cause blisters. The supply of air is regulated by adjusting the ash pit and fire jaws, no special devices for this being necessary.

Sub-Stations.

There are 11 sub-stations on the companies' lines, 9 of which are in operation while those at West Lake Park and Pasadena, previously mentioned, have not yet been equipped. With the exception of the sub-stations at the Los Angeles railway power house, at the Pasadena power house and at Echo Mountain, all of the sub-station buildings are of the same general design, and a description of one will suffice. The building is a brick structure 36 x 66 ft. outside dimensions and 30 x 60 ft. in the clear inside. The walls are set on concrete footings and wooden trusses support a roof of 2 in. tongued and grooved plank covered with tarred paper and a water tank for supplying cooling water to the transformers. The floor and the foundations for the machines are built of concrete. A small reservoir is built under the floor and the water, after circulating through the transformers, is collected here and pumped back into the tank on the roof.

The sub-stations are all fed from three-phase 15,000 volt transmission lines which are installed in duplicate to insure the continuous operation of the system, and wire outlets are built into the roof on each side of the building, permitting the main lines to pass through the station instead of having taps run from the sub-station to the pole line. On entering the building the current first passes through the high tension air switches having a 32-in. break, by means of which the station can be entirely cut off from the line, or if a portion of the line is down, the connections may be changed from one line to another. From the high tension switches the current is led to the high tension gallery which is very similar to that described in the main generating station. In some of the buildings the galleries are supported on columns and in others they are suspended by rods from the roof trusses. The floor of the gallery is made by plastering concrete on expanded metal stretched over the floor beams, and through the center of the gallery is a fire proof parti-



ROTARIES IN LONG BEACH SUB-STATION.

tion similar to that described in the power house. The plan of having everything in duplicate is carried out in the sub-stations and this gallery partition separates duplicate sets of wiring and switches.

The busses are of solid copper wire having 3-16-in. rubber insulation with braided covering. They are supported on porcelain insulators mounted on locust pins which were cemented into the wall during the construction. From the busses wires are run through Stanley oil switches to the transformers, which are on the main floor. These switches are supported on angle iron frames the same as described in the power house and the switches are of the same type but of smaller capacities. The transformers are located directly under the switches and the wires from the switches run through porcelain floor bushings. Emergency stations are located between the oil switches and transformers. These are small copper switches operating in air with a break of about 10 in. or less. They have four blades opening radially from the center, the blades standing at an angle of 90° to each other. Both of the busses are

Lake Park sub-station and another battery of 1,000 ampere-hours capacity will be located at the Plaza where an additional sub-station will be built. These batteries will be of the "Chloride" accumulator type made by the Electric Storage Battery Co., of Philadelphia. Battery houses are being erected at each of the three sub-stations mentioned. The buildings are 40 ft. wide by 100 ft. long and are of brick with concrete foundations and footings. The electrical details of these battery installations have not yet been arranged.

(To be continued.)

THE LONDON (ENG.) SUBWAY SYSTEM.

The Underground Electric Railways Co., Limited, which is to build and operate intramural railways in London, Eng., and will absorb and manage the five underground roads that were acquired by Charles T. Yerkes and Speyer & Co., is capitalized at £5,000,000, of which 50 per cent has been paid in, the remainder being subject to call. Mr. Yerkes has been elected chairman and the other directors are James Speyer, T. Jefferson Coolidge, jr., James A. Blair, James H. Hyde, L. F. Loree, Robert H. McCurdy, Charles A. Spofford, Right Honorable Lord Farrer, Ernest St. Clair Pemberton, Walter Abbott, Frank Dawes, Charles James Carter Scott, Edgar Speyer and Henry Teixeira de Mattos.

The parent company now controls the Metropolitan District Ry., owning its right of way in fee, and is building three deep level and tube roads, the Baker St. & Waterloo, the Great Northern, Piccadilly & Brompton, and the Charing Cross. The Metropolitan District is a shallow subway and surface road. The Underground company also controls the United Tramways Co., with many miles of surface roads. The Metropolitan District Ry. is being electrically equipped. The construction work on all lines is well advanced. The power house will have a capacity of 100,000 h. p.

Several large banks and trust companies in the United States have joined a syndicate to underwrite an issue of \$15,000,000 5 per cent 10-year bonds of the Underground company. The entire loan will be \$30,000,000.

SOUTHWESTERN GAS, ELECTRIC & STREET RAILWAY ASS'N MEETING.

The annual convention of the Southwestern Gas, Electric & Street Railway Association, which was to have been held at Dallas, Tex., this year, has been postponed to 1904, owing, chiefly, to the death of the president, Mr. E. H. Jenkins, of San Antonio, which occurred soon after last year's meeting, and the removal from the state of the secretary, Mr. H. A. Evans. At a meeting of the executive committee, Feb. 9th, Mr. Yaeger, of Laredo, was chosen president and Mr. Frank E. Scovill, of Austin, secretary. Since then Mr. Yaeger's business interests compelled him to resign the presidency and Mr. A. E. Judge, third vice-president, has been acting president. In addition, most of the men who extended the invitation to meet in Dallas have removed elsewhere, owing to the changes effected by the consolidation of the interests in that city, and it was deemed better to go to Dallas in 1904. Another meeting place could not well be arranged in season.

NEW ELEVATED ROAD FOR CHICAGO.

The Englewood Elevated Railroad Co., of Chicago, the South Side Elevated Railroad Co., and the Chicago Junction Ry., the last named being a steam railroad, have accepted ordinances providing for elevated service in Englewood and the Stock Yards district, and express trains between 43d and 12th Sts., Chicago, to cost approximately \$5,000,000, divided as follows: Elevating Chicago Junction Ry. tracks in 40th St., \$1,000,000; elevated road from Lake Ave. to the Stock Yards district, \$1,250,000; third track on South Side Elevated, and asphalt street beneath, \$1,000,000; Englewood elevated railroad, \$1,750,000.

The plans provide for a third track on the South Side Elevated road between 43d and 12th Sts.; Mr. C. V. Weston, of Chicago, has been appointed chief engineer and will have charge of the work; construction will begin by August. In 40th St. the tracks of the Chicago Junction Ry. and the Union Stock Yards & Transit Co. are to be themselves raised, and the elevated structure placed over the steam tracks. The tracks will be extended eastward to the packing house district.

ANNUAL REPORT OF GENERAL ELECTRIC CO.

In the report of the General Electric Co., for the year ending Jan. 31, 1903, the president, Mr. C. A. Coffin, states that the profits of the company for the year were \$10,277,169.15. Interest on debentures and deductions from patent accounts leave a net profit of \$8,618,958.17. The amount of surplus at the end of the preceding fiscal year was \$15,287,140.65, making a total of \$23,906,098.82, from which was paid \$2,677,263.50 in dividends and \$16,746,133.33 in stock issued in restoring the percentage of reduction made in 1898, leaving a surplus on Jan. 31, 1903, of \$4,482,701.99. The amount written off from factory plants and machinery during the year was \$1,908,324.11, and from patent account, \$2,000,755.75, of which latter \$1,613,879.82 was for expenditures incurred chiefly in acquiring the patents of the Sprague Electric Co. These amounts exceed the amounts written off the same accounts the year before by about \$2,500,000. The present condition of the company is satisfactory and indicates a considerable increase in volume.

Mr. Eugene Griffin, first vice-president, reported that the total sales (amount billed to customers) during the year were \$36,685,598, as against \$32,338,036 for the previous year. The increase of orders received was 16.4 per cent. The total number of roads that have been equipped by the multiple unit control system is 31; total number of cars, 2,081. The grand total of railway motor sales in the past 11 years is 85,256 motors, having a total capacity of 3,100,106 h. p. The growth of water power enterprises is shown by the fact that 221 plants have been equipped with 428,269 h. p. in G. E. motors. There are also 24 plants equipped with 41,820 h. p. in G. E. generators, operated partly by steam and partly by water power. During the year about 162,000 separate orders, not including contracts, were received, or an average of 541 per day.

The report of Mr. E. W. Rice, jr., third vice-president, states that expenditures of about \$2,500,000, exclusive of the cost of patterns, small tools, etc., were made for real estate, new buildings, extensions and machinery. In 1899 the company occupied 1,800,000 sq. ft. of floor space and employed 8,000 factory hands; in 1903 it has 3,000,000 sq. ft. floor space and 18,000 factory employees. There has been a large increase in the equipment of industrial establishments with electric motors. The distance to which electricity has been delivered has been largely increased and many new long distance plants have been installed, using pressures of from 60,000 to 80,000 volts and delivering power at from 50 to 150 miles. The demand for direct current generators of 2,000 kw., and over, has fallen off, owing to the increasing use of alternating current.

The financial report rendered by the treasurer, Mr. Henry W. Darling, and the general auditor, Mr. Edward Clark, shows the total capital stock authorized Jan. 31, 1903, to be \$42,031,600. The value of patents, franchises, good will, etc., is returned as \$2,000,000. The total cost of factory plants is \$14,726,205.22, of which \$9,726,205.22 has been written off during the past 10 years, leaving a book value of \$5,000,000. The total book value of all stocks and bonds is placed at \$12,682,214.63. During the year various stocks and bonds carried on the books at \$2,707,339, were sold for cash at a profit of \$973,649.74. Their par value was \$3,960,278.33. The face value of notes and accounts receivable is \$13,491,184.38. Of some 14,500 regular customers there were debit balances against 5,800 at the close of the fiscal year. The total accounts payable amounted to \$1,378,660.42.

RECEIVERS FOR LEHIGH VALLEY TRACTION CO.

A few creditors of the Lehigh Valley Traction Co., including Tom L. Johnson, executor of the estate of Albert L. Johnson, asked for the appointment of a receiver, much to the surprise of the officers of the company, who believe that such proceeding was unnecessary. The court appointed Robert E. Wright, C. M. Bates and George W. Norris receivers. Mr. Wright is president of the company, Mr. Bates, secretary, and Mr. Norris a creditor.

In the case of William L. Johnson, of Michigan, and the Lorain Steel Co., against the Philadelphia & Lehigh Valley Co., the court appointed the same receivers, with the exception of George W. Norris, in whose stead Robert W. Lesley was named.

Two Pasadena (Cal.) car robbers were sentenced to the state prison for life April 29th by Judge Smith, of Los Angeles.

NEW EMERGENCY LINE CAR.

BY JAMES H. CREEDON.

A new emergency line car has been constructed at the Campello (Mass.) car barn of the Old Colony Street Railway Co., under the direction of George F. Seibel, superintendent, and Frank S. Randlett, master mechanic, which embraces many of the requirements of a car of this description and in its general design, systematic arrange-



LINE CAR, PLATFORM LOWERED.

ment of details and general practical utility is believed to embody several new ideas.

The car is 31 ft. 6 in. over all; 7 ft. 10 in. wide; and measures 12 ft. 3 in. from the top of the car to the rail. The car is vestibuled at each end with sheathing partition dividing the vestibule from the body of the car. Leading from each vestibule to the body of the car is a door 22 in. in width, and this swings either in or out, as is desired, so that a man with an armful of material does not have to expend any time either in unlocking or closing the door. There are also side rolling doors, each 4 ft. 6 in. wide on either side of the car.

The interior of the car is fitted with a variety of tools and the usual appliances for emergency and repair work, emphasis being laid on the rule that each article must have one place somewhere in the car and must always be returned to its place after use. The heavier pieces are arranged on the floor while the lighter materials so essential to this work are carried on strong, well-constructed shelves placed at intervals along the sides. Brackets of strap iron are bolted along each side for carrying extra trolley poles.

For stringing trolley wire a reel stand is placed on the inside near the end opposite the tower, the wire being fed out through a small trap door cut in the roof. The trap door has a roller placed at the edge over which the wire is conducted with minimum friction. The stand will carry a reel containing about a mile of wire.

A particularly handy feature is a portable crane which can be adjusted on either side of the car to hoist heavy material and supplies. The crane is operated by compressed air supplied from the air brake cylinder.

The tower is placed near one end of the car. It is raised and lowered by windlass with two 3-shieve pulley blocks, thus making it easy to handle. The tower platform can be lifted 6 ft. above the car roof to reach the high trolley wire over railroad tracks or crossings. When standing on the tower the operator has the trolley wire at either side he may choose. The tower platform is fitted at the side edges with collapsible railings which can be folded down onto the platform when the tower is not in use. The tower is held at an elevation by a 1½-in. iron rod, run through two staunchions placed on the interior. The adjustment is such that the tower can be raised by one man, with two others standing on the platform.

The car is mounted on Peckham improved trucks with 33-in. wheels and 4-in. axles. The electrical equipment includes four G. E.

67 high speed motors and the car is equipped with Christensen air brakes. This equipment permits the car to be run at high speed, rendering it suitable for both city and interurban service. The heavy equipment was selected with the end in view of avoiding any possibility of the line car interfering with regular traffic through breakdown or inability to run at high speed.

The whole construction is particularly strong and substantial, so that the car can be used in winter as a double truck snow plow, simply by placing a nose or shear in front. The side sills are 6 x 8 hard pine, and the cross sills are of seasoned oak, so framed that the nose or shear can be attached with very little trouble, the removal of the fender being the only alteration necessary.

A second, or "brother" car has been equipped, under the direction of the same two officials, which for its practicability is a model in its way, since it can be utilized by the company in various ways. For the present it is used as a supply car, in taking freight and supplies to the different divisions of the Old Colony Street Ry. Every inch of space in the car is available, as it is open from vestibule to vestibule. The doors, at either side are 7 ft. in width. This car is supplied with box skids, barrel skids, and air hoists, making it possible to handle heavy material with convenience and dispatch. It is also equipped with screw jacks, pump jacks, picks, crowbars, chains and ropes and can be utilized as a wrecker. The car is mounted on St. Louis improved trucks, with 33-in. wheels, 4-in. axle and is equipped with G. E. 67 motors, and Christensen air brakes.



LINE CAR, PLATFORM RAISED.

The car like the first is constructed so that a nose or shear can be attached, thus making it a double-truck plow.

In designing both cars particular emphasis was laid on securing high speed possibilities in order to avoid interference with the passenger service.

A resolution providing for an amendment to the constitution enabling the Detroit Common Council to arrange for the purchase and operation of street railways in that city was defeated in the Michigan House of Representatives by a vote of 64 to 24.

The York County Traction Co., York, Pa., will open a new park a few miles from Dover the first week in June. It comprises 20 acres and is naturally attractive. A pavilion, 37 x 100 ft., is being built, wells will be dug, a dam and bridges constructed and the grounds beautified. The company will offer a prize for a name for the resort.

PERSONAL.

SCHARK BROTHERS, of New York City, electrical engineers and contractors, have removed to No. 174 Columbus Ave.

MR. T. K. GLENN, whose appointment as general manager of the Georgia Railway & Electric Co. was mentioned in the "Review" for March, 1903, was born in Vernon, Miss., about 34 years ago,



T. K. GLENN.

the son of Rev. W. F. Glenn, a prominent Methodist minister. The family removed to Cave Spring, Ga., while he was quite young, thence to Marietta, then to Newnan, back to Marietta, and finally to Atlanta, where he has since resided. He was educated in public and private schools in Marietta and Atlanta. His first employment was with the Maddox-Rucker Banking Co., where he remained three years as a collector. When the street car companies were merged into the Atlanta Consolidated Street Railway Co., Mr. Glenn was given a position as stenographer. In a short

time he was made claim agent and was soon after advanced to secretary and treasurer. In 1898 he was elected vice-president, which position he retained when the company was changed to the Atlanta Railway & Power Co. In 1901 the company was absorbed by the Atlanta Rapid Transit Co., and reorganized as the Georgia Railway & Electric Co. Mr. Glenn was made vice-president and secretary, and was also placed at the head of the claim department. When Mr. D. A. Belden resigned the position of general manager, Mr. Glenn was chosen his successor.

MR. H. F. LINCOLN has resigned the superintendency of the St. Albans (Vt.) Street Railway Co., having been elected city engineer.

MR. H. E. SMITH, formerly private secretary to the president of the Hudson Valley Railway Co., has been appointed general passenger agent.

MR. L. G. WHITE has been appointed assistant general manager of the Columbus (O.) Railway Co. He was formerly with the Columbus Edison Co.

DR. E. A. BRYANT has been appointed chief surgeon of the Los Angeles Railway Co., vice Dr. F. K. Ainsworth, resigned. The appointment will become effective June 1st.

MR. EDWARD C. WHITE, of New York City, has been elected president of the Oneonta, Cooperstown & Richfield Springs Railway Co., vice Dr. Norman Getman, deceased.

MR. W. W. MILLER, first vice-president of the New Orleans Railway Co., has resigned and will devote his time to his duties as attorney for the New York Securities & Trust Co.

MR. W. H. MOORE has been formally appointed assistant to the president of the Toronto (Can.) Railway Co. Mr. Moore has for a long time been confidential secretary to President MacKenzie.

MR. B. F. O'MARE, of Terre Haute, Ind., succeeds Mr. J. W. Renfro as superintendent of the Northern Texas Traction Co. Mr. Renfro was recently elected street commissioner in Fort Worth.

MR. ALLAN F. EDWARDS, manager and purchasing agent of the Toledo & Monroe Ry., resigned and will devote his time to the Detroit, Toledo & Shore Line Railway Co., of which he is receiver.

MR. JOHN J. MAGILTON has been appointed a member of the executive committee of the Street Railway Accountants' Association of America. He is assistant treasurer of the Schenectady Railway Co.

MR. GEORGE S. PATTON has been appointed land agent of the Pacific Electric Railway Co., and general manager of the Los Angeles Land Co., and the Huntington Land Co., all of Los Angeles, Cal.

MR. JOHN DOLPH, general sales agent for the Electric Insulating Department of the Standard Varnish Co., on May 12th sailed for Europe where he will spend two months visiting the principal electrical firms.

MAJ. E. E. WINTERS, of Macon, Ga., has been appointed general manager and treasurer of the Montgomery (Ala.) Traction Co., a new road recently equipped by a New York syndicate. Major

Winters was previously superintendent of the Macon Consolidated Street Railroad Co. Major E. A. Graham is attorney for the new company.

MR. E. C. MYERS has been appointed purchasing agent for the Pacific Electric Railway Co., of Los Angeles, Cal. The department is a new one and the appointee will have headquarters at Seventh and Alameda Sts.

MR. A. G. HATHAWAY has disposed of his interests in the Vulcanus Forging Co., and is devoting his attention to iron and steel and railway supplies, with headquarters at 807 Cuyahoga Building, Cleveland, O.

MR. JOSEPH W. MAUCK has resigned as treasurer of the Chicago & Milwaukee Electric Railroad Co., to become president of Hillsdale College, Michigan. He has been an official of the road since its inception.

MR. F. IRVING DOW is in charge of the Cleveland offices of Messrs. A. E. Appleyard & Co., recently opened in the Citizens' Building. The company now has offices in Cleveland, Boston, Philadelphia and Cincinnati.

MR. JOHN DONOVAN succeeds Mr. W. T. Van Brunt as president of the St. Joseph (Mo.) Railway, Light, Heat & Power Co. Mr. Van Brunt resigned to accept the presidency of the St. Joseph & Grand Island Railway Co.

MR. WILLIAM E. MOORE, whose resignation as superintendent of the Augusta Railway & Electric Co. was mentioned in the "Review" for April 20, 1903, was the recipient of a gold watch and fob, gifts of his former employes.

MR. FRANK C. FISCHER has been appointed master mechanic and electrician of the Fairmont & Clarksburg Electric Railroad Co., Fairmont, W. Va. He was formerly in the service of the Camden Interstate Railway Co. at Ashland, Ky.

MR. F. M. ZIMMERMAN, formerly general manager of the Elgin, Aurora & Southern Traction Co., will have charge of the construction department of the Widener-Whitney street railway syndicate, with headquarters at Warsaw, Ind.

MR. DAVID YOUNG, vice-president and general manager of the North Jersey Street Railway Co., Jersey City, will discontinue his services with that company June 1st, which date will mark the 10th anniversary of his connection with the system.

MR. THOMAS L. HISGEN has been chosen first vice-president and general sales agent of the Railway Appliance Co., of Albany, N. Y. Mr. Willis G. Nash has been elected second vice-president. The company was incorporated about a year ago.

MR. J. B. INGERSOLL has resigned as a construction engineer for the Westinghouse Electric & Manufacturing Co., to accept the position of superintendent of power and lines for the Hudson Valley Railway Co., with headquarters at Glens Falls, N. Y. He



J. B. INGERSOLL.

has been identified with the Westinghouse company for several years and is only leaving it temporarily. Mr. Ingersoll's chief undertaking will be the installation of high tension lines, rotary converters and about 700 kw. in generators. Mr. Ingersoll was with the Brush company for a number of years before going to the Westinghouse company, and was also superintendent of rolling stock for the Montreal Street Railway Co., where he not only brought the rolling stock to a high efficiency, but otherwise contributed to the prosperity of the company. He was also popular with the employes and when about to leave Montreal the men presented him a costly chain and charm, and a suitably-framed address. Mr. Ingersoll has been very successful in railway work and has materially helped in many ways to build up several large systems; his record with the Westinghouse company has been an enviable one.

MR. J. W. PARKER has entered upon his duties as superintendent of the Springfield & Xenia Traction Co., which was recently purchased by the Bushnell syndicate. He succeeds Mr. C. S. Bidwell, who has entered the employ of the Cleveland Construction Co.

Mr. Parker was formerly connected with the Dayton, Springfield & Urbana Electric Railway Co.

MR. C. O. SIMPSON, treasurer and auditor of the Birmingham (Ala.) Railway, Light & Power Co., was severely injured April 22d by falling from a chair on which he stood to place some decorations. Three ribs were fractured and he was bruised considerably.

MR. W. B. TARKINGTON, recently appointed general superintendent of the Detroit, Monroe & Toledo Short Line Co., began his railroad career in the mechanical department of the Chicago &



W. B. TARKINGTON.

Northwestern Railway Co., as a machinist's apprentice. He was promoted to division master mechanic on the Iowa division, being at that time the youngest official in the mechanical department of the road. In 1888 the Omaha & Council Bluffs Railway & Bridge Co. was formed to build an electric line between Omaha and Council Bluffs, and a high steel bridge over the Missouri River, this being the first electric railway built by the Thomson-Houston Co. Shortly after, Mr. Tarkington entered the service of this company as chief engineer. In a short time he was promoted to

master mechanic, having entire charge of power plants and shops. About three years ago he was appointed general superintendent of the system. While he was master mechanic a modern power station was erected and the rolling stock was entirely rebuilt and equipped with the most improved machinery. Mr. Tarkington is 38 years old.

MR. A. L. NEEREAMER has been appointed general passenger and freight agent of the Columbus, Delaware & Marion Railway Co. He was formerly chief clerk in the office of the general passenger agent of the Columbus, Sandusky & Hocking Valley R. R.

MR. J. W. HOLMAN, formerly with "The Engineering and Mining Journal," and Mr. G. W. Scott, recently of the "Mining and Scientific Press," have purchased the "Western Mining World," of Chicago, which is to be hereafter known as the "Mining World."

MR. E. E. DOWNS has been elected president of the Winnebago Traction Co., of Oshkosh, Wis., vice Mr. Emerson McMillen, of New York, who resigned the office, but retains his place in the directorate. Mr. Downs was vice-president and general manager.

MR. JOHN C. WEAVER has resigned as division superintendent of the Cincinnati Traction Co., on account of his advancing years. He was connected with the company more than 30 years and is the third of its old-time officials to retire within the past few months.

MR. W. J. HILLIER has resigned the superintendency of the Cleveland & Southwestern Traction Co., which position he held from the time the first line was built, to manage the Andwur Hotel, Elyria, O. Mr. E. W. Coe, assistant superintendent, will succeed him temporarily.

MR. C. C. REYNOLDS has been appointed general manager of the Indianapolis & Northwestern Traction Co. He has lately been identified with the McKinley traction system, but before then was connected with the Chicago & Erie R. R., at Huntington, Ind., and later at Chicago.

MR. GEORGE K. EDWARDS has been appointed superintendent of the San Jose & Santa Clara Railroad Co., San Jose, Cal. For the past two years he has been with the Oakland, San Leandro & Hayward Electric Ry. Previous to that he occupied the position he has just resumed.

MR. C. D. EMMONS, for two years superintendent of the La Fayette (Ind.) Street Railway Co., has been appointed general superintendent of the reorganized Fort Wayne Traction Co., and is in immediate charge of the construction of a line between Fort Wayne and Logansport.

THE BOSTON & NORTHERN STREET RAILWAY CO. has divided its system into two divisions. Mr. Frank C. Wilkinson has been appointed superintendent of Division No. 1, and Mr. Thomas Lee of Division No. 2. Other changes are announced as follows: Mr. John Murphy, appointed superintendent of the Lynn division, Mr. Thomas J. Sayer, appointed superintendent of the Lowell division;

Mr. David Bruce, appointed superintendent of the Lawrence division; Mr. W. H. McKay, appointed superintendent of the Haverhill division.

MR. F. H. CHAMBERLAIN, formerly with the General Electric Co., and until recently on the construction staff of the Sydney City & Suburban Tramways, New South Wales, has been retained to prepare plans for the conversion of the horse tramways in Christchurch, New Zealand, for electric power.

MR. HORACE S. REARDEN has been elected president of the Springfield (Ill.) & St. Louis Railroad Co., vice Mr. H. H. Littell, resigned. Mr. Rearden was formerly superintendent of the Chicago, Peoria & St. Louis Railway Co. of Illinois, and later general manager of the Litchfield, Carrollton & Western road.

MR. JOHN A. CALDWELL, formerly with the American Stoker Co., is now general sales manager for the Wilkinson Manufacturing Co., of Bridgeport, Montgomery County, Pa., a manufacturer of automatic stokers, steam engines, condensers and pumps. Mr. Caldwell has charge of the New York office, 45 Broadway.

MR. CHARLES W. WASON, of Cleveland, and Mrs. Wason were guests of honor at a dinner given by the Japan Electrical Association at Shiba, Japan, March 12th. Mr. Wason spoke on electrical undertakings in Japan. On March 17th he addressed the Electricians' Association on "American Street Railway Business."

MR. OLIVER D. HENRY has been appointed superintendent of the Westchester (Pa.), Kennett & Wilmington Ry. He was born in Joliet, Ill., has been superintendent of the Kansas City-Leavenworth Railway Co., superintendent of motive power of the Detroit & Pontiac Ry., and eastern representative of the Lorain (O.) Steel Co.

A CORRECTION.—We regret that the announcement in the "Review" for April, that Mr. George B. Larrabee had gone to Peoria to take charge of the Peoria & Pekin Terminal Ry., was an error, due to our having been misinformed; and we gladly make this correction, trusting that neither party has been seriously embarrassed by the mistake.

MR. JAMES U. JACKSON resigned the presidency of the Augusta (Ga.) Railway & Electric Co., and Mr. R. Lancaster Williams, the vice-president, was elected to succeed him. Hon. Boykin Wright was chosen vice-president. Mr. Williams, who was also vice-president of the Augusta & Aiken Railway Co., resigned that position, his successor being Mr. John Blair MacAfee.

MR. ALBERT EASTMAN, superintendent of the express service of the Utica & Mohawk Valley Railway Co., has resigned to return to Detroit, where he will re-enter the service of the Detroit United Ry. as superintendent of the Wyandotte and Trenton branch. Mr. Eastman went to Utica to inaugurate the new express service and manage it until it attained a paying basis.

MR. FRANK J. GERDON, assistant superintendent of the Utica & Mohawk Valley Railway Co., has been appointed superintendent of transportation for the system. The office of superintendent, held by the late James A. Stewart, has been abolished, but Mr. Gerdon's duties will be practically the same. Mr. Gerdon has been in the street railway business 15 years, going to Utica from Cleveland.

MR. F. A. TUCKER, superintendent of the Omaha Street Railway Co., will direct the management also of the Omaha & Council Bluffs Railway & Bridge Co., instead of appointing a successor to Mr. W. B. Tarkington, until recently general superintendent of the latter road. Mr. Tucker will have for assistants at Council Bluffs Mr. F. B. Hudson, a former conductor, and Mr. H. B. Noyes, master mechanic.

MR. AUGUSTUS WOLFF, formerly with the Brooklyn Rapid Transit Co., has been made chief engineer of the United Railroads of San Francisco, vice Mr. C. J. Kaigin, resigned. Mr. Richard Eick, formerly with the North Jersey Street Railway Co., succeeds Mr. M. D. Stein as superintendent of all lines running from the Turk and Fillmore, and Oak and Broderick St. car houses of the United Railroads.

MR. E. G. CONNETTE, vice-president and general manager of the Syracuse Rapid Transit Co., was the subject of a most appreciative biographical article in the Syracuse Sunday Herald for May 10th. Mr. Connette entered the street railway field in 1889 when he became manager of the consolidated roads of Nashville. In 1900 he left Nashville and went to Syracuse. Mr. Connette admits that perhaps his greatest weakness is a love for politics, and congratulates himself upon having so far succeeded in keeping clear of politics in

Syracuse, as he was not so fortunate in Nashville, where he was elected to the Tennessee Legislature, and also served upon the Nashville Board of Education.

MR. WILLIAM H. SNOW, for the past year superintendent of operation of the Public Works Co., Bangor, Me., has assumed the duties of superintendent of construction and will manage both departments in the future. He was superintendent of the Bangor Street Ry. several years before the Public Works Co. was formed. Mr. James H. Green, formerly superintendent of construction, has taken up general railway construction work.

MR. JOHN F. CALDERWOOD has been elected third vice-president, a newly-created office, of the Brooklyn Rapid Transit Co., and appointed general manager of the system. During the past year he has been assistant to the president. Mr. Calderwood is well-known to our readers as the former comptroller of the Twin City Rapid Transit Co., and one of the organizers of the Street Railway Accountants' Association. He is also a member of the Institute of Secretaries, of London.

MR. THOMAS N. McCARTER has resigned as attorney general of New Jersey to accept the presidency of the Public Service Corporation of New Jersey formed by the Fidelity Trust Co., of Newark, to take over the control of the trolley and electric light companies in the northern part of the state. Mr. McCarter is also second vice-president and general counsel of the Fidelity Trust Co. The main office of the new corporation will be at Broad and Canal Sts., Newark, on a site now unoccupied.

MR. H. WARD LEONARD, of New York, furnished the estimates upon which are based plans for the adoption of electricity as the motive power on the state railroads of Sweden. Mr. Leonard is a graduate of the Massachusetts Institute of Technology. He was born in Cincinnati, O., and at 24 he was general manager of the Edison General Electric Co. A feature of his plans for the Swedish railroads is that water powers are to be used in a chain of stations not more than 100 miles separated, so that neighboring stations can help each other in emergency.

MR. GEORGE A. DAMON, managing engineer for the Arnold Electric Power Station Co., Chicago, presented a very interesting paper on "Railroad Repair Shop Design and Equipment" at the regular meeting of the Western Railway Club on Tuesday, April 21st. Mr. Damon holds that most shop descriptions have been written with a favorable pen, and that what is needed is a series of articles on "how not to do it"; that some sort of a general clearing house for actual experience would be a good thing. With this idea in view his paper contained specifications for a complete repair shop which might be considered both hypothetical and actual.

MR. J. S. BADGER, manager of the Brisbane (Australia) Tramways Co., will sail for the United States on a six months' vacation, May 25th, after an absence of seven years. Mr. Badger was an old General Electric man and when that company secured the contract to change the Brisbane horse railroad for electrical operation he was sent to superintend the construction. After completing the contract he was engaged by the London directors as manager of the company, in which position he has been very successful. During his vacation he will visit London, and also attend the meeting of the American Street Railway Association at Saratoga. Mr. Badger's family have spent the past year in Elgin to permit his sons to attend school.

MR. R. E. LEE has been appointed general superintendent of the Cincinnati Traction Co., and assumed his new duties May 1st. Mr. Lee entered street railroad work in 1886 as a horse-car conductor for the Baltimore City Passenger Railway Co. He was promoted to dispatcher and later to a position in the auditor's department. In 1894 he resigned to enter mercantile life, but after one month re-entered railway work as superintendent of the South Baltimore Division of the Baltimore City Passenger Railway Co. In 1899 he was made superintendent of the Washington Railway & Electric Co., and in 1900 general superintendent. From there he went to Cincinnati. The vice-president of the Washington company recently gave a banquet in Mr. Lee's honor and the officers presented him a diamond-studded watch charm. The employees gave him a silver service. When Mr. Lee left the Baltimore company he was the recipient of a diamond ring. He is 38 years old.

MR. BLAKE A. MAPLEDORAM, general manager of the Moline, East Moline & Watertown Railway Co., Moline, Ill., has resigned and will take up interurban work elsewhere. His resignation

was intended to take effect May 1st but he has remained a few weeks to complete the construction of the system to Watertown. Mr. J. C. Hoffman, chief electrician, has also resigned and will return to his home in Pittsburg. Mr. Mapledoram has been manager since construction began, about a year ago. Part of the system has been in operation six months and Mr. Mapledoram points with satisfaction to the record of its two interurban cars that ran 50,000 miles without one cent having been expended for repairs. Mr. Stuart S. Wise, of Boston, of the office of Blood & Hale, the owners, succeeds Mr. Mapledoram.

MR. GEO. M. COLE has resigned as manager of the Plattsburg (N. Y.) Traction Co. His successor is Mr. Albert E. Reynolds, formerly superintendent and treasurer of the company.

MR. W. J. O'CONNOR was on May 4th appointed general storekeeper for the Interborough Rapid Transit Co., including the Manhattan Ry. division. Mr. O'Connor was, until a few weeks ago, the general storekeeper for the Brooklyn Rapid Transit Co., in which position he had established a standard system of accounting for supplies, which was most highly commended by the expert accountants who examined its workings. With the Interborough company Mr. O'Connor will have charge of all the storehouses of the system and will reorganize the supply accounting system of the Manhattan line now known as the Elevated Division.

MR. WILLIAM C. ANDREWS, for the past two years associate editor of the Street Railway Journal, last month resigned that position to become the eastern representative of E. P. Roberts & Co., consulting engineers, with headquarters in New York. Mr. Andrews was graduated from Columbia University, School of Mines, in 1895, receiving the degree of electrical engineer. He traveled a year in Europe and then entered the employ of the Royal Electric Co., of Montreal, where he remained a year. In 1897 he began a post-graduate course at Cornell University and in the spring of 1898 he became assistant in physics at Columbia University, where he remained until 1900.

MR. WALTER B. SPELLMIRE has been appointed district manager of the Atlanta office of the Bullock Electric Manufacturing Co. and will assume his duties at once with headquarters in the Empire Building, Atlanta. Mr. Spellmire has been with the Bullock company seven or eight years, during which time he has served as chief of the testing department, represented the company in London and Paris in connection with some important installations at those places. After being abroad for a year he returned to the United States to act as sales engineer in the New York office, from which position he has just been appointed district manager. Mr. Spellmire's work with the Bullock company gives assurance that he will attain success in his present position in which he will have a very much broader field of operation.

OBITUARY.

MR. SAMUEL B. KEPPEL, president of the Reading (Pa.) & Womelsdorf Electric Ry., died last month at his home in Sinking Spring, Pa. He was 55 years old.

MR. E. P. WILLIAMS, vice-president of the Sherwin-Williams Co., died Sunday, May 3d, at his home in Glenville, O. He was 61 years old and prominent in Cleveland business circles.

MR. JEREMIAH A. FARRINGTON, general purchasing agent of the Boston & Maine Railroad, died May 11th at his home in Portsmouth, N. H., after a long illness. Mr. Farrington was born in Conway, N. H., June 19, 1843. He was a civil engineer by profession, and early engaged in railroad work; as purchasing agent for the Boston & Maine he had charge of the same department for the electric railways controlled by this company. A widow, two sons and two daughters survive him.

MR. JAMES R. M'CARDELL, of Trenton, N. J., died April 22d, at the age of 44 years. He was well known to electric railway managers from his connection with the "Trenton" trolley wagon, which was invented and developed by the firm of which he was the head. Mr. McCardell was born in Trenton. He was a woodworker and in 1885 formed a partnership with Mr. C. H. West, a carriage blacksmith, to build carriages and wagons. In 1886 they purchased the extensive manufactory of Mr. Richard Sutphin, with whom they learned their trades. In 1891 Mr. M. J. McDonald was admitted to partnership and the firm name changed to Mc-

Cardell, West & Co. In 1898 Mr. West retired and the firm name was changed to J. R. McCardell & Co. Mr. McCardell was confined to his room nine months by his last sickness.

MR. A. O. KITTREDGE, president of the Account, Audit & Assurance Co., of New York, died suddenly in Boston March 23d. He was born in Dayton, O., in 1848. In his earlier years he was bookkeeper in a stove foundry, and later in a sheet metal house at Salem, O., where he published a "Manual of Sheet Metal Architectural Work". From 1874 to 1878 he published "The Sheet Metal Builder." In 1886 he published "The Office," a monthly periodical devoted to business accounting. In 1890 the paper was sold and the name changed to "Business, the Office Paper," Mr. Kittredge being retained as editor. In 1898 Mr. Kittredge formed the Account, Audit & Assurance Co. In 1900 Mr. Kittredge was appointed Professor of the Theory and Practice of Accounts, in the School of Commerce, Accounts and Finance, of New York University. He was also editor of the institute's semi-monthly Bulletin. He was a frequent contributor to technical periodicals upon accounting subjects and was widely known among street railway accountants.

MRS. T. C. PENINGTON, wife of Mr. T. C. Penington, treasurer of the Chicago City Ry. and secretary of the American Street Railway Association, died on April 16th after a lingering illness. The interment was at Princeton, Ill., the former home of Mrs. Penington, on April 19th.

CONVENTION ANNOUNCEMENTS.

The American Railway Mechanical & Electrical Association, which begins its convention one day earlier than the other associations, will hold business sessions on each of the four days, September 1, 2, 3 and 4. Secretary Mower advises us that the papers to be presented at the meeting include the following:

"Care and Maintenance of Car Bodies"—By C. F. Baker, superintendent of motive power and machinery, Boston Elevated Railway Co.

"Improvements in Street Car Motors"—By E. W. Olds, superintendent of rolling stock, Milwaukee Electric Railway & Light Co.

"The M Control"—By W. O. Mundy, master mechanic, St. Louis Transit Co.

"Use and Abuse of Controlling Mechanism"—By D. F. Carver, chief engineer, Cleveland Electric Railway Co.

"Shop Kinks"—By H. H. Adams, superintendent of shops, United Railways & Electric Co., Baltimore, Md.

"Car Shop Practices"—By Alfred Green, master mechanic, Rochester Railway Co.

"Brakes"—By C. F. Uebelecker.

The opening address will be made by the president, Mr. Thomas Farmer, superintendent of motive power, Detroit United Ry.

NEW LINES OPENED TO TRAFFIC.

The first car was sent part way over the Danville (Ill.), Urbana & Champaign Railway Co.'s new line from the Danville end May 10th. Cars have been running east from Champaign to St. Joe some time. The entire system will be in operation in July.

The last link in the through line of the Utica & Mohawk Valley Railway Co. between Rome and Little Falls, N. Y., 37 miles, was opened April 29th. This gives a double track route over private right of way parallel to the New York Central railroad. The company will extend the line 15 miles to Oneida this summer.

The Baltimore, Sparrows Point & Chesapeake Railway Co.'s system was opened to traffic as far east as Sparrows Point May 2d. This is a new property of the United Railways & Electric Co., of Baltimore.

The Camden & Suburban Railway Co.'s new line connecting Moorestown with Stanwick, N. J., has been opened to traffic. At Stanwick connection is made with the Burlington County Traction Co.'s Mount Holly line.

At the dedication of the new engineering hall of the Iowa State College of Agriculture and Mechanic Arts, to take place at Ames, Ia., May 22d at 3 p. m., addresses will be delivered by Dr. R. H. Thurston, of Cornell University, Mr. W. Clyde, of Chicago, and Mr. M. J. Riggs, of Toledo. There will be a reception at 8 p. m.

NEW WAGE SCHEDULES FOR STREET RAILWAY EMPLOYES.

An agreement between the Interborough Rapid Transit Co. and its Manhattan elevated railway employees, which became effective April 19th, provides the following wage schedules:

Conductors, first year, \$2.10 per day; second year, \$2.25; third year, \$2.40. Guards, first year, \$1.55; second year, \$1.70; third year, \$1.80; fourth year, \$1.95. Agents, first year, \$1.75; second year, \$2.00. Agents who are operators, first six months, \$1.75 per day; second six months, \$2.00; after first year, \$2.25. Gatemen, first year, \$1.40; second year, \$1.55. Platform men, \$1.75 a day. Car couplers, \$1.55. Tower switchmen, first year, \$2.31; second year, \$2.47. Hand switchmen, first year, \$2.00; second year and thereafter, \$2.20. Car cleaners, \$1.55. Lamp men, \$1.75.

The schedule advances the wages of the conductors 10 cents per day after the first year, guards and gatemen 15 cents, platform men 10 cents, couplers, hand switchmen 10 cents, car cleaners 5 cents and lamp men 15 cents. The others get no increase. Agents, platform men, gatemen, ticket choppers, tower switchmen and couplers may have one day off each month without loss of pay.

The new agreement, which has no time limit, provides for a work-day not exceeding 9½ hours, that schedules shall be made as straight as possible, that a permanent grievance committee shall represent the men on all future negotiations in case of disputes or difficulties, and there are regulations as to payment of men for short days and extra work and swings between runs.

Beginning May 1st the motormen and conductors employed by the Augusta (Ga.) Railway & Electric Co., and the Augusta & Aiken Railway Co., receive from 12 to 16 cents per hour, instead of from 8 to 14 cents, length of service prior to May 1st to govern the amount.

The Youngstown-Sharon (O.) Railway & Light Co. has increased the wages of motormen and conductors on all its lines, including the New Castle & Lowell Electric Ry., and the New Castle Traction Co., three cents an hour. The original demand was for an advance of five cents.

The Knoxville Traction Co. has advanced the wages of its conductors and motormen two cents an hour to 14 cents. After five years' service the rate will be 15 cents. The company will also furnish two uniforms yearly to employees who have no accidents.

The motormen and conductors of the Mobile (Ala.) Light & Railroad Co. have been granted an increase in pay ranging from 6 to 15 per cent.

Motormen and conductors of the St. Louis & East St. Louis Electric Railway have received an increase of 22½ cents per day; the carmen of the East St. Louis & Suburban Railway Co. get an increase of 20 cents per day, the shopmen 15 cents, and the line-men a slight increase.

The Ononta, Cooperstown & Richfield Springs Railway Co., of Ononta, N. Y., has granted its conductors and motormen an 18 per cent increase in pay.

The employees of the McKinley syndicate traction lines in Illinois received May Day gratuities amounting to 5 per cent of their wages for the year ending Apr. 30, 1903.

The Chattanooga Electric Railway Co. has increased the wages of its motormen and conductors who have been in the service from two to five years one cent an hour; those who have been in the service more than five years are increased two cents an hour. Motormen now get from 14 to 18 cents an hour and conductors from 13 to 16 cents.

CONDUCTOR KILLED IN ST. JOSEPH COLLISION.

A head-on collision between two cars of the St. Joseph (Mo.) Railway, Light, Heat & Power Co., April 26th, due to the failure of the crew of one car to wait on the double track where the line merges into single track until the other car passed, resulted in the death of a conductor and probably fatal injuries to a motorman. It was very foggy and the men at fault thought the other car had passed. There were no passengers. Both cars were badly damaged.



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We cordially invite correspondence on all subjects of interest to those engaged in any branch of street railway work, and will gratefully appreciate any marked copies of papers or news items our street railway friends may send us, pertaining either to companies or officers.

DOES THE MANAGER WANT ANYTHING?

If you contemplate the purchase of any supplies or material, we can save you much time and trouble. Drop a line to THE REVIEW, stating what you are in the market for, and you will promptly receive bids and estimates from all the best dealers in that line. We make no charge for publishing such notices in our Bulletin of Advance News, which is sent to all manufacturers.

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CONVENTION SOUVENIR.

The street railway conventions this year are to be held more than a month earlier than is usual, and in consequence our regular August number will be made the Saratoga Convention Souvenir. This issue will bear date August 20th, but will be mailed some days earlier in order that copies may reach all subscribers before delegates leave for the conventions. No pains will be spared to make the 13th Annual Convention Souvenir the most elaborate and attractive number that the "Review" has ever published.

DAILY STREET RAILWAY REVIEW.

The "Daily Street Railway Review", the publication of which was commenced in 1899, on the occasion of the street railway conventions that year held in Chicago, will be an important feature of the coming meetings. There will be four issues of the "Daily" published at Saratoga, appearing on the mornings of Wednesday, Thursday, Friday and Saturday, September 2d, 3d, 4th and 5th. Copies will be mailed daily to our subscribers and reach every street railway in the world; at Saratoga the paper will be distributed at the hotels and convention halls.

The "Daily Review" is greatly appreciated by officials present at the conventions and perhaps even more so by those who are unable to attend; the "Daily" brings to these latter the first complete account of the proceedings. There is no better index of the success which has been achieved by the "Review" in the publication of special convention reports than the growth of the "Daily" during the last four years in the number of its reading pages and the volume of patronage extended by advertisers in the street railway field. In 1899 each issue of the "Daily Review" contained an average of 42 pages of which 20 were reading matter; in 1902 the "Daily" published at Detroit had in each number an average of 75 pages, of which 33 were reading matter. The "Daily" is in its nature supplementary to the monthly "Street Railway Review" and for convenience should be bound with the latter; to facilitate this arrangement the folio numbers of the Saratoga "Daily" will be consecutive with those of the monthly following next after August.

By reason of there now being three street railway conventions, instead of but two as for the past six years, the field for the "Daily Review" is broader than heretofore and the need greater.

MECHANICAL AND ELECTRICAL ASSOCIATION.

The preliminary announcements of the American Railway Mechanical and Electrical Association regarding its coming convention have been issued and a list of the papers to be presented will be found on another page. The program includes the subjects of car bodies, car motors, car brakes, methods of car control, and shop practice. The fact that the other portion of the field covered by this association—the power station—has not been represented to an equal extent is doubtless due to the choice previously made by the American Street Railway Association for its program of two power house subjects—"Steam Turbines" and "The Manufacture and Distribution of Alternating Current for City Systems."

The mechanical and Electrical Association now has a total membership, in all classes, of 72, which is a most satisfactory growth and indicative of need that is felt for an association of this character.

THE CHICAGO SITUATION.

During the past month but little progress has been made towards a settlement of the Chicago franchise question. The Illinois Legislature finally passed an enabling act under which any city in the state may acquire and operate the street railways within its limits, provided that the proposition to do so be first submitted to the electors and approved by three-fifths of those voting thereon. It is provided that either bonds of the city or certificates which shall be a lien only on the street railway property purchased may be issued in payment. Further, in event of default in the payment of the certificates or the interest thereon, foreclosure proceedings may be taken; but in such case the right to operate the properties is limited to 20 years. Assuming that this bill receives the approval by the governor (which as we go to press is still a matter of doubt) we have but little faith in its efficacy. The street railway companies still have claims under the 99-year-act which must be adjudicated or compromised before a settlement can be effected.

The most important event of the past month was the appointment

of receivers for the Chicago Union Traction Co. by the United States court. Such a step was considered necessary largely because of the city's attitude regarding the 99-year act in the negotiations with the company earlier in the year.

STREET RAILWAY MEN AND THE Y. M. C. A.

On another page we print extracts from an address delivered by Mr. T. J. Nicholl, vice-president and general manager of the Rochester Railway Co., before the conference of the International Y. M. C. A., at Topeka, Kan. Mr. Nicholl describes the manner in which a Y. M. C. A. branch was established by his company but a short time ago, and the general improvement noticeable in the demeanor of the employees due to its establishment. It is the desire of every street railway manager to employ honest, sober and trustworthy men and we believe that the street railways present an important field for Y. M. C. A. work, not because street railway men as a rule do not compare favorably with other classes of employees, but largely for the reason, as pointed out by Mr. Nicholl, that many of these men are employed intermittently and having much spare time on their hands require some such influence as is extended by the Y. M. C. A. to neutralize the evil influences which always beset idle men in large communities. While it may not be best to press religious subjects upon employees to any great extent the general moral tone of the men cannot but be improved by the surrounding influences of such an organization, and this work is worthy of the consideration of every street railway manager.

THE LOS ANGELES RAILWAY SYSTEMS.

In this number is commenced a description of the urban and interurban street railway systems of Los Angeles which have recently been acquired by the Huntington-Hellman syndicate and which, at the present time, aggregate over 300 miles of track. From the description which we give it will be apparent that the management of these properties is adopting a policy of putting their roads in a first-class physical condition, and the engineering details of the power plants have been carefully considered. Like most of the larger systems of the eastern and middle states this southern California system has grown to its present proportions through the merging of several smaller companies. It compares very favorably in size at this time with many of the most important systems in the older settled parts of the country and as constant additions are being made it will undoubtedly, in the near future, rank among the largest of our interurban systems. The plants of the system, which are described in considerable detail, do not present any unusual engineering features, but what will appeal most strongly to the street railway engineers is the thorough and substantial construction which characterizes all the work of the company. In addition to the power plants described the companies maintain a very complete set of machines and repair shops which constitute a complete car building establishment. These shops present an excellent illustration of individual motor-driven plants, and will be described and illustrated in the June issue of the "Review."

SOMETHING FOR NOTHING.

The receipt of an inquiry from a street railway company for information as to the business of a company that claims to "ride you on any street car or elevated railroad in the United States for one cent," prompts a short discussion on the methods by which this is attempted. The subject is not a new one, as about three years ago considerable attention was attracted to various "endless chain" schemes for selling street railway tickets, which were operated in different cities, among them Atlanta, Baltimore, Chicago, Kansas City, Pittsburgh and Washington. In several of these places the promoters of the system were arrested and forced to leave town. After the full exposure of the principles of the endless chain made at that time it is rather surprising that such a company should be able to continue in business, yet at this time a concern styled the American Street Car Transportation Co., and purporting to be incorporated in New York with a capital of \$100,000, is again undertaking to provide a gullible public with something for nothing, with a profit for the promoter.

Briefly stated the scheme is as follows: A person (whom we will call B) desiring to secure street railway tickets at the advertised rate of one cent each first buys an "introduction" from some former customer (whom we will call A) or an agent of the company pay-

ing therefor 25 cents; this introduction with 75 cents additional is forwarded to the company, which returns three coupons; the purchaser sells the coupons to three of his friends (who may be designated as C) for 25 cents each, retaining the money so received, and after the said three friends have each sent their respective coupons and 75 cents to the company, the latter sends B 25 street railway tickets.

B has expended \$1.00 and received 75 cents (from the three friends, C) and tickets to the value of \$1.25, showing a profit of \$1.00 on the transaction.

The company has received \$2.25 (75 cents each from the three friends, C) and has given B tickets worth \$1.25, showing a profit to the company of \$1.00.

If each of the three persons whom we have designated as C are to fare as well as B did, nine others in class D must in the aggregate give the company \$6.75, of which the latter retains \$3.00 as profit. It is apparent that if we consider as a whole the public which pays for and uses the tickets it is expending \$2.25 for every 25 tickets received in return, or a premium of 80 per cent on their face value. Taking Chicago with a population of approximately two millions, for instance, and assuming that tickets for the 200 rides per annum that each person takes are all secured on the endless chain system, the solution of some simple problems in geometrical progression shows that after the year's supply of tickets had been secured, assuming the sales of endless chain coupons to have been made to Chicago people only, the situation would be as follows: The street railway companies would have gross receipts of \$20,000,000. The endless chain concern would have its profit of one dollar on each 25 tickets, amounting to \$16,000,000. Each and every one of the 2,000,000 inhabitants of the city would have on the average 48 coupons and be looking for a market among the others who were similarly situated.

Of course such a scheme could never be carried so far, although to reach the results stated only 17 links in the chain would be needed, starting with a single purchaser. Long before the end the difficulty in finding purchasers for coupons would appear and under the most favorable circumstances about the time that the people composing class K (to return to the A, B and C series begun in our second paragraph) some 15,000 in number had disposed of their tickets to the three times more numerous class L, the coupon company's profit on the tickets supplied to class J would be carried as a loss among classes K and L, at 25 cents per head, and the K people would have no tickets.

Any enterprise which inevitably leads to such a result as this is beyond question against public policy, and the efforts of street railway companies whose tickets are made the commodity to be handled, should be directed toward suppressing the scheme, which is essentially a confidence game. The appeal is made to avarice and credulity, under the guise of presenting a business proposition, the promoter well knowing that success depends upon continuous operation, and that after a brief period continuous operation is an impossibility.

ECONOMY OF COMBINED SERVICE.

On another page will be found an interesting description of the power plant and system of the Everett Railway & Electric Co., by Edward P. Burch, which is deserving of attention not only because of the somewhat unusual features of the design but on account of the economy in operation which is attained by the combination of an electric railway, an electric lighting and a city water pumping station in one plant. The combination of these three loads is found profitable for the reason that as their peaks do not overlap, the total load on the boilers and engines is much more nearly uniform than it would be with either of the separate loads carried independently, and at the same time it enables the station units to work at an average load which approaches their maximum capacity. The idea of the designer throughout has been to enable the units to work as near their maximum loads as possible at all times, and this is one of the most important considerations in the economical running of a plant; with this end in view the rotary converter is used for converting from 550-volt direct current to 380-volt, two-phase alternating current, the latter being raised by static transformers to 2,200 volts, and vice versa. This allows one of the units to be shut down in times of light load permitting the maximum and therefore the most economical loading of the engine at all times.

RECEIVERS FOR CHICAGO UNION TRACTION COMPANY.

Since the publication of the report of the Chicago Union Traction Co. for the year ending June 30, 1902, it has been considered probable that a reorganization of the company might be necessary, but it was not expected that steps in this direction would be taken until after the company had concluded negotiations with the city for the extension of the franchises under which it operates. The failure of the conferences held during the early part of the present year between representatives of the city council and the traction companies, and particularly the demand of the city that claims under the 99-year act be waived as a preliminary to further negotiations, however, hastened a crisis, and on April 22d application was made to the United States Circuit Court, by the Guaranty Trust Co. of New York, for the appointment of receivers for the Chicago Union Traction Co., and its two lessor companies, the North Chicago Street Railroad Co. and the West Chicago Street Railroad Co.

The three companies confessed judgment on notes held by the Trust company, the amounts being \$218,727.22, against the Union Traction, \$565,089.29 against the North Chicago, and \$270,476.50 against the West Chicago. On the return of executions unsatisfied Judge Grosscup named R. R. Govin, of H. B. Hollins & Co., New York; James H. Eckles, president Commercial National Bank, Chicago, and treasurer of the Union Traction company, and M. E. Sampsell, clerk of the United States Circuit Court for the Northern District of Illinois, as joint receivers for the three companies.

Following the appointment of receivers there were numerous meetings of different factions of the stockholders affected, but as yet no definite plans for action have been determined by the various protective committees appointed to represent stockholders.

May 14th the receivers presented to the court a petition for instructions in which is given a full history of the companies affected, and the causes which made a receivership necessary explained. Among these are the loss of traffic amounting to \$700,000 per annum to the Northwestern Elevated R. R., an increase of \$353,000 per year in wages paid employes, and an increase of \$292,000 in the taxes assessed for 1903 as compared with 1900.

The most startling statement in this document is an allegation that the earning capacities of the North and West Chicago companies had been misrepresented to the Chicago Union Traction Co. The petition says:

"Your petitioners further show that they are informed and believe that for the three fiscal years ending July 1, 1897, 1898 and 1899, the North Chicago Street Railroad Co. declared and paid dividends of 12 per cent per annum upon its entire outstanding capital stock and the West Chicago Street Railroad Co. for the same period declared and paid in each year a dividend of 6 per cent upon its entire outstanding capital stock.

"Your petitioners show, however, as they are informed and believe, that the North Chicago Street Railroad Co., during said fiscal years ending July 1, 1897, 1898 and 1899, did not earn a dividend upon its capital stock exceeding 8¾ per cent per annum and the West Chicago Street Railroad Co. did not earn a dividend exceeding 3.85 per cent per annum."

Instructions were asked concerning the payment of rentals to the North and West Chicago companies and the court authorized the receivers to borrow the money needed to pay the West Chicago rentals due May 15th, \$149,835, and to pay accrued interest on the existing floating debts. The matter of North Chicago rentals due July 15th was not covered in the order.

With the object, it is believed, of bringing the Union Traction properties under the control of the state courts application for the appointment of a receiver for the traction company was made in the Cook County Superior Court, May 8th. The petitioners were two holders of bonds of underlying companies, Max Kollinger and Adolph Nathan, and two others, Ernest Hanks and Peter Scherman, who are plaintiffs in personal injury actions now pending. A hearing on this petition was postponed until May 15th, and then put over till May 26th.

CHICAGO GENERAL TRANSFERS HELD GOOD.

Mention was made last month of mandamus proceedings instituted by one W. A. Hall to compel the interchange of transfers between the Chicago City Railway Co. and the Chicago General Railway Co.

Judge Baker of the Cook Circuit Court on May 8th overruled the demurrers entered by the defendant companies and held that passengers leaving the cars of the General railway on East 22d St. are entitled to transfers to the lines of the City railway. An appeal will be taken to get an early ruling from the upper courts.

The decision was based on city ordinances which provide: 1. That passengers on the 22d St. line of the Chicago City Ry. shall be transferred, either way to or from the north and south lines of said company which they cross, without additional fare. 2. That at any point where any line of any street railway owned, leased or operated by any corporation within the limits of the City of Chicago crosses or intersects any other line of street railway owned, leased or operated by the same corporation, passengers on the first mentioned line shall be given free transfers, etc.

The East 22d St. line is owned by the Chicago City Ry. and in 1897 was leased to the Chicago General Ry., by which it is operated.



STRIKES OF THE MONTH.

The motormen and conductors of the Union Electric Co., of Dubuque, Ia., struck at 8 p. m., May 6th, for recognition of the union and to secure the reinstatement of the local union's president and secretary, who were discharged for violation of the rules. The entire system was tied up. May 9th the company started its cars, but was compelled to abandon the attempt after two cars had been wrecked and several motormen assaulted. Arbitration was proposed May 12th, Archbishop Kean and Judges Shires and O'Donnell being the company's selections. It was thought the union would name arbitrators also.

The subway strike in New York, which began in a small way among laborers in one section, assumed serious proportions May 1st, when laborers and teamsters to the number of several thousand struck throughout the subway. The Rapid Transit Contractors' Association claimed that the Central Federated Union violated a two-years' agreement made June 4, 1901, by endorsing the strike. The union replied that it was not responsible for the acts of the excavators' and rockmen's unions, which were formed after the agreement was signed, nor for the teamsters' union. During the first half of this month riots and bloodshed, calling for extra police vigilance, were prevalent, especially in Brooklyn and the Bronx. May 11th John B. McDonald, contractor, sent an ultimatum to the Central Federated Union that it must order the strikers back to work without delay, or their places would be filled by others as rapidly as possible. It was stated that if the excavators' and rockmen's unions could get their members to consent, the central union would order the men back pending arbitration. Work on the subway has been considerably delayed.

All the state owned railroads of Victoria, Australia, including the Melbourne lines, are tied up by a strike which began May 8th. The government is willing to allow the men to have their own organization, but objects to their affiliating with the general organization known as Victoria Trades Hall. The government guaranteed double wages to non-strikers for two months and notified the men that they would lose their pensions if they struck. They were given until May 12th to withdraw from Trades Hall. About 11,000 men are involved in the dispute. A limited passenger service has been maintained, but freight traffic is suspended. A special session of Parliament was called to act in the matter.

The Connecticut Railway & Lighting Co., which successfully combated the Waterbury strike, referred to in the "Review" for March and April, 1903, has another strike on its hands at Bridgeport, Conn., where the company's headquarters are located. Sunday, May 17th, the company started six cars on the Barnum and State St. lines with nonunion men in charge. A mob of 4,000 persons stoned the cars and drove them back to the barns. The 12 nonunion motormen and conductors, a dozen passengers and 14 deputy sheriffs were injured by missiles and the mayor, who was elected on a labor ticket, was struck on the head with a stone while he was attempting, it is alleged, to effect the release of a rioter whom a deputy sheriff had arrested. It required the combined efforts of the police, deputy sheriffs, firemen and 100 or more nonunion men to disperse the mob, which gathered in front of the car barn and destroyed as much of the company's property it could reach. Streams of water from the fire hose were most effective in dispersing the crowd. No more cars were sent out Sunday.

Design of the New Power Plant and System of the Everett Railway & Electric Co.*

BY EDWARD P. BURCH.

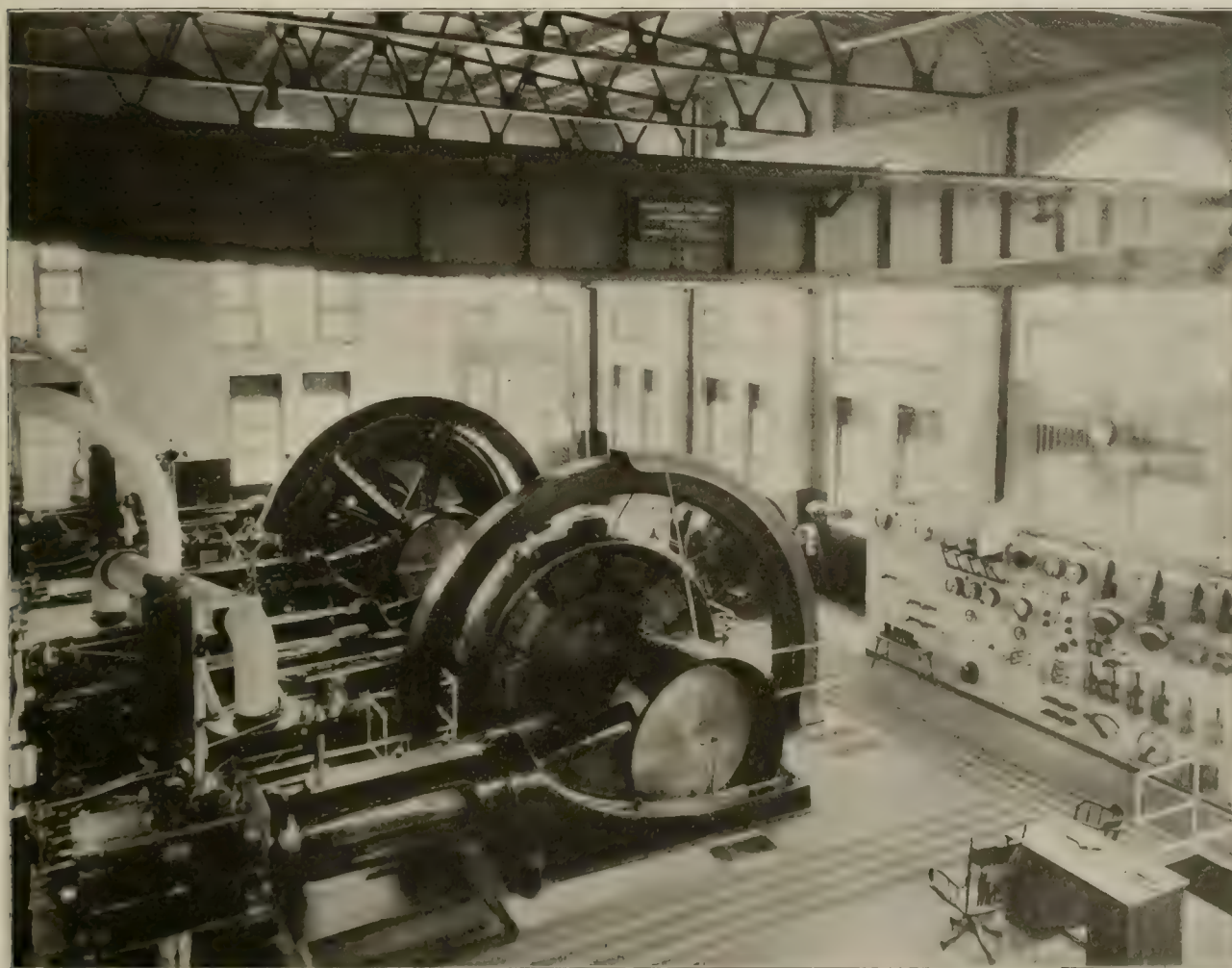
(A combination found profitable of an electric railway, electric lighting and city water pumping system in a small city. An original and peculiar adaptation of a rotary converter to improve the economy of the engines. The advance in central station development during the past decade. The operation of the services.—Editor.)

Everett, Wash., is located on Puget Sound where the Great Northern Railway line from St. Paul to Seattle first touches salt or tide water. The city was platted in 1892. The population in 1903 is 20,000. The city is growing very rapidly, as are all the new north-west coast lumber and shipping towns.

The first electric railway and electric lighting plant in Everett was installed in 1893 by Mr. Leo Daft. It had the following char-

The service was not reliable. The electric light meters were abandoned. The 40-lb. girder rail on six miles of track began to warp and the joints to flatten as the fir ties rotted and sank in the clay. The service on one long grade which ran from 10 per cent to 13 per cent was abandoned. The trolley line became the talk of the newspapers which advocated new franchises for other interests. A deficit from the operation of the system was the natural result. The depreciation on the property had been rapid.

In 1901, the railway and lighting property was purchased by interests represented in the Everett Improvement Co., which company owned the town site, the city water system, the docks, etc.



INTERIOR OF POWER HOUSE, EVERETT RAILWAY & ELECTRIC CO.

acteristics. Low pressure return tubular boilers, burning slabs for fuel; a high speed engine belted to a long countershaft which in turn was belted to several "Standard" 40-light arc machines, to three 45-kw., 133 cycle alternators and to a 75-kw. 500-volt railway generator. As the system grew two belted engines were added, also several small belted generators; and later a simple non-condensing belted corliss engine. Finally, the railway plant was transferred to another building, a half mile distant, allowing room for temporary additions in the original plant.

In the course of time the electric lighting lines assumed a ragged appearance. The regulation of the overloaded lines became bad.

The purchase was made very largely because the old railway and lighting system was not being improved or extended or properly managed and thus it was hindering the growth of the city and the Improvement company's land and other valuable interests.

The new president of the company, John T. McChesney, employed the writer as consulting engineer to design a new plant, suitable for the rapidly growing city; also to supervise the reconstruction of and the extensions to the old system. The designs and the equipments selected by the consulting engineer and placed in operation in April, 1902, are given below:

The Power Site

This was chosen near salt water (where the tide variation is 16 feet). The site is convenient for fuel and for fresh water supply.

*From a recent address before the students in power plant design at Minnesota State University.

It is on the harbor side of the city and near the heaviest railway grade.

The Building

The building, as well shown by the accompanying photographs, plans and cross-section. It is 103 x 88 ft. and it is built with 24-in. brick outside walls. The cross-section shows two symmetrical halves separated by a 17-in. partition wall. The building may be extended in one direction for additional machinery without in any way destroying the symmetry or the economy of the original installation.



BOILER ROOM. EVERETT RAILWAY & ELECTRIC CO.

The elevation of the boiler room floor was chosen largely with reference to the elevation of the railway tracks and the harbor water. One of the accompanying photographs shows the design of the exterior of the building.

The Foundations

The building and machinery required that 1037 fir piles, 26 ft. long and 20 in. in diameter, be driven through the drift to firm footings. These piles were capped with 3 ft. of concrete, made with Haccourt portland cement. Beach gravel was used in place of crushed stone, as is common in Government fortifications. The boiler foundations are of concrete. The engine foundations are of granite (which is abundant), laid in large blocks.

The principal features carried out in the design of the Everett power plant are those which affect the economy of operation, i. e., the cost of fuel and labor per kilowatt hour output. These are:

Coal Handling.

Coal, a semi-lignite delivered for \$1.75 per ton, comes in hop per bottom cars. It is weighed on track scales and is then dumped into a storage bin which has 400 tons capacity. The upper fourth, or the daily supply, runs through the chutes to the boiler furnaces. Thus the coal is not shoveled.

Boilers.

These consist of three Babcock & Wilcox vertical header type boilers. A fourth boiler will be installed this year. The steam pressure is 160 lb.; the heating surface 2640 sq. ft. These boilers are too well known to require description. The boiler and the piping arrangement shown, delivers dry steam, probably slightly superheated, under all conditions of operation.

The Furnace.

The Babcock & Wilcox chain grate stoker was selected. The arch over the front of the furnace roasts or cokes the fresh fuel, as it enters gradually on the grate under the arch, releasing the volatile gases which are burned in the combustion chamber above the bed of incandescent coke on the grates. There is complete combustion of the fuel before it is thrown as ash to the pit below. No smoke issues from the stack. The economy of steam production is remarkably high, due to the non-admission of cold air and to the entire combustion of the volatile matter. The temperature of the gases from the boilers is approximately 465° or 100° F. above the temperature of the steam.

The boiler room is a comfortable place in which to work. Note

the height to the roof, as shown in the sectional view. The furnace attendant has really a very clean and scientific job. Efficient help is thus obtainable. Two boilers are used, one being held in reserve. The two boilers are well loaded.

The Draft

Mechanical draft is used. Two New York Blower Co.'s induced draft fans of the three quarter housing type are used to furnish the draft. The fans are 140 in. in diameter. The blast wheels are 84 in. in diameter and from 44 to 37 in. in width. One fan is engine driven, and one is motor driven, the latter held in reserve. About 15 h. p. is the maximum power required by the fans when furnishing a draft of 1¼ in. (of water) at the fan, which, owing to the mechanical resistance imposed by the economizer to the passage of the gases, is ½ in. at the furnace, during the maximum rate of combustion. The top of a 72-in. independently supported steel stack is 40 ft. above the grates. The speed of the fans is proportional to the load. It is governed by an automatic valve connected directly in the steam header. This pressure regulator acts immediately when the steam pressure drops, speeding up the fan and increasing the draft, and vice versa.

Induced draft is found to be flexible, always ample, easily controlled and independent of the wet weather prevailing on the Pacific coast. Thus lignite coal of cheapest volatile grades may be burned. This system provides for a rapid growth of the plant. The power required is small and the exhaust from the engine is used to heat the feed water.

The arrangement shown of the smoke connections, the economizers, by-pass for economizers and for fans to use natural draft, and the arrangement of the fans themselves have been carefully studied out. The fan equipment requires little attention.

Feed Water Heaters.

The condenser uses ocean water. Therefore the feed water does not come from a hot well. Fresh water for the boilers is first sent to a Wainwright closed feed water heater where its temperature is raised from 40 to 140 degrees by the exhaust from the boiler feed pump, a dry vacuum pump, and a 15-h. p. induced draft fan engine. From the heater it is forced through a Green fuel economizer which raises the temperature to an average of 240° F. This economizer plant is found specially valuable for the storage of heat. It increases the capacity of the boiler plant, the work in the boiler being decreased. The saving in fuel by the economizer is appreciable. The



BOILER ROOM PIPING. EVERETT RAILWAY & ELECTRIC CO.

economizer heating surface is 2,688 sq. ft. It holds 10,700 lb. of water.

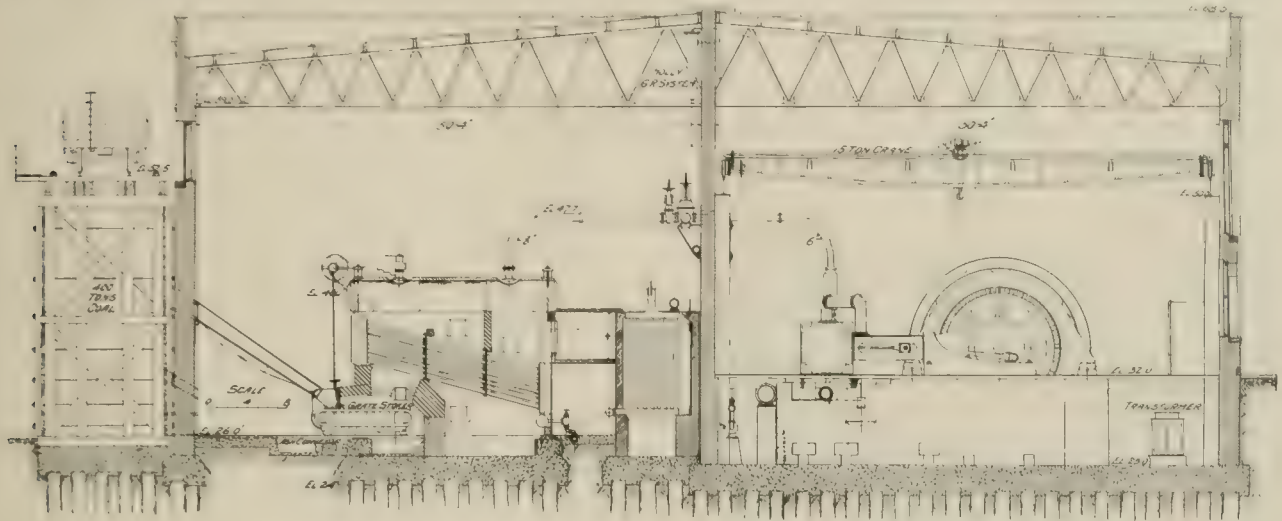
The Generating Units.

These are simply two 500-kw. Westinghouse electric generators, one for 550-volt direct current railway work and one for 2,200-volt two-phase lighting service, no reserve unit being installed. A second 500-kw. lighting unit will be installed in 1904.

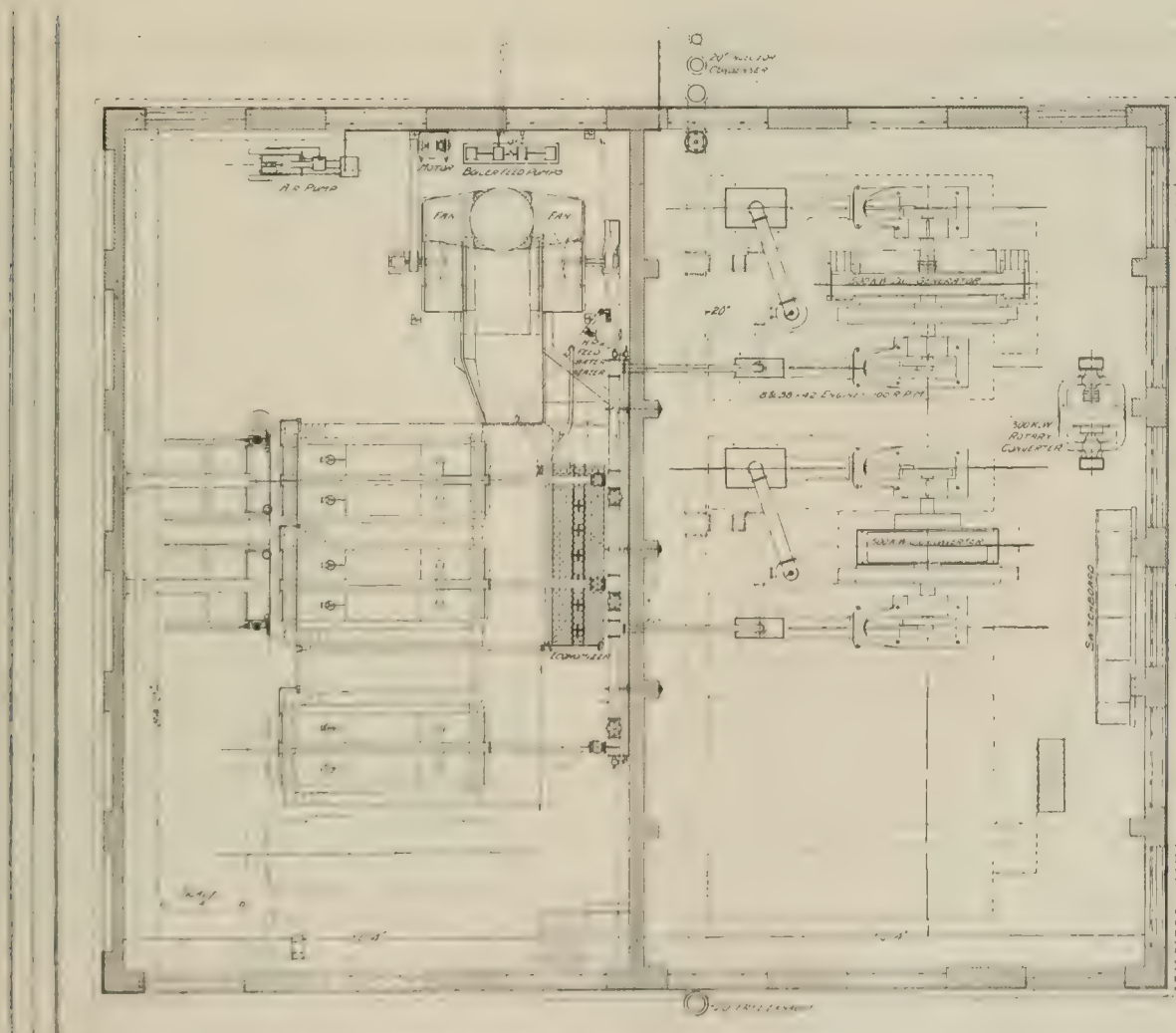
Each generator is direct connected to an 18 and 38 by 42 in. Allis-Chalmers cross-compound engine. The speed is 100 revolutions per minute, making the piston speed 700 ft. per minute. Two eccen-

tries are used for the steam and exhaust valves of each cylinder. A reheating receiver is placed between the cylinders. The fly-wheel is 18 feet in diameter and weighs 45,000 pounds.

April, 1901, small steam turbines were not a commercial success. The new Curtis turbine of April, 1903, it is said, will produce a kilowatt-hour on 19.3 lb. of water, under the same conditions. The



CROSS SECTION OF POWER HOUSE, EVERETT RAILWAY & ELECTRIC CO.



PLAN OF POWER STATION, EVERETT RAILWAY & ELECTRIC CO.

These engines, or turbines will work in Minneapolis, develop a horse power of 12,777 h. p. of water. This at 92 per cent efficiency for the engine and 93 per cent for the generator would be equivalent to 20 pounds of water per kilowatt-hour. At the time of purchase,

steam turbine has, however, great advantage in large unit, due to the use of high pressure and superheated steam.

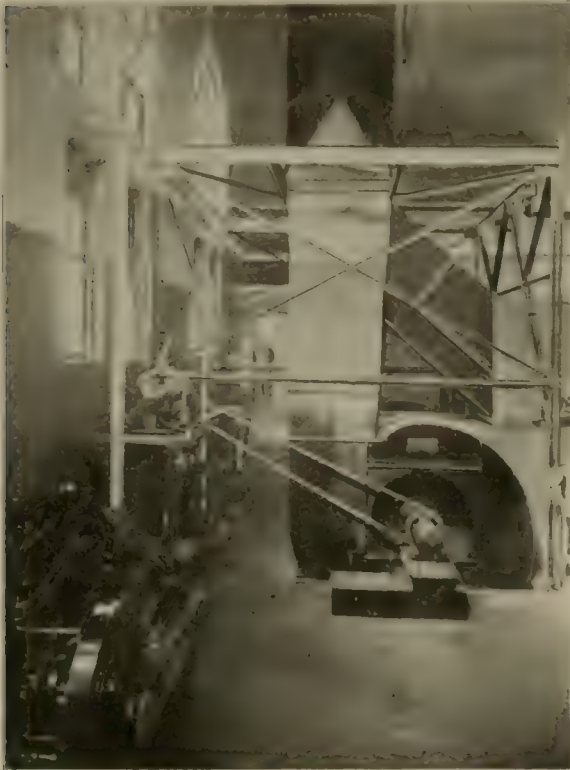
In combined electric lighting and electric railway service varying from 50 to 150 per cent of rated capacity (one fifth cut off),

there is required at the Everett power plant from 26 to 28 lb. of steam per kilowatt hour, an exceptionally good record. Better results will be secured as the load factor of the engines improves.

The generators have a 50 per cent safe overload capacity for one hour following a full load run of 10 hours. The revolving field of the two phase alternator is 12 ft. in diameter and weighs 21,000 lb. The armature of the railway generator weighs 20,000 lb.

Converter.

A 300-kw. rotary converter is used in a most interesting way. It simply converts from 550-volt direct current to 380-volt two phase



MECHANICAL DRAFT, EVERETT RAILWAY & ELECTRIC CO.

alternating current, which latter voltage is raised by two 150-kw. static transformers to 2,200 volts. The reverse operation is as easy and simple. By the use of this converter either engine when underloaded may be shut down regularly for economy, and both the railway and the lighting service supplied by the other engine. The regulation of the converter is very satisfactory. There is an induction motor at one end of the shaft for starting from the alternating current side. On the other end of the extended shaft there is a small direct connected exciter which is used when converting from direct to alternating to prevent any possible racing.

The use of this converter thus helps to furnish an electric generating system of minimum first cost. It allows maximum engine economy, since on the lighter loads one engine may be economically loaded, which is a most desirable feature in the design of a small power plant. The flexibility of the scheme in time of accident is also apparent.

In common operation one (either) engine runs from midnight to 6 p. m., and carries both the railway and the lighting service; after which both engines run during the remaining 6 hours of the day. The engines may be run in parallel if desired.

Switchboard.

In the design of the switchboard the manufacturing company's standards were used in large measure. The panels are shown in one of the photographs. A Lincoln synchronizer is mounted over the board in plain sight of the engineman at the throttle. Indicating and integrating wattmeters are provided. The wiring is of lead-covered cables. Ample space back of the board, good mechanical work and permanent construction are features.

The Condenser.

A Worthington 20-in. elevated injector condenser is used. Salt sea water is used, being supplied by a motor driven triplex pump 12 by 15 in. located 1,500 feet from the power plant out on the company's docks. The speed of the pump, or the amount of injection water, is controlled in the power house by a Cutler-Hammer combination regulator which varies the resistance in the armature and field circuits. The power used by the motor when delivering 27,000 lb. of salt water per hour is but 4.77 kilowatts.

Pumping

City water pumping is provided for by a small triple expansion condensing Worthington pumping engine with a capacity of two million gallons per day. An old compound Worthington pump is held in reserve. Water is pumped up to a reservoir during the first 18 hours of the day, or when the lighting load is small. Thus extra men and additional boilers are not required. The economy of the whole plant, in pounds of coal per unit output, was increased 8 per cent by the addition of the pumping load. The water horse power of work by the pumps is reduced to kilowatt hours. At 140 lb. pumping pressure, 1,000,000 gallons pumped per day are exactly equivalent to 1,000 kw. h. output. The efficiency of the pumping engines on steady load is approximately equal to that of the railway and lighting service.

Auxiliaries.

In importance, there is first a 20-ton Whiting traveling crane to reduce the labor item and to decrease the time required for inspection and repairs. There are several small motor driven accessories for the economizer, ash conveyor, etc., a Holly gravity return system of drainage to save all condensation, a Sweet receiver, Finn traps, an automatic oiling system, etc.

The steam auxiliaries were recently tested by R. P. Stevens,



EXTERIOR OF POWER HOUSE, EVERETT RAILWAY & ELECTRIC CO.

superintendent, and D. B. Young, engineer. The steam was weighed, using a small special temporary condenser. It was found that the auxiliaries require the following pounds of steam per 24 hours: Holly system 2,300; boiler feed pump 2,360; stoker engine 975; dry vacuum or air pump 6,250; induced draft fan engine 2,050; total, 13,935 lb. or from 6 to 7 per cent of the steam used by the engines. The heat units in the exhaust steam are entirely used to heat the feed water as stated.

Labor.

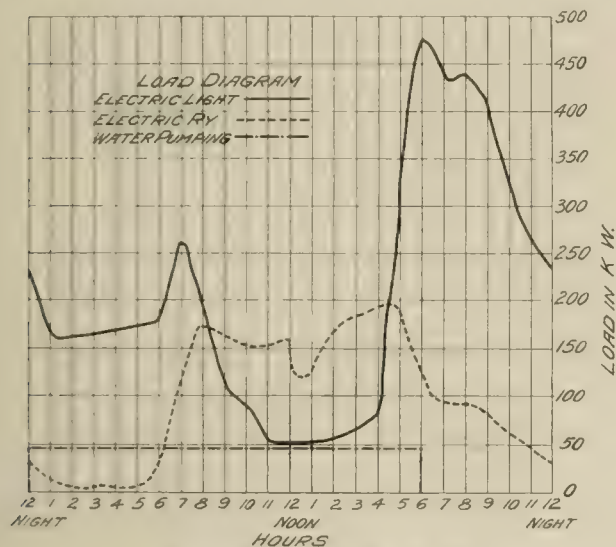
The men work on eight hour shifts. Two men operate the plant on each shift, one in the engine room, one in the boiler room. There is one chief engineer over these six operators. The design of the plant permits a minimum of labor.

Metering.

All water evaporated by the boilers is metered by cold water meters before it goes to the heater. Coal is weighed in cars only, except during tests. Recording wattmeters measure the total output. The engineer's daily reports show particularly the number of pounds of steam required per kilowatt-hour output; also the pounds of water evaporated per pound of coal burned. The results have been most satisfactory. The temperatures of feed water and of gases are recorded and studied.

Load Diagrams.

These are plotted from hourly readings. The railway and the lighting load peaks overlap during December and January. The pumping load is on from midnight to 5 or 6 p. m., and does not



LOAD CURVE FOR DEC. 30, 1902.

Engine No. 1 started at 5:20 p. m. and ran until 11:50 p. m.
 Engine No. 2 running continuously.
 Water evaporated, 26,490 lb.; temperature 236°.
 Fuel burned, 26,150 lb.; cost of fuel \$1.75 per ton.
 Total output, 7,630 kw. h.; coal (lignite) per kw. h. 4.73 lb.
 Water per kw. h., 27.06; water per lb. lignite, 5.71 lb.
 City water pumped, 58,800 lb.; pressure 140 lb.
 City lighting, 173 arc lamps; off 7:20 a. m.; on, 5:20 p. m.

overlap the peak of the lighting load. These records of the plant are mailed to the consulting engineer daily. A common load diagram, of Dec. 30, 1902, is reproduced herein. In summer, the water pumping and electric railway loads increase while the lighting loads decrease.

Economy.

The economy of the power plant is best expressed by the number of pounds of water used per unit output. The results have shown the use of 26 lb. of steam per kw. h. output during the past months. The steam pressure was 150 to 160 lb.; the temperature of the feed water 240° F.

The economy of production in power plants depends more on the load factor, i. e., the ratio of the average to the maximum load on the boilers and engines, than it does on any other variable item. This matter has received the greatest consideration in the design of the plant. The boilers have a fair load factor, as shown; the use of the rotary converter to improve the engine load factor was an important step.

Railway System.

The electric railway system at Everett consists at present of 13 miles of road. Extensions are now being planned to nearby cities and towns. The track is gravel ballasted. A 60-lb. T-rail of A. S. C. E. section is used. The rail joints have a standard 8.4-lb. angle bar. The Brown plastic bonds are used.

A good patronage has been induced by new and modern Brill car

equipments, good service, long runs for 5 cents and a rapid schedule, which also saves in trainmen's wages. The gross earnings exceed \$3.00 per capita per annum, which is high for a small city.

Lighting System.

The electric lighting system for the city as remodeled consists of modern equipment. Single phase feeders are used. The product of the length of feeders by their amperes was made a constant. The regulation of lines is excellent. Eight commercial circuits of No. 2 wire are used. Transformers are located in the middle of each business block, the distribution being radial therefrom. Many Nernst lamps which have a high power factor were used in place of multiple alternating current arc lamps, by which the regulation of the transformers was greatly improved. The Hartford enclosed arc lighting system is used for municipal lighting. The gross earnings from electric lighting are over \$3.00 per capita per annum.

The meter rates established for commercial lighting are, 16 cents per kilowatt-hour for one hour's use of the maximum current on an average per day, 14 cents for two hours' average use of the maximum current per day, 12, 11, 10, 9.5, 9.0, 8.5, 8.0, etc., to 5.0 cents for 3, 4, 5, 6, 7, 8, 9, etc., to 24 hours' average use of the maximum current per day. These rates are proportional to the total cost of the electric current, i. e., operating expense, interest and a sinking fund. In order to determine just how many hours per day a consumer uses current on an average, one first divides the kilowatt-hours used during the month by 30. This gives the average kilowatt-hours used per day. Dividing this quotient by the maximum demand of the consumer in kilowatts and we have the average hours' use of the maximum current per day. The maximum demand is measured, in large establishments, by reading the kilowatts from the consumer's recording wattmeter for one hour during the heaviest use of light. The maximum demand is seldom measured in residences, but is ordinarily assumed to be one-half of the installed capacity.

Electric power is furnished from the 550-volt grounded circuits without exception. A separate positive feeder was run for this service. It was considered a bad plan to install power service on lighting feeders. The matter of protection against fire and lightning was carefully considered in all power installations. Meter rates for electric power are approximately one-half of the meter rates for electric light.

General Design.

The plant and system as designed, for the entire city water, incandescent and arc lighting, electric railway and power service, show low first cost and high economy. "Specially" designed apparatus was not chosen. Sizes were thoroughly studied before purchase by first obtaining reliable data, using the knowledge of others freely, and getting correct technical facts as a basis. The commercial factors were recognized and engineering economy was not pushed to its full face value. The complication of many recent designs is avoided. Coal is not shoveled at any time and the stokers promote furnace efficiency. One man easily handles the battery of boilers. The piping is especially free from complications. The minimum amount of generating equipment used saves on investment, labor and complication. Reliable service and maximum economy of the engines are guaranteed by the use of a rotary converter. (A magnetic clutch has been used by others to accomplish similar excellent results.) Future needs will be supplied by the addition of similar units of the largest possible size consistent with economy.

The plant is considered reliable, economical and commercially consistent as a whole. The system is satisfactory to the stockholders because it is successful financially.

ELEVATED TRAFFIC IN CHICAGO.

The traffic of the Metropolitan West Side Elevated Co., Chicago, for April was the largest ever reported by that road. The daily average of fares collected was 117,597, an increase over April, 1902, of 7.64 per cent. The South Side Elevated Railroad Co. carried an average of 87,500 passengers daily, a gain of 8 per cent. The North-Western Elevated Railroad Co.'s daily average was 71,300, an increase of 9 per cent. The Lake Street Elevated Railroad Co. carried a daily average of 44,865 fare passengers, a gain of 8.01 per cent.

The Louisville (Ky.) Railway Co. has leased for 25 years a property on Seventh and Market Sts., Louisville, for storage purposes, and ultimately for a transfer station.

LIVERPOOL CORPORATION TRAMWAYS.

The report of C. R. B. Jones, general manager of the Liverpool Corporation Tramways for the year ending Dec. 31, 1902, shows that more than 12 millions of low fares were opened for road lines with double track, and through communication was established between St. Helens and Southport, making 21 routes operated with 101 motor cars. A new form of cover was adopted for the upper decks of cars, which can be placed in or out of use within one minute, and by permitting the upper seats to be used in inclement weather increases the covered seating accommodation to 58 instead of 42 passengers. This cover consists of a framework and closed end screens with doors, with curtains for the roof and sides.

The company decided to equip all its cars with the plow life guard, it having been demonstrated that although since its introduction 21 persons had been actually under cars fitted with this guard, all were pushed out of danger without being seriously injured, medical assistance not being required in any case. The number of personal accidents in 1902, as compared with 1901, decreased 2.05 per cent, and collisions nearly 4 per cent, although the mileage was appreciably increased. The ratio of fatalities to passengers carried in 1902 was 1 to 13,667,000; the ratio to passengers carried by all the railways in the United Kingdom was 1 in 895,878. In Massachusetts, in 1901, the ratio of fatalities to passengers carried by the street railways was 1 to 5,704,300.

The Tramways Act of 1870 empowers tramway companies to carry merchandise over any of the lines. The Liverpool company is formulating a complete scheme to include all its lines. The Lambeth Road works were extended during 1902 at a cost of £24,129. The company owns four electric car sheds. During the year 3,595 cars were sent to the works for alterations or repairs; each car ran 3,306 miles before requiring attention. There were 1,015 emergency calls, or a decrease of 56 per cent from 1901, and the cost of maintaining and renewing the overhead electrical equipment decreased 30.47 per cent, the sum expended being £6,224. The total electrical energy used, in units, was 16,855,113, an increase of 17 per cent.

The total number of passengers carried in 1902 was 109,335,585; total mileage, 11,790,815; total receipts, £506,728. The increase over 1901 was as follows: Passengers, 8.1 per cent; mileage, 7.5; receipts, 8.2. During coronation week 255,674 passengers were carried; total receipts for the week, £15,032. A total of 7,352 cars ran in and out of the city daily. Nineteen persons were prosecuted for spitting on the cars in 1902 and substantial fines were inflicted. The wages of inspectors, motormen and conductors were increased. Inspectors receive from 6s. to 7s. 6d. per day; motormen from 6d. to 6½d. per hour, and conductors from 5d. to 6d. Several employees received gratuities for services out of the ordinary, such as stopping runaway horses and assisting the police.

The report shows that there were 1,717 members of the Employees' Benefit Society, that sick allowances were paid 749 members, and 23 death claims were paid during the year. The society had £2,189 5s. 4d. on hand December 31st. The company is considering the creation of a superannuation fund. There is an employees' band of 35 pieces which the company equipped and maintains, and the Tramway Employees' Social, Athletic and Thrift Society has a membership of 1,241. In March, 1902, ambulance classes were formed to instruct employees in first aid to injured.

Following is a summary of the principal figures applicable to the Liverpool Tramways system: Capital expenditure, £1,832,977; total revenue, 1902, £517,935; operating costs, £339,810; gross profits, £178,124; interest and sinking fund, £102,627; balance, £75,497, divided as follows: Reserve, renewal and depreciation fund, £50,331; transferred to general rate account, £25,166. The total operating expenses per car mile were 6.884d.; car mile earning 10.34d. The average fare per passenger was 1.111d.

Accompanying the report are tables showing routes, stages, fares and service, fares running from 1d. to 5d.; also diagrams indicating the licensed capacity of cars on the Cabbage Hall routes as 1,300, while 1,000 was the greatest number carried; also the number of persons carried per month for six years past, 1902 being the highest, the heaviest traffic being in June and the lightest in February; also showing passenger traffic over a typical route during each hour between 5 a. m. and 12 p. m. over an average of one week, the heaviest traffic being between 6 and 7 p. m. The statement of the comptroller shows the total expenditure for 1902 to have been £339,810; total income, £513,424; balance to net revenue account, £173,613.

PHILADELPHIA TO NEW YORK BY TROLLEY.

It is now possible to make the journey from Philadelphia to New York entirely by electric railway in approximately 13 hours with little waiting at connections and no walking. The cost in fares is about \$1.30. The total distance traveled is about 120 miles.

The route is as follows:

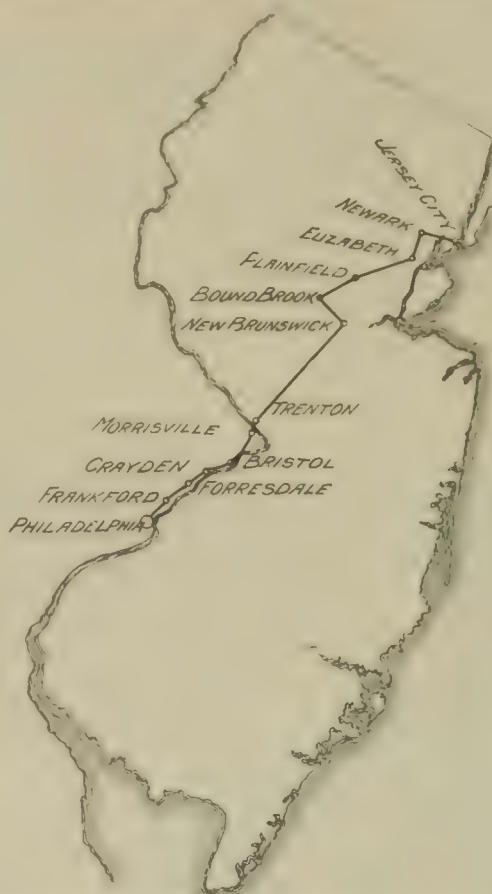
From 5th and Chestnut St., Philadelphia, to Frankford; time 52 minutes; fare five cents.

From Frankford to Torresdale; time 28 minutes, fare five cents.

From Torresdale to Croyden; time 25 minutes; fare five cents.

From Croyden to Bristol (including short transfer in 'bus); time 10 minutes; fare five cents.

From Bristol to Morrisville; time 45 minutes; fare 15 cents.



TROLLEY ROUTE FROM PHILADELPHIA TO NEW YORK

From Morrisville to Trenton, N. J.; time 7 minutes; fare five cents.

From Trenton to Interstate Fair Grounds; time 19 minutes; fare five cents.

From Interstate Fair Grounds to New Brunswick; time 90 minutes; fare 35 cents.

From New Brunswick to Bound Brook; time 30 minutes; fare 10 cents.

From Bound Brook to Plainfield; time 45 minutes; fare 10 cents.

From Plainfield to Elizabeth; time 75 minutes; fare five cents.

From Elizabeth to Newark; time 35 minutes; fare five cents.

From Newark to Jersey City; time 50 minutes; fare 20 cents.

Jersey City to New York by ferry.

The Atlantic City & Suburban Traction Co., Atlantic City, N. J., is constructing an electric line from the Board Walk to Pleasantville, with branches to Absecon and Somer's Point, in all about 18 miles. The road will operate 12 cars, each equipped with four Westinghouse 12-A motors, and five trailers. In the Pleasantville power house will be installed two 400-kw. direct-current Westinghouse generators, running at 550 volts and 125 r. p. m., and a Westinghouse switchboard of two generator panels, one load panel and four double feeder panels.

Street Railway Park Development. -VI.

Design of Terminal Track Facilities for Parks—Successful Methods of Advertising Parks—Descriptions of Parks.

DESIGNING TERMINAL FACILITIES.

In any instance, the financial success of catering to what is commonly termed pleasure resort traffic, will be determined very largely by the facilities provided for handling it. Travel to parks and pleasure resorts is largely a created or artificial traffic, and as every electric railway manager knows, is so easily influenced one way or the other as to make success or failure sometimes turn on seemingly triv-

facilities must be ample to accommodate the traffic of the one heaviest day of the year as well as the ordinary run of travel, otherwise the management will have the chagrin of seeing a considerable

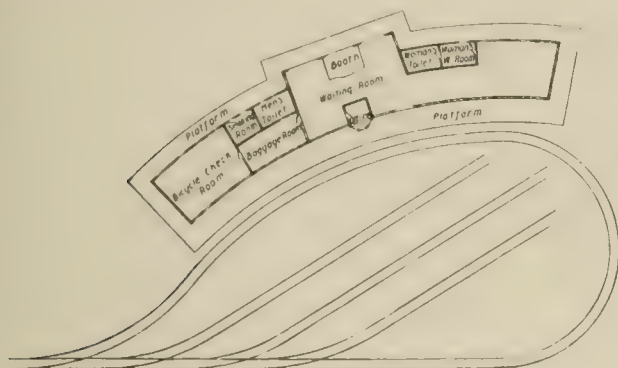


FIG. 1 PLAN OF TERMINAL AT OLCOTT BEACH.

ial details. For this reason money invested in high-class attractions at a pleasure park may very easily be rendered a useless expenditure if adequate facilities for transporting the increased crowds with reasonable dispatch and comfort are not furnished. The degree of dispatch and comfort that can be offered by the company will depend very largely on the facilities for loading and unloading passengers at the park, and the speed with which cars can be moved into and out of the terminal. Again, the handling of large crowds always brings increased risk of accidents, and more than the usual degree

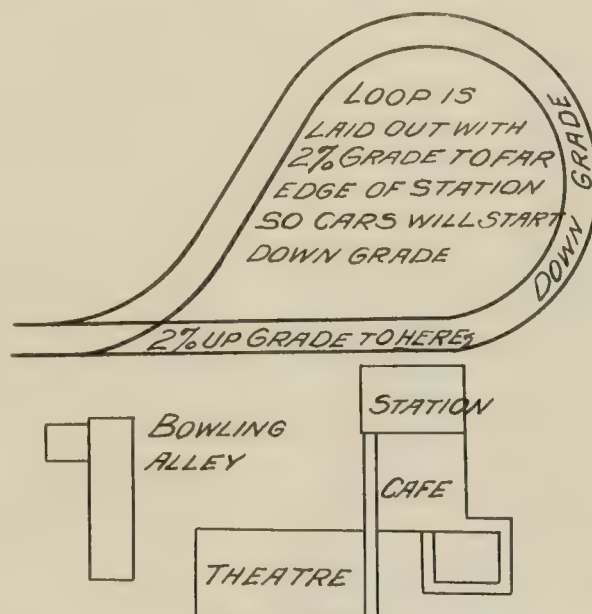


FIG. 1-ARRANGEMENT IN WHICH A DOWN GRADE IS UTILIZED FOR STARTING HEAVILY LOADED CARS.

possible revenue lost through lack of facilities for moving the increased traffic.

It is hoped that managers or engineers confronted with the prob-

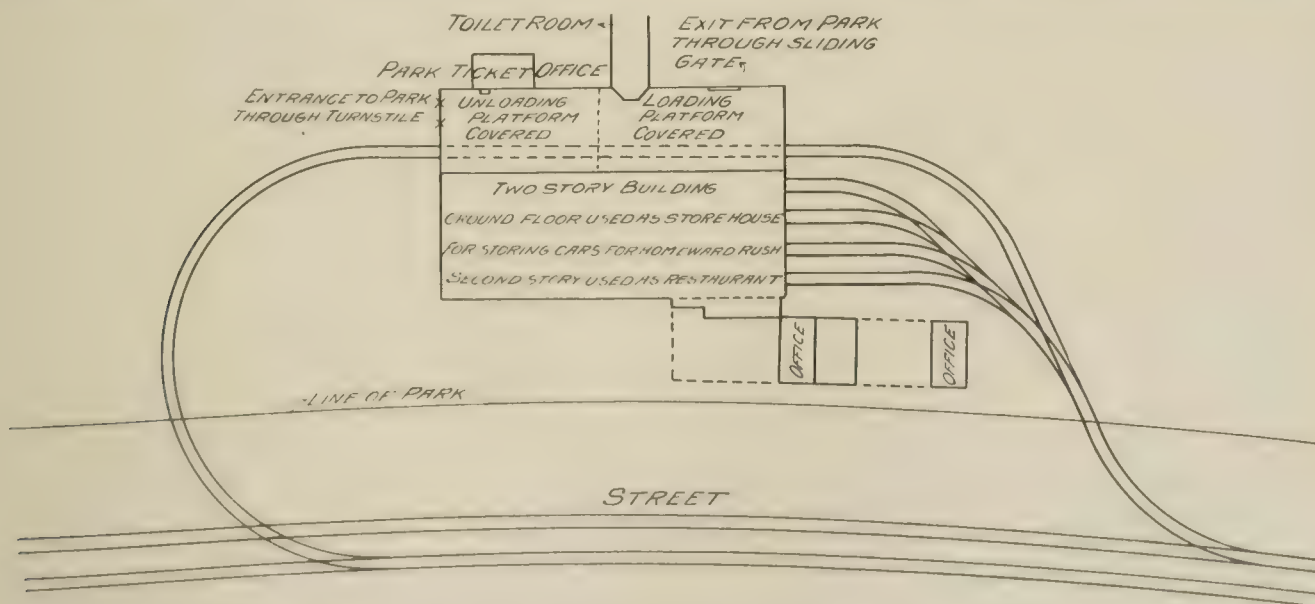


FIG. 2 TERMINAL LAYOUT AT A PROMINENT PARK IN NEW ENGLAND.

lem of designing or rearranging terminal layouts will find useful suggestions in the accompanying sketches of a few of the principal types of terminals that have proved satisfactory at successful parks and pleasure resorts in this country.

In Fig. 3 is given a layout suitable for a suburban park located at

the terminal of a single track line. This is the plan as built at Olney Beach at the terminal of the Buffalo & Lockport Ry. The tracks in the center of the loop give convenient storage arrangement and the loading cars can either be run out on to the loop or passengers can cross the loop track and board the cars on the spur tracks. This arrangement works very well where the interval between regu-

stantially built, there should be no noticeable disturbance on the second floor from the moving cars underneath. An annex at the side of the building provides room for loading and unloading platforms, and the roof of this annex can be made to serve as a veranda or piazza to the second story. The arrangement requires that cars held in the car house have to be switched twice to reach the loading

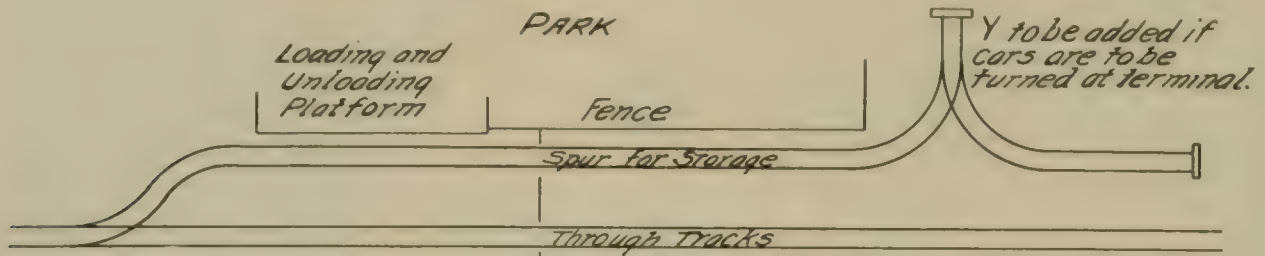


FIG. 2. HANDLING PARK TRAFFIC ON DEAD-END SPUR

lar cars is 10 or 15 minutes or more, as the regular cars can come in, make the loop, and after stopping at the platform long enough to take on such passengers as may be waiting, can leave on schedule time, thus leaving the cars stored in the center to be run in as specials whenever the size of the crowd waiting to leave the park warrants it. If this design is followed, care should be observed to make the loading platform long enough to accommodate more than one car so that cars may be run as double or triple headers if it becomes desirable to so run them.

The idea set forth in Fig. 2 is particularly applicable for parks sit-

uated near comparatively large cities where several thousand people are to be handled on heavy days and where it is desirable to have a covered car house for storing cars in anticipation of heavy movements of traffic toward the city after theater performances, in case of sudden showers or on other occasions. It will be observed the park cars pass from the main line to the large-radius loop, so there is no interference with the regular service on the through main line. Within the confines of the loop is a two-story building, the ground floor of which serves as a car house for car storage. The second floor can be utilized as a restaurant, dancing pavilion, music hall or for other purposes, and if the building is properly designed and sub-

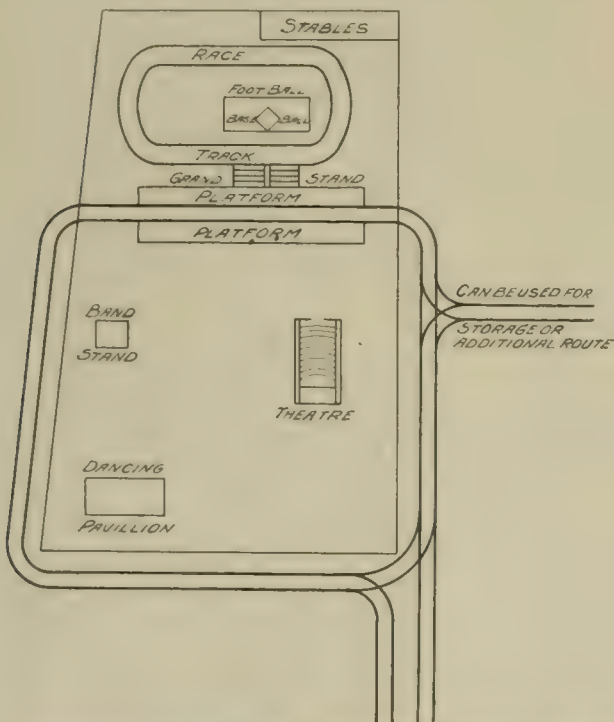


FIG. 3. ARRANGEMENT FOR CARRYING PASSENGERS INTO THE HEART OF THE PARK.

stantially built, there should be no noticeable disturbance on the second floor from the moving cars underneath. An annex at the side of the building provides room for loading and unloading platforms, and the roof of this annex can be made to serve as a veranda or piazza to the second story. The arrangement requires that cars held in the car house have to be switched twice to reach the loading

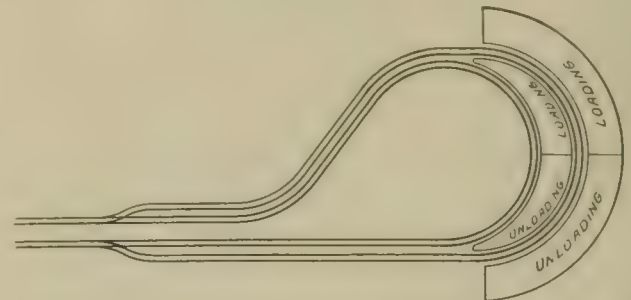


FIG. 4. DOUBLE LOOP. EITHER SET OF TRACKS MAY BE USED FOR STORAGE.

Although dead-end terminals are always more or less unsatisfactory, especially on park lines, the amount of ground available and other considerations sometimes make a dead-end unavoidable. In Fig. 3 is given a plan that may be suggestive under these conditions. In this case the track used by the park cars is a spur from the main

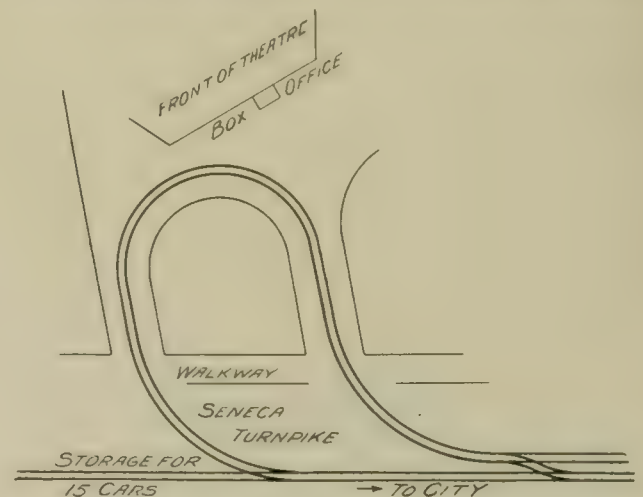


FIG. 5. TERMINAL LOOP AT VALLEY THEATER, SYRACUSE, N. Y.

through tracks so the park travel will not interfere with the regular travel. Wherever a dead-end terminal is absolutely necessary, the loading and unloading platform should never be placed directly at the dead-end, but there should be an ample length-of track beyond

the edge of the platform to give sufficient room for storage and for sitting and turning cars before they are brought to the platform for loading. If the actual shifting is done immediately in front of the platforms where crowds are waiting to board the cars there will

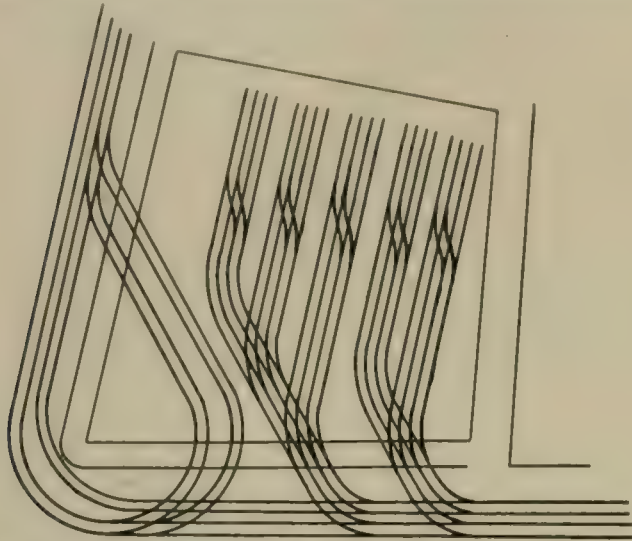


FIG. 8—LARGE TERMINAL STATION FOR SEVERAL DIVERGING LINES.

always be an undue amount of confusion, and the opportunities for accidents will be largely increased.

Fig. 4 illustrates a simple loop arrangement that will be found to fill the needs of the average small suburban park. This diagram draws attention to a suggestion that will be found valuable. From the entrance to the loop to a point beyond the station platform, the track is laid on a 2 per cent up-grade and from this point for the rest of the distance around the loop the track is down-grade. The idea is, of course, to utilize the down-grade for starting heavily loaded

the tracks directly into the heart of the park in order to bring the crowds closer to the various park attractions. This is especially necessary where the park property covers a large amount of ground. In Fig. 5 is given an arrangement whereby one side of the terminal loop passes directly through the park. This idea is feasible where several lines come to the park from different directions, as all cars can enter the terminal loop and pass the loading and unloading platforms without confusion. If it is desired to store cars for the homeward rush, a spur can be built from any convenient point on the terminal loop.

Figs. 6 and 7 show different forms of terminal loops that are interesting and may be useful where it is necessary to meet special conditions. Fig. 6 in particular gives considerable flexibility in the way cars may be banked and handled.

Fig. 8 illustrates the terminal station for a park in or near a large city where the different city and suburban lines converge. If each line is assigned its own special track and the tracks are properly designated, this arrangement will avoid a great deal of confusion and will relieve intending passengers of considerable annoyance in finding the particular car wanted.

The terminal loop plan (Fig. 9) adopted for the Charleston Exposition combined one large radius loop with long straight approach and exit tracks. Passengers were discharged at one side of the loop and boarded cars at the other side. No spur tracks were provided for storage purposes but as the exposition line was a double-track line built for the exclusive purpose of handling the exposition traffic it was possible to use the terminal loop itself for storage in anticipation of heavy homeward movements. That is, cars could be banked on the loop and brought up to the loading platform as the traffic demanded. This idea is applicable to park terminals where the park is on a separate line devoted exclusively to park traffic and where there is plenty of ground room available for terminal facilities. It is hardly applicable if the terminal is to be used also by cars intended to serve the regular street traffic, as the congestion of cars on the loop will prevent regular cars from getting away on

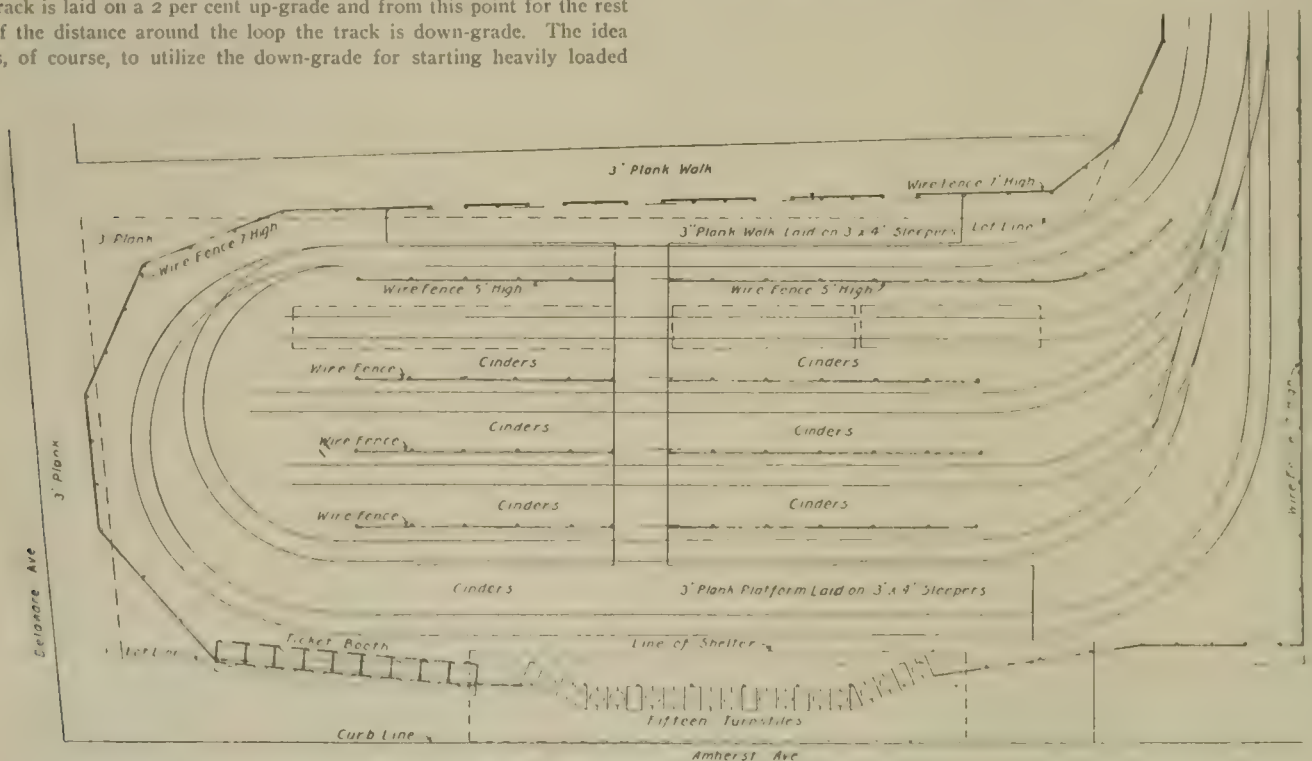


FIG. 11—AMHERST TERMINAL, PAN AMERICAN EXPOSITION

cars, and thus relieving the hard pull on the power house when the park travel is the heaviest. The suggestion is a particularly good one inasmuch as visitors to a park usually come in comparatively small lots but they frequently all want to leave at the same time, so that the arriving cars which have to mount the up-grade are not usually so heavily loaded as the departing cars.

Under certain conditions it may be considered advisable to run

schedule time and it would necessitate sending cars away from the park only partially filled in order to get the regular cars out.

In Figs. 10 and 11 are shown the two general forms of terminals at the Pan-American Exposition in Buffalo two years ago. These are reproduced here for the benefit of those who may be called upon to design terminals for handling excessively large crowds as for expositions, fairs, or similar enterprises. As will be seen, the main

Pan-American terminals comprised two independent but closely adjacent loops with a set of storage tracks within each loop. To facilitate the movement of cars, the main tracks at the north end of the loops were divided into four loading or unloading tracks, the cars of the different loops always switching onto the same track. Passengers bound away from the exposition entered the terminal depot through turnstiles. They purchased tickets at the ticket booths immediately before passing through the turnstiles. The loading tracks were separated from each other by high fences of wire netting. To permit the crowds to pass from the depot to any of the four loading platforms, a wide plank walk-way was built at right angles to the tracks as shown. The tracks within the loops were utilized for storing cars ready for heavy homeward rushes, and the well-arranged system of crossovers permitted the cars to be moved from the storage tracks to any part of the loops or vice versa, or into the temporary car house erected in one of the loops as shown.

The smaller Pan-American terminal which was known as the "Amherst" terminal included an ingenious arrangement of loops, storage and loading and unloading tracks as shown.

HOW TO ADVERTISE STREET RAILWAY PARKS.

In continuation of this subject, which was begun in the April number of the "Review," below will be found additional information concerning the advertising methods employed by various street railway companies to advertise their parks or other places of interest and attraction.

Last August the Cleveland (O.) Electric Railway Co. adopted a novel method of advertising Garfield Park, located about six miles from Forest City Sq., in what is called the South End, and which it desired to popularize. "Return ticket" coupons were printed in all the daily newspapers for three consecutive days and it was announced that the coupons would be honored by the conductors for a return trip from the park, thereby making the cost of the round trip five cents. Special attractions were announced, including concerts by a popular military band. The result of the first Sunday was far beyond expectations and the cars could scarcely accommodate the patrons. Fully 25,000 persons visited the park, which is a very pretty one containing 162 acres. Mr. J. W. Butler, manager of the company's outing department, devised the idea. There are many public parks, boulevards, pleasure resorts and points of interest reached by the company's lines, and in the fall when Nature is at her best "nickel outing excursions" are arranged by Mr. Butler's department. One of the most effective means of advertising is the use of posters and circulars, printed in colors. The circulars announce that for special trolley car service or picnic bookings arrangements can be made by calling upon Mr. Butler at the outing department offices. The large posters for use on bill boards and dead walls contain but little reading matter, "nickel outings" and "autumn leaves" being the seductive suggestions most prominently displayed. The company also issued a 56-page pamphlet artistically designed and printed, entitled "Hasten at Leisure." It is replete with half-tone illustrations and sets forth the fine buildings, resorts and other places of interest in and around Cleveland in a most attractive fashion. General information and routes of all lines, alphabetically arranged, are also given, and a chapter is devoted to the funeral car.

By means of a unique folder, handsomely illustrated, and entitled, "Grand Rapids Big 3," the Grand Rapids Railway Co. advertises its leading summer resorts—North Park, Reed's Lake and John Ball Park, described in the "Review" for January, 1903. The reader is taken to and through the resorts in company with "Puck and his friends," the "friends" being "Woof," a dog, and "Hoo," an owl. Just what cars to take are indicated and also a map gives a clear idea of the railway lines and location of the points of interest. The company maintains a free information bureau and extends an invitation to everybody to call and ask questions concerning the city, as well as the railway system.

"Pittsburg's Popular Parks on lines of Pittsburg Railways Co." is the title of a 24-page illustrated treatise on Kenwood, Calhoun, Oakwood and Southern Avenue Parks, described in the "Review" for July 20, 1902. Another artistic publication of the Pittsburg Railway Co. is a booklet of the Duquesne Garden, the home of "rotated amusement," mentioned in the "Review" for April, 1903.

The story is told almost wholly by illustrations, the frontispiece being a likeness of Hon. Christopher L. Magee, the founder of the institution. Interior views show the palm garden, the theater auditorium, both empty and filled, and the rink wherein are held the leading hockey contests in this country. There are also photographs of the principals of the Duquesne Garden Stock Co.

The Manistee, Filer City & Eastlake Railway Co., of Manistee, Mich., uses as one form of advertisement a 20-page booklet giving a glimpse of Orchard Beach Park, described in the "Review" for April, 1903, and setting forth some of the advantages of Manistee and its surroundings as a place of rest and recreation. Bear Creek, a famous trout stream; Bar Lake, where bass and pickerel abound; Red Park and Onokama, two pretty resorts on Portage Lake; an electric car ride around Manistee Lake, and a visit to a salt-block, of which Manistee has the largest in the world, are featured. The illustrations are numerous and attractive.

One of the means adopted by the Torrington & Winchester Street Railway Co., of Burrville, Conn., to advertise its Highland Lake Park, described in the "Review" for April, 1903, is a four-page circular, folio 8 x 10 in., printed on heavily embossed paper and illuminated by tinted illustrations. The park is alluded to as "the people's picnic resort." On the fourth page is a list of attractions, the inside pages being given over to a general description of the park.

The Youngstown (O.) Park & Falls Street Railway Co. issue a novel, as well as attractive 20-page booklet pertaining to Idora and Mill Creek Parks, which were described in the "Review" for July 1902. Full page half-tone illustrations tell the story, while opposite each picture is an appropriate poetical reference to the scene depicted, the selections being chosen from the writings of Longfellow, Whittier, Scott and others prominent in the world of letters. Altogether, the souvenir is one to be valued as a keepsake.

The Anniston (Ala.) Electric & Gas Co. has kept up with the march of progress and has a completely equipped high-class recreation resort known as Oxford Lake Park, reached by electric car service every half hour the year round to and from Anniston and Oxford. The company has set forth the meritorious features of the park in a 12-page pamphlet, which contains, in addition to half-tone views of the park, illustrations of the more striking features of recent agricultural fairs, usually held each year at the lake. The company provides free to its patrons swings, seats, lunch tables, a tennis court, croquet ground, ball ground and large dance pavilions, and it charges a small fee for boats, bathing, bowling, merry-go-rounds, mystic swing, refreshments and vaudeville entertainments.

The Syracuse Rapid Transit Railway Co. employs a variety of handbills, flyers, program and placard advertising for Fellows Park, Lake Park and Rockwell Springs, which were described in the "Review" for February, 1903. At Fellows Park the Valley Theater, where light and comic operas are performed by a stock company, is located. Mr. H. S. Daniels is the manager. Souvenir programs are frequently used to advertise the Valley Theater, while announcements of both parks are always to be found in the Syracuse Weekly Amusement Guide. On the large placards used for outdoor billing of the theater attractions it is announced that round-trip tickets, including admission, may be obtained of the conductors for 25 cents. Sometimes a placard announces, simply, "Fireworks, Valley, Tonight."

Winfield, Kan., boasts some very attractive parks, the chief being Island Park, the home of the Winfield Chatauquan Assembly. Pastime Park, five miles above Winfield on the Walnut River, is very popular, while the Fair Grounds and the Astronomical Observatory property are visited by large numbers, all of which creates traffic for the Union Street Railway & Transfer Co. The souvenir edition of the Winfield Courier, published in March, 1901, described and illustrated the parks interestingly. A favorite mode of reaching Pastime Park is by steamer, and circulars are employed to advertise the excursions to this resort, the round trip being 25 cents. The facilities of the park are free to passengers. There are swings, merry-go-rounds, croquet grounds and other diversions there.

The Port town (Pa.) Passenger Railway Co. owns and operates Saratoga Park, 3 1/2 miles from the center of the city. It covers 40 acres and included within the park limits is a large lake with an

land in it. At night the lake and island are illuminated by electric light. There is an auditorium with a seating capacity of 1,000, where refined vaudeville, exclusive of monologues, is free after noon and evening. There are two waxed floors for dancing. Other attractions are naphtha launches, row boats, toboggan, merry-go-round, shooting gallery, etc. Adjacent to the park is a camp field, where military and similar organizations muster. No liquor is sold on the grounds. The park is managed by Mr. Samuel H. Fridy. One of the preferred methods of advertising the park is by illustrated booklets, handsomely got up, with the main features alluringly described. Special inducements are offered to excursionists and picnic parties, chiefly in the form of commissions allowed upon the tickets purchased for transportation and also upon the receipts of the toboggan, merry-go-round and boats.

The Jamestown (N. Y.) Street Railway Co. finds Celeron Park on Lake Chataqua a valuable resource, it often requiring 15 to 20 extra cars to accommodate the traffic. The park is $2\frac{1}{4}$ miles from Jamestown and is operated by the Celeron Amusement Co., lessee, Mr. George E. Maltby, superintendent of the Jamestown Street Railway Co., being general manager. Briefly, the outdoor attractions are boating, fishing, swimming, balloon ascensions, live wire acts, phoenix wheel, fireworks, base ball, dog and cat shows, electric fountain and pole, searchlight and hand concerts afternoon and evening. Dancing is popular. There is an exhibit of manufactured articles in the auditorium, and there are a pretty theater that seats 2,000, at which vaudeville reigns with a change of bill each week, a convention hall seating 8,500 persons and a zoological garden. Chataqua Lake and its attractions are advertised by the Lake Shore & Michigan Southern Ry., the Erie and other railroads. The park itself is advertised by the Chataqua Steamboat Co., in connection with the street railway company, usually by means of circulars illustrated by large half-tone cuts, some of the illustrations being 5 ft. x 10 ft. A 16-page newspaper called Summer Tide is published to illustrate Chataqua Lake and in it the railway company has an advertisement extending across the top halves of the two inside folios. The Lake Shore & Michigan Southern Ry. also issues a 50-page booklet, handsomely illustrated, in which Celeron Park is given generous space.

The Pomona Pavilion and picnic grounds at Fruitport, Mich., constitute a popular resort owned and operated by the Grand Rapids, Grand Haven & Muskegon Railway Co., under the supervision of Mr. Thomas L. Hackett, soliciting freight and passenger agent for the company. The pavilion is located at the head of Spring Lake, a very pretty body of water about seven miles long, emptying into the Grand River. It is an attractive place for picnics and is well patronized, being 26 miles from Grand Rapids, 8 miles from Grand Haven and 7 miles from Muskegon. The picnic and base ball grounds and pavilion are free. There are music afternoon and evening, dancing every evening, except Sunday, and restaurant, and boating facilities. This season several additional attractions are contemplated, such as a merry-go-round, electric fountain, etc. Various methods of advertising the park are resorted to. For instance, when a picnic of any size is planned a folder is issued giving full particulars concerning the interurban service, time table of the company's steamboat "Ottawa," regulations of the resort and other general information. The company also issues time table folders or leaflets, for both the third rail and interurban systems between Grand Rapids, Fruitport, Grand Haven, Muskegon, Spring Lake, Muskegon Lake and Lake Michigan, each time table containing a map of the line, together with half-tone illustrations of the Pomona Pavilion and the base ball grounds. The Grand Rapids Herald issues artistic advertising matter frequently, in which space is always taken by the railway company for an illustrated writeup of its outing resorts. Incidentally, the advertising department issues a neat little folder devoted to its freight and express service, which has attained large proportions.

In an exceptionally artistic publication entitled, "Seattle Street Railways; How to Use Them," the Seattle Electric Co. embodies descriptions of Madison, Leschi and Madrona Parks, all owned and operated by the company. These parks are located 3.62 miles, 2.22 miles and 3.19 miles, respectively, from the center of the city and are all on the shore of Lake Washington. The class of entertainment that has proved most remunerative are afternoon and evening band concerts. A small zoo at Leschi Park is popular, also.

Small lake steamers run between the parks. Madison Park has a pavilion where concerts are given by one of Seattle's best orchestras summer evenings. Madrona Park is a favorite picnic and outing spot for private parties and children. It is a small natural park and includes such attractions as swings, boating and bathing facilities, rustic seats and summer houses, on the bluff. The illustrations used in the advertising matter are tinted, and red, green and black ink are used for the printed matter, the body type being red.

The Geneva, Waterloo, Seneca Falls & Cayuga Lake Traction Co., of Seneca Falls, N. Y., owns and operates Cayuga Lake Park, three miles from the center of the city. It is superintended by Mr. W. C. Gray. It has an open-air theater at which high-class vaudeville is given, admission being free to patrons of the cars. Balloon ascensions, fireworks and illumination of the grounds serve to draw large crowds. There are merry-go-rounds and other attractions found at outdoor resorts. The company advertises extensively, one of the most profitable methods being the issuance of handsome booklets and folders replete with half-tone illustrations calculated to show that this is the finest excursion resort in central New York. It also resorts to striking circulars, printed in blue, to announce the vaudeville program. Conductors issue tickets for the performance after 6 p. m.

The Marlboro & Westboro (Mass.) Street Railway Co. has a very pretty resort known as Lake Chauncey Park, which is sought by churches and societies as a picnic resort, and attracts large crowds of individuals as well. It is two miles from Westboro. The directors of the company manage the park, leasing privileges to Mr. U. B. Long. Vaudeville entertainments are given in a theater that has a seating capacity of 2,000 and there is a well-patronized dance hall. Boating and fishing are favorite pastimes, too, and on Sundays band concerts are very popular. The company issues a souvenir book depicting by means of half-tones the beauties of the park. It is very attractively arranged and printed, and is well filled with advertising. The name "Chauncey" was given to the lake and park in honor of Dr. Charles Chauncey, the second president of Harvard College.

Willoughbeach Park, a strictly temperance resort at Willoughby, O., 17 miles from Cleveland, is owned and operated by the Cleveland, Painesville & Eastern Railroad Co., with Mr. G. E. Bender as manager. The company publishes a booklet in which the features of the resort are attractively, yet briefly, described, tinted illustrations conveying the ideas better than words. The park is especially designed for outings of Sunday schools, lodges and societies. It covers 25 acres of land and its natural beauties are enhanced by rustic bridges, arbors and tables. There are swings and seats, a new pavilion and dance hall with dining hall connected, a fine beach, good boating and bathing, merry-go-round, baseball field and other innocent amusement features. Sunday and holiday band concerts are also a feature.

The Pacific Electric Railway Co., of Los Angeles, Cal., issues an attractive pamphlet descriptive of a trip from Los Angeles over its various lines to the points of interest and attraction touched by the system. These include the San Gabriel Valley, Pasadena, Rubio Canyon, Echo Mountain, the Mt. Lowe observatory, the Alpine Tavern, summit of Mt. Lowe, San Gabriel Mission, Long Beach, Dominguez Rancho, and other places dear to lovers of the picturesque and sentimental. The little book is artistically arranged and ornamented by numerous original sketches of the subjects treated.

Two effective advertising publications are issued by the Boston Suburban Electric Companies and the Lexington & Boston Street Railway Co., the latter road being controlled by the former. "The Route of the Minute Men April 19, 1775," is the title of the booklet issued by the Lexington & Boston Company. It describes Lexington, Concord, Bedford and Lowell, as seen from electric cars, and is replete with half-tone illustrations of parks, monuments and mementoes of Revolutionary fame. "Trolley Exploring Trips" is an illustrated booklet describing 25 routes on the consolidated Newton lines, part of the Boston Suburban Electric Companies system, covering 83 miles of the most picturesque scenery in Massachusetts. Norumbega Park, described in the "Review" for March, 1903, is one of the resorts prominently mentioned.

The Mt. Vernon (O.) Electric Railway Co. uses posters and souvenir books to advertise its Lake Hiawatha Park, described elsewhere in this number of the "Review." The style of poster preferred is a large colored lithograph showing a bird's eye view of the

central portion of the park, including the lake, summer cottages, pavilions, boat and bath houses, etc. The souvenir issued by the company leaves the description for the most part to the half-tone illustrations, "which speak more praise than the pen can describe."

DESCRIPTIONS OF PARKS.

MT. VERNON, O.

The Mt. Vernon Electric Railway Co. owns and operates Lake Hiawatha Park, an exceptionally attractive resort covering 50 acres, in the center of which is the lake, eight acres in area, which gives it its name. Mr. E. T. Selig is the manager. The park is about three miles from the center of the city and is the mecca not only of multitudes of transients, but is also the summer home of a large colony

species. An auditorium with a seating capacity of 1,500 people is popular. It is a brown stone structure and is lighted by electricity, as are the grounds and other buildings. At the dance hall an orchestra is in attendance at all hours. There are baseball and croquet grounds, tennis courts, a half-mile track for autos, bicycles and horses, and numerous other amusement devices, not forgetting a merry-go-round and a pony livery stable for the children.

Many important conventions and public gatherings are held at the park, notably, the Ohio State Baptist Assembly, which lasts 10 days, and which brings together 1,000 or more campers, or "tenters" each year; the Cleveland City Guards, who annually muster there for 10 days; the State Sunday School Union, 1,000 members, who also camp there for 10 days each summer; the County Fair, which was started in 1901, is likewise held there annually.

The park has telephone and telegraphic connection with the outside



BIRD'S EYE VIEW OF LAKE HIAWATHA PARK, MT. VERNON, O.

for whose use the company has erected 35 cottages in the finest location in the park. Many school teachers spend their vacation there. The Hiawatha cottages, as they are called, are furnished ready for occupancy, excepting the bed linen. Each bears a charming Indian name. The terms of rental are moderate. The tenants may cook their own meals, if desired, but there are two public eating places in the park, the regular dining hall presided over by a chef, where boarders may secure special rates on the American plan, and the dairy kitchen, or lunch room, which is on the European plan. The drinking fountains on the grounds are supplied from large mineral springs. No intoxicants are sold.

Lake Hiawatha is fed by springs and inexhaustible wells, from which the water is pumped by electricity. The lake abounds in black bass and sun fish. There is a handsome boat house and near by a bath house containing 20 apartments. Expert swimming attendants of both sexes are at all times present. A water toboggan is one of the amusements. There is also a bowling alley conducted by an expert. The zoo is a source of pleasure, it contains wild animals of many

world and there are two free mail deliveries daily. Outdoor entertainments are one of the features of the park, one of the most popular forms being concerts by Innis' Band, or other organizations of note. The park is an ideal spot for picnics and lodge outings and is much in demand for that purpose.

OTTUMWA, IA.

The Ottumwa Traction & Light Co. expects to operate a new public park this season, for which certain improvements were made last year, it being the company's first venture in the park line. It has not been decided to date whether regular attractions will be run or not.

UTICA, N. Y.

The Utica & Mohawk Valley Railway Co. owns and operates two parks, Summit Park, 7 miles out, and Utica Park, 2 miles from the center of the city. Mr. A. E. Lunn, Jr., is manager of both parks and

at Summit Park has the assistance of Mr. S. N. Baker, superintendent. At this park which contains 42 acres, there is a theater with a seating capacity of 1,200, and dancing, boating, swings, merry-go-round and other park features are provided. Utica Park embraces 82 acres, including a fine grove. Dancing is the most popular amusement. There are swings, etc., for those who prefer.

MONTGOMERY, ALA.

The Montgomery Traction Co. has planned some excellent attractions for this summer at Pickett Springs, where two very fine theaters



VIEW OF LAKE SHOWING BOAT HOUSE, BATH HOUSE AND TOBOGGAN SLIDE, LAKE HIAWATHA PARK, MT. VERNON, O.

have been erected, one for white people and one for negroes. Mr. J. H. Curtis, an old showman, has been retained to get together a first class stock company to present popular plays with vaudeville between the acts. A cafe is another of the attractions proposed.

NORTH ADAMS, MASS.

The Hoosac Valley Street Railway Co. recently purchased Hoosac Valley Park, located between Adams and North Adams, together with the big Moody farm. The land is easily accessible. It was formerly a wild woody stretch of side hill, but by the expenditure of quite a sum it has been made very desirable for an outing place. The com-



PONY STABLE, LAKE HIAWATHA PARK, MT. VERNON, O.

pany will operate it this summer under the direction of a competent manager.

WINONA, MINN.

The Winona Railway & Light Co. owns and operates Bluff Side Park, two miles from the center of the city. It has no theater, but moving pictures, band concerts and the like serve admirably as attractions, all being under the direction of Mr. S. B. Livermore.

PARKERSBURG, W. VA.

Terrapin Park is the mecca of many thousand patrons of the Parkersburg-Marietta & Interurban Railway Co. It is three miles

out of the city and is operated by the company. Besides a theater with a seating capacity of 1,000, in which drama and vaudeville combined are presented, there are scenic railway and pavilions for dancing, refreshments, etc.

WABASH, IND.

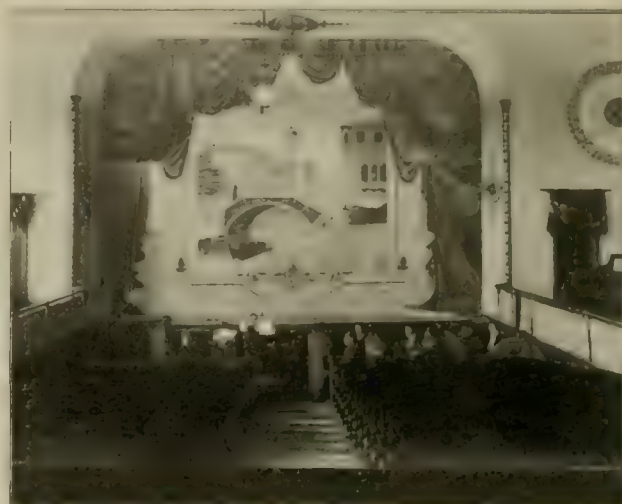
The Wabash River Traction Co. owns and operates Boyd Park, located 6¾ miles from the center of the city, and 8 miles from Peru, Ind., and the attendance is large at all times during the season. One of the leading attractions is a theater which seats 1,000 people. Vaudeville is the prevailing form of entertainment.

SALT LAKE CITY, UTAH.

The Consolidated Railway & Power Co. has a valuable property in Calder Park, situate six miles from the center of the city, which embodies a race track and excellent facilities for boating, dancing and other forms of outdoor amusement, together with a theater with a seating capacity of 200 in which vaudeville entertainments are given. The park was leased last season to Morris Levy and the company expects to lease it again this season.

FREDERICK, MD.

In Braddock Heights the Frederick & Middletown Railway Co. has a resort of unusual interest and one that has proven a very valuable



AUDITORIUM AT LAKE HIAWATHA PARK, MT. VERNON, O.

adjunct. It is famed for its height and is an excellent viewpoint, being 1,200 ft. above tidewater, and from the observatory can be seen four states and more battlefields than from any other point in the United States, according to Mr. George W. Smith, president, and manager both of the road and park. It is five miles from the center of the city and is resorted to by picnic parties a great deal. Dances are held there twice a week regularly and vaudeville, burlesque and moving picture exhibitions are given frequently.

PUTNAM, CONN.

The Worcester & Connecticut Eastern Railway Co. has a delightful resort in Wildwood Park, 4½ miles out, just half way to Danielson. There are row boats, launches, merry-go-rounds, photograph galleries a dance hall and a refreshment pavilion, and on special occasions balloon ascensions and band concerts are added. No intoxicants are sold. There is a theater that seats 1,250 persons, and the form of attraction preferred is either vaudeville or abridged light opera. The park is owned and operated by the company and last year was managed by Mr. L. R. Brown.

DURANGO, COL.

The chief pleasure resort on the lines of the Durango Railway & Realty Co. is known as The Fair Grounds, situated 1 mile from the postoffice, operated by the Colorado-New Mexico Fair Association,

lessee. The street railway company has purchased a tract about two miles out and contemplates establishing a pleasure park there.

SIOUX CITY, IA.

The Sioux City Traction Co. has a very popular resort called Riverside Park, about four miles from the center of the city, at which the principal forms of entertainment are embodied in base ball, band concerts and a theater that seats 800 persons. The park is operated by the company in the name of the Riverside Park Improvement Co., and its management devolves upon Mr. E. L. Kirk.

OTTAWA, CAN.

Britania-on-the-Bay is the attractive name of the principal outing resort owned by the Ottawa Electric Railway Co., seven miles from the city. It is managed by the company and among its chief features are a bathing beach and a pier that extends 1,050 ft. into the bay, with dressing rooms attached and a swimming instructor in attendance. There is a pavilion for ladies containing dressing rooms and all conveniences, with a maid in attendance. There is also a good refectory. Band concerts are given in the evening. The company also owns and operates Rockliffe Park, $2\frac{1}{2}$ miles from the center of the city, noted mainly for its beautiful drives and its boating and swimming facilities.

REDLANDS, CAL.

The Redlands Street Railway Co. owns 40 acres of land which it will eventually improve and lay out as a park, according to Mr. C. W. A. Cartlidge, the vice-president, but as yet there has been nothing done except the planting of a few hundred trees.

PAINT.

An interesting paper on the composition and use of various kinds of paint was read by Mr. Houston Lowe at the March meeting of the Western Railway Club. The author stated that oil paint, as made and used today, was based upon the theory that the solids are coefficient with the liquids in producing best materials and the secret, if there be any, lies in the determination of the amount and kind of each needed in the mixture to secure the best results. All paints are defined as a close union of solids or pigment and liquids or binder. The inorganic, or solid matter in a finely divided state is mixed with the organic or liquid matter and they are linked together chemically or mechanically. Ordinary mechanical mixtures in which the pigments and liquids have little affinity for each other or in which the powders are feebly suspended in the liquids scarcely deserve the name of paint.

The essentials of a good structural oil paint are given as follows: It must work properly; it must dry fast enough; it must wear well; it must produce a satisfactory appearance and it must exclude moisture from the material it covers. In addition to these essentials the cost must also be considered. Wood usually contains water, extractives, ligno-cellulose and mineral matter, the first two being enemies of paint. An oil paint to preserve or protect must be repellant of water, for water and sap cause the decomposition of wood. If the paint is composed of hydrofuge material one cannot expect it to stick to a damp surface. Most of the complaints of paint spotting, cracking, crawling, wrinkling and blistering on wood may be attributed to water, sap, soot or grease under it. Some parts of a board will suck or pull the liquid out of an oil paint leaving more or less of the dry pigment on the surface, while other parts less absorbent will support the paint so that it will give the desired appearance. The painter, therefore, must study the things to which paint is applied and the method of applying it.

In regard to the influence of various pigments and adulterations on the durability of paint the author stated that pigments used in structural oil paints are of two general classes, namely: those that react more or less with the oil and those that have no chemical action with the oil. The former class produces the quicker drying and the less durable paint and the latter the slower drying and more durable coatings. Pigments are probably used in oil paints

for the following purpose: To color or better the appearance of surfaces; to permit the application of more oil than can be accomplished by the use of oil alone; to protect the oil mechanically; to hasten the hardening of the oil and to increase the thickness of the covering layer. Oil applied to a smooth, non-absorbent, vertical surface runs off until it reaches a certain thickness. After the layer has dried it forms a film so thin that it is difficult to measure it with a micrometer gage. If the pigment is added to the oil the result is a thicker layer. Moreover, with any given pigment the more finely it is divided the thicker will be a layer formed with a given proportion by weight to the oil. Presupposing the use of good paint, one bottoming coat and three subsequent coatings laid on at suitable intervals will be required to produce a layer of oil paint of sufficient thickness on iron to keep moisture away from the metal and to protect the latter from rust. The problem of wear seems to be to determine what materials should be taken as pigments and in what state of division they must be, so that by their power of adhesion to the oil they will secure coats of the greatest thickness. In a layer of paint that has just dried and hardened each little particle must be veneered with a film of dried oil. When this veneer on the outer surface of the layer has worn away through atmospheric influences the particles of pigment exposed to these influences will shield and protect the oil or binder, covering the particles of pigment underneath. It may therefore be concluded that any pigment that would unite with the binder and that is unaffected by the agencies that affect dried oil will prolong the life of the paint by reason of the mechanical protection that it gives to it. Pigments that have no chemical action upon the binder produce the most desirable paints as far as durability is concerned, but if quick drying is wanted and it is desired to avoid the use of volatile substances then it is apparent why pigments are used to assist in the hardening of the oil. Pigments like white lead and red lead react with oil. The former contains quite an amount of constituent water and saponifies the oil and therefore a white lead paint works well, dries well and decomposes somewhat rapidly. The action of red lead is different, as this is anhydrous and produces a more insoluble soap from oil than white lead; its characteristics are rather those of plaster than of soap. A little red lead or white lead added to pigments like graphite, lamp black, oxide of iron, etc., always makes them not only dry better but work better and under ordinary methods of painting, wear better.

The author considers that an adulteration of the pigment is anything that lessens its ability to perform the essential requirements as a pigment. For example, suppose black paint is used with lamp black as coloring matter. If all lamp black were used as the pigment, we would have a paint that would dry very slowly, and further, such a paint would be apt to secure a film on the surface to which it was applied so thin that it would have but little value as a protective covering. If, when a black paint is wanted we take from 15 to 20 per cent of lamp black, a small percentage of red lead for drying purposes and a large percentage of some inert powder such as gypsum, silica, etc., for mechanical protection, we secure with linseed oil a paint of much higher efficiency. The question naturally arises, are the red lead and inert substances that are added to the lamp black adulterations or not? The same principle holds with oxide of iron. There is no use in making a paint from this alone; such a paint would prove less efficient than one in which the pigment has been largely combined with some inert powder.

There are three constants which accompany every color: hue, luminosity and purity. Many pigments are claimed to be amorphous; the author, however, is of the opinion that all pigments good for use in paint making have a defined crystalline structure. The influence of grinding upon any given pigment can be determined by rubbing a small portion of it in an agate mortar with a pestle. The influence of grinding on many pigments is to lighten their color and, as a rule, all hard stable compounds are made lighter by grinding.

Linseed oil, after centuries of use, still holds its own as the best oil for painters' use where durability is the main consideration. A

layer of linseed oil upon a non-absorbent surface while fresh and soft changes rapidly. The most common cause of difficulty in drying paint is change of temperature or change in the amount of moisture held in the air. The drying oil changes from a liquid, first into a sort of jelly, then to a solid rubber-like substance which not only holds itself together, but also clings to any substance on which it has formed. It takes oxygen from the air and gives off carbon di-oxide and water. This process has been called the breathing of the drying oils. The rubber-like substance is called linoxyn. This is a solid which is insoluble in many liquids and is much less soluble in any solvent than linseed oil. The author has had specimens of it in dilute acid and weak alkaline solutions for months, also in alcohol, chloroform, acetone, etc., in which it shows but slight decomposition or solution. These experiments indicate its power of resistance to atmospheric influences.

Modern railway conditions demand rapidly drying paints. Linoxyn is not quickly formed without light, good ventilation, and moderate artificial heat. Bridge painters, house painters, and freight car painters still suffer from having to do their work under variable conditions out of doors, and these conditions have created in late years an enormous demand for quick drying thinners to take the place of linseed oil. These thinners, or adulterations, if they may be so considered, consist largely of volatile matter. They dry almost wholly by evaporation, not like oil by oxidation. Some of them, if used in reasonable proportions, insure much better results for the painter than he can get from the use of linseed oil and the class of Japans usually furnished. These thinning Japans, etc., cannot be condemned as long as painters must apply their material to surfaces that are not in fit condition to receive a good oil paint, and under atmospheric conditions that will not permit an oil paint to dry fast enough.

None of the linseed oil is perfectly pure. Impurities like water and albumen are readily detected, but impurities like the oil extracted from the seed of weeds generally associated with the flax plant can hardly be detected. Mineral or resin oils added to linseed are readily detected by the "sense impressions" they make upon one familiar with good oil. Further, they may be determined by chemical tests, and such adulterations are not common. Other adulterations sometimes added when oil is high in price that are difficult to detect are corn oil, cotton seed oil and fish oil. When linseed oil is cheap the small gain arising from the use of these adulterants does not compensate for the risk the seller runs in introducing them into his oil. The author also considered the influence of gums on varnish. Resins are the ingredients which impart hardness and brilliance to varnishes. The harder they are the longer will the varnishes made from them hold their luster under any conditions of exposure. "Long-oil" varnishes are products in which it is attempted to make linseed oil that has been more or less resinified by heat and other treatment take the place of fossil gum. The "long-oil" varnishes, while they wear fairly and work well, lack bearing-up qualities and soon lose their luster. The principle upon which resins are used in varnish is somewhat analogous to the principle on which pigments are used in paints. Oil gives elasticity, or toughness to either paint or varnish and pigments or resin in a similar way give hardness or firmness. It may therefore be concluded that if the resin used in making a varnish has greater power to resist atmospheric influences and the action of the sun's rays than linoxyn it will prolong the life of the varnish; otherwise it will shorten it.

In regard to the desirability of specifications for paint the author believes that in general it is easier to secure satisfactory material by purchasing from sample than by purchasing under specifications, and it may be safely presumed that professional paint makers having a reputation to sustain know more about determining the properties of paint than the chemists employed by railroads and other purchasers. The quality of paint is fully as dependent upon its physics as it is upon its chemistry, and the author does not believe that it will ever be possible to design satisfactory specifications for painters' material until chemists are willing to co-operate with competent painters.

In order to foretell the probable result to be obtained from the use of any paint one should know the following things about it: Its history and mode of preparation, its physical properties and its chemical properties. Pieces of dry, polished glass afford the most accurate means of observing the properties of paint. A test of paint should include its working properties, its drying properties and its durability, as well as its spreading and hiding power precipitation and adherence.

A CONVENIENT PIT TABLE.

BY JOSEPH H. SMITH

The accompanying illustration shows a serviceable pit table which can be easily and cheaply constructed. It consists of a No. 2 Barrett jack and a small hand car designed to run on the bottom of the pit. To make this table a new rack, 5-ft. long can be secured of the builders of the jack, this rack being without head or foot. This is used in place of the short rack with which the jack is ordinarily supplied.

Two pairs of small wide tread wheels and axles are used upon which a wooden platform is built. The bottom of the pit is bolted



A SERVICEABLE PIT TABLE.

to this platform, a hole being made in the center through which the rack can work. A cast-iron plate, 6-in. square and $1\frac{1}{2}$ -in. thick, will answer for the head. A hole one inch deep should be bored in the center of this head to fit the end of the rack. Upon this head is bolted an oak block 12-in. square by 2-in. thick, which can be used for carrying armatures or motors. Bolts should be run sideways through this block to prevent it from splitting. For removing wheels a similar table may be used, except that it should be 20-in. long and 6-in. wide, and on the ends of this piece should be bolted a V-shaped block to take the axle. It is necessary to cut a hole in the floor of the pits for the rack to run into when the jack is lowered down so as to clear the bottom of the truck. It is advisable to select a place in the pit where most of the motor and wheel work is done to locate this jack, as it cannot be moved very far on account of the hole required in the floor. The device, however, will be found very serviceable as one man can raise or lower the heaviest motor with ease in a very short space of time.

BROOKLYN RAPID TRANSIT TO HANDLE FREIGHT.

The Brooklyn Rapid Transit Co. has placed orders for equipment for the handling of not only express matter but heavy freight, and has entered into tentative contracts with manufacturing plants and business houses to take advantage of this freight service when inaugurated. This traffic will be conducted largely at night.

NEW TRANSFER STATION AT NASHVILLE, TENN.

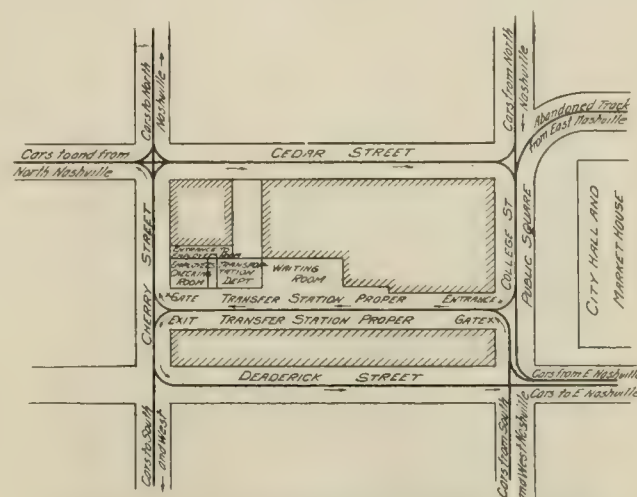
A new transfer station has recently been completed in Nashville, Tenn., which forms a terminal for all the city lines as well as all the suburban lines entering the city, and in which transfers from one division to any other division of the company's lines are made, thereby doing away with transfer tickets and their attendant troubles. There are but comparatively few transfer stations of this character in this country probably for the reason that to effect transfers in this way it is necessary that all lines in a city have some common meeting point, a condition not usually existing. One of these transfer stations is in Denver and others are at present building in Cincinnati, and Los Angeles. The first transfer station in Nashville was established about 12 years ago and was a small building accommodating only three cars at once. This was abolished when the Hambleton syndicate, of Baltimore, consolidated the different street car companies of Nashville, and the usual method of transferring at street corners was inaugurated.

Owing to a strong public demand the new transfer station illustrated herewith was recently built and the former system of transferring was again inaugurated. The new station is situated opposite the public square and runs through to Cherry St., between Deaderick and Cedar Sts. It is 365 ft. long by 32 ft. in width, the entrance being on the public square. One of the incidental benefits of the new station is the shortening of the schedules on 17 out of the 20 divisions of the company's lines.

The station is one block in length and passengers are permitted to change cars anywhere within this block. The waiting room is situated in an offset 52 x 90 ft. and all cars stop at the waiting room to discharge and take on passengers except during the rush hours, when the entire length of the station is used for this purpose. Cars frequently pass through the station with a delay of only 10 or 12 seconds.

The waiting room is provided with seats, and a row of benches also extends along the walls the entire length of the station. A public telephone is also provided and there is a fruit, candy, soda wa-

pine. The ceiling is paneled, each panel containing an arc light and an electric fan. The wall opposite the waiting room is divided by brick columns into panels which are utilized for advertising purposes, the income from advertising alone being about \$3,000 per annum and the other concessions amounting to about \$2,000. The roof is supported by iron trusses and has three large skylights. Ad-



GROUND PLAN, NASHVILLE TRANSFER STATION.

joining the waiting room is a checking room where the conductors deposit their records after each trip. Next to this is the waiting room for the conductors reached by an outside entrance from Cherry St. as shown by the accompanying diagram. The employees' room has been provided with individual lockers for the men and is substantially, although plainly furnished. The station also contains offices for the transportation department and on the second floor are the local offices of Ford, Bacon & Davis, engineers in



INTERIOR OF NASHVILLE TRANSFER STATION.

ter and a public telephone. The station is built of 60-ft. rail slightly elevated and the street surface is paved in such a way as to be level at one time. It is provided with a steam heating plant and a large number of electric fans for ventilation.

The waiting room is reached by a single set of large windows in the northern wall. The ceiling and walls are tinted a light shade and the room is surrounded by a deep wainscoting of natural

charge of the Nashville railway system. The average number of people passing through the station daily is 18,000 except Sunday and holidays, when it sometimes runs as high as 30,000, and on the fourth of July, last, 40,471.

The street corner system of transfers has also been retained to a certain extent, so that these figures do not, by any means, represent the total transfers daily. The company operates 70 cars on its regular schedule on the 20 divisions and each car makes an

age of 15 trips per day, making the average number of cars passing through the station daily, exclusive of specials, 1,050, or about two cars per minute. Three transfer agents are employed during the day and two at night to ring up the fares of the passengers transferring at the station. The transfer agents ring up the total number of passengers boarding each car on the register, and give the conductor a record of the number on a slip, retaining a duplicate. The conductor uses these slips in making up his returns. Before entering the station each car register is set at zero.

The ground on which this station is built cost \$52,000 and the



TRANSFER STATION EXIT.

building cost \$22,000. The building is located on historic ground once owned by James Robertson, the founder of Nashville. He purchased the entire square July 30, 1784, for £4 and 118 years later the Nashville Ry. paid \$52,000 for about one-fifth of it, showing the ground value to have increased about 13,000 per cent in 118 years, or at the rate of 110 per cent per annum.

An iron plate on the south wall of the station bears the following inscription:

From 1784 to 1807
The site of this Building
Was Owned by
JAMES ROBERTSON,
Founder of Nashville.

ANNOUNCEMENT FOR ACCOUNTANTS' CONVENTION.

Under date of April 25th, H. J. Davies, president, and W. B. Brockway, secretary, of the Street Railway Accountants' Association of America, issued the formal announcement for the seventh annual convention of the association, which is to be held at Saratoga Springs, N. Y., Sept. 2, 3 and 4, 1903, headquarters being at the Grand Union Hotel. The circular continues as follows:

"Following our usual plan, the program is not announced in full at this time, but the completion of present purposes will make a program containing papers to be read which will be strong and interesting. Provision has been made for the interurban railways, and they will be as fully interested as those strictly urban.

"There will be three half-day sessions, the afternoons being assigned to the exhibits and entertainment. This change will be very acceptable, as it serves to break the 'all work—no play' features of the last two or three years.

"Arrangements for railroad rates and the full program will be announced in another circular to be issued about a month before the convention.

"While any time is a good time to join with us, as there is no best time for good work, now is a particularly fortunate time, for the

reason that it gives the benefits of participation in the coming convention. There is something tangible in the discussions of subjects by and with men in your own frame of mind, and the personal contact with them and they with you brings results always. The accountant of an electric railway occupies a peculiar position, in that there is rarely more than one of him in a town, and he always has to get his exchange of personality by visiting or being visited. This convention gathers together accountants from all parts of North America, more than you have time to visit in a year, and then it depends upon yourself how much you absorb.

"An application blank is enclosed for your use. If your company is a member now, get some other company to join. If your company is not a member now, it is a paying investment to fill it out and send it to the secretary.

"New companies will receive sets of the back reports as long as they last, which of itself is a good investment."

STREET RAILWAYS AND THE Y. M. C. A.*

BY T. J. NICHOLLS

Street railroads are most prosperous, and consequently employ more men, where population is most dense, and where population is most dense there we find vice and crime most rampant. I have often said that the street railroads of the country were doing more towards the uplifting of humanity, morally and socially, than any other force in existence, because in the use of the street railroad people are enabled to become more widely separated. The rapidity with which he can be carried from the outskirts of a city to the center, enables the poor man to enjoy more of God's free, pure air, and he is not compelled, as in olden times, to live close to his work, breathing foul air, with his offspring being brought up and nurtured amidst all manner of sinfulness. I believe that facts will bear me out when I say that not less than 75 per cent of the sinfulness of the world is due proportionately to density and to communities such as Five Points in New York City and similar localities in other cities. I am given to understand that in those places the religion of Jesus Christ has very little foothold, and that there are thousands of people who have seldom heard His name, except in the way of blasphemy.

Now it is amidst these people that the street railroad man is compelled to live and work, and therefore it does not require much stretch of imagination to understand why the field is hard and that it is going to require more and harder labor to develop than has been the case with the steam railroad branch. We all know that the steam railroad man is beset by many temptations and hardships, being away from home and friends, but it must not be forgotten that a great portion of his time is spent alone, and furthermore that he has many hours and days of rest that give him an opportunity to attend divine service and renew his moral and spiritual strength.

Street railroads are compelled to operate always—nights, days and Sundays. Sunday, the day that others rest, is the day upon which the street railroad man has to work the hardest, and this he does for his fellow men, enabling those who are so inclined to attend to their religious duties, and others to reach places of pleasure and recreation. I take it that were it not for the supposedly corrupt and sinful street railroad man, but few of our churches in the cities would flourish to any great extent. Even the pastors of many of them are compelled to use the street railways on Sunday, and doubtless but few of them ever think of the fact that it is at the sacrifice to some extent of human souls that they are enabled so to do.

In view of what I have already said and the actual experience of many of you, I beg of you to think kindly of the poor street railroad man. Think of the example that is set him by the public, in his every day communication with them. Think of the many outrages that he has to bear with patience. Think of how he must stand and allow himself to be called a thief, without an opportunity of resenting it except at the risk of being called a blackguard and placed under arrest. Think of how he is daily expected to receive the slap on one cheek and turn the other. Think of how many duties he is required to perform under the most trying circumstances, and yet

*From an address delivered at the conference of the International Young Men's Christian Association, Topeka, Kan., May 1, 1903.

†Vice-president and General Manager Rochester Railway Co., Rochester, N. Y.

be pleasant and affable. Think of how he is to be all things to all people, and never lose his temper. Think of how he is obliged to accept the severe and harsh utterances of an arbitrary public, aimed, whether rightfully or not, against the company for which he is working, and notwithstanding all this to be always gentlemanly, attentive and polite to all, and to keep it up every day in the year with hardly an opportunity of receiving a kind word or thought for his good. When you think of all these things seriously, I believe that you will agree with me that there is a great field open for the street railway branch of the Y. M. C. A., and I know that you will give it the benefit of your best thought, your best work and prayers, that it may be put into the hearts of those in charge of street railways to see that a branch is organized in their midst, and the larger the city, let me say, the more necessary is the work.

To such people as myself and those I represent the Y. M. C. A. is pre-eminently qualified and organized for our benefit. Through its officers and active members it has an opportunity of entering into the lives of all classes and conditions of men,—college students, colored men, Indians, soldiers, sailors, railroad men, and in fact men of every color and vocation of life, with all of whom it has so far had an uninterrupted success, and why not the same success attend the work amongst our street railroad men?

In the second place let me say that the Y. M. C. A., with its complete, thoroughly tried and efficient methods of work, with its international and state committees and its local associations,—all of which add to the strength of any point where this or similar work may be instituted,—is particularly qualified for work amongst our class of people.

Again, this wonderful institution, whose organization I believe is second to none in the world, save perhaps the church catholic, is constantly making a specialty of hunting up men for its secretarieships, training and equipping them for the noble work by teaching them to approach the veriest sinner in somewhat his own language, and still doing effective work with and for him in the direction of increasing his moral responsibility if not his religion. It must also not be forgotten that the history of this association has thoroughly demonstrated the fact that while it is distinctively a religious organization it is not, as I have said before, sectarian, having within its membership men of widely divergent thought and creed, and in this connection it may be well to state that I am informed that more than half the men belonging to the Y. M. C. A. are not members of any church, either protestant or catholic, and that amongst those who have church affiliation more members are connected with the catholic church than any two protestant denominations.

Now, as to our work in Rochester. Early in the spring of 1902 the street railway company which I represent decided, through its board of directors, that we should make an attempt to attract our motormen and conductors, when not at work, from idleness, liquor, gambling, etc. Let me explain, for the benefit of many of my hearers who probably will not understand why such conditions should exist, that in addition to our regular men, who operate our regular cars, we are obliged to keep on hand at our car stations enough men to man cars for any occasion and at any time. Men are often taken sick or are called away on account of sickness, which also makes this extra force necessary, but probably the greatest reason is the changeableness of the weather, which can be depended upon for but a few hours, so that we are often obliged on account of rain or storm to put into operation fifty per cent more cars within the space of 20 or 30 minutes, and if we do not have the men on hand to take charge of these cars, very bad service would result. Thus it is absolutely necessary in the street railway business to have, during the hours of service, enough men in waiting to meet almost any emergency, and it is these men that our company sought to attract and amuse. At a very large cost they fitted up handsomely a billiard room, reading room, bath room, bowling alley, etc., our intention being to run the rooms ourselves in an orderly manner but without regard to religion, ethics or high moral instruction.

The city secretary of our Young Men's Christian Association heard of what we were doing and called upon me, setting forth the nature of the methods of his association, and indicating what they were doing amongst steam railroad men, which enabled me to at once grasp the idea of the necessity and probable success of such a work among our own men, but the question was as to how it could be applied, from the fact that street railway men are of somewhat

different temperament and knowledge of human nature to steam railroad men, their duties being vastly more confining, etc. After giving the question due consideration I decided to at least make the attempt, and with the aid of Mr. Starritt, the city secretary, we secured the services of Mr. Montignani, our present secretary (who is here today), and under his administration, with what aid I could give him, we have succeeded in establishing a live, up-to-date and growing branch, with a membership of over 125 men, who have come into the association of their own free will and accord. Religion is not pressed upon them, at the same time they are far enough advanced so that many religious meetings are held. A generally good influence prevails in the rooms, and where at one time could be heard scarcely anything but vile words and blasphemy, now it is very much out of place for the men to say anything of the kind. In fact the whole moral tone of our men has been raised in this way. Furthermore, I am very much pleased to report that out of five or six saloons and loafing places in the neighborhood of our rooms, one has already been compelled to abandon its business as our men were not patronizing it so much. I notice that those remaining are very much milder in their form than they were, and I think it is only a question of time when more of them will go out of business.

I cannot close my remarks without most heartily endorsing the work of the Y. M. C. A. in general, and recommending most earnestly to the attention of managers of street railways the necessity of their joining in this work. From a financial standpoint I am quite sure that it will pay them. We all want sober, moral and religious men, and I know of no better instrumentality to bring this about than this grand association, which is so well equipped for the work, providing the managers of the companies with which it is connected will give it the proper support. I think that we have in Rochester demonstrated the practicability of an institution of this kind, from the fact that we have increased from nothing to 125 members in nine months, and that today we are receiving proportionately more applications for membership than ever before, and the moral standing of our men is at least, conservatively speaking, 50 per cent better than it was nine months ago.

THROUGH LINE FROM CLEVELAND TO COLUMBUS.

The entire property of the Tuscarawas Traction Co., New Philadelphia, O., was sold May 2d to the Tucker-Anthony Co., of Boston, of which P. L. Saltonstall is president. The road is 12 miles long and runs from Canal Dover through New Philadelphia to Uhrichsville. It was constructed in 1896 by the Mandelbaum-Pomeroy interests and has since been under their management, F. T. Pomeroy being president. The control of the line passed to the Tucker-Anthony Co. May 15th. The purchaser assumed the bonded indebtedness amounting to \$250,000 of 5 per cent, 20-year bonds due in 1921, and purchased outright the stock issue of 2,500 shares of a par value of \$100 a share.

The acquisition of the Tuscarawas lines by the Boston syndicate is regarded as another step toward the cross-state line from Cleveland to Columbus. The Tucker-Anthony Co. owns the Canton-Akron line and also has a traffic agreement with the Northern Ohio Traction Co. from Cleveland to Akron. From Canton it has a line to Massillon and from that point to Navarre and New Philadelphia. It has already built out of Columbus as far as Newark and this leaves a constantly diminishing stretch to be constructed between Newark and Uhrichsville.

The Philadelphia & Gray's Ferry Passenger Railway Co. and the Schuylkill River Passenger Railway Co. will be merged into a new company with the same title and officers as the former. There will be 20,000 shares, par \$50, and one share of the new stock will be issued for one of the old Gray's Ferry line, and one for five of the Schuylkill River.

The Wason Co., of Brightwood, Mass., is building a \$15,000 private trolley car for Mr. Wm. B. Plunkett, of Adams, Mass., president of the Berkshire Cotton Co. It will be the first private car owned in the western part of the state and will have handsome appointments. The Hoosac Valley Street Railway Co. will have charge of it and the motorman and conductor will wear distinctive uniforms.

CORRESPONDENCE.

STARTING AND STOPPING CONDENSING ENGINES.

It has been the practice, still in vogue in a great many cases, to start the condenser or vacuum pump and allow a vacuum to form in the low pressure cylinder, and after warming up the engine, to proceed to start upon the vacuum so formed, and in a great number of cases jet condensers are operated by single-acting pumps. It is my belief that no single-acting pump should be used for this purpose, as there is no pump of this description on the market to-day that can be depended upon to run a jet condenser with safety. The best single-acting pumps will stop, apparently without reason, and sometimes very frequently, and a pump that will stop in the event of a vacuum breaker refusing to work, with the engine either stopping or starting, is certain to cause trouble.

A compound engine in starting is a pump of itself until such time as the amount of steam discharged from the low pressure cylinder is sufficient to destroy the vacuum, which is not the case at starting, or still worse, stopping. When installing a plant insist upon a duplex pump as a condenser pump, as a duplex is fairly reliable. Or else have an engine with a balance wheel (if it has two cylinders the cranks should be at an angle of 45°) and the pump piston or pistons on continuations of the rods carrying the steam pistons. With such an appliance the danger is reduced to a minimum.

Now as to vacuum breakers. The best of them are not to be relied upon implicitly. Watch them carefully, overhaul them regularly and cause them to operate daily if possible, after shutting down the engine; eternal vigilance is the price of safety. A belted engine will, in case of steam being shut off, immediately decrease its speed to a very noticeable extent, whereas, a direct connected machine which has been cut out from the switchboard, and is consequently taking only such steam into its high pressure cylinder as is required to maintain the speed is, upon closing the throttle, a pump of enormous capacity as compared to the condenser pump. Further, after closing the throttle of such an engine, especially if now cut out from the condenser, it will run a long time; from two to five minutes. At such a time, if the condenser pump which we will assume is a single-acting one should stop, and I have seen it happen time and again, there is only the vacuum breaker to depend on and a float is hardly to be relied upon, even with the utmost care and attention. On installing a condenser, insist upon two floats or vacuum breakers. I have seen a float in a vacuum breaker, which was examined at night and found to be tight, but upon the following night found to be nearly full of water from some leak developed during the day, and of course in an unsafe condition. This has occurred not once, but several times.

In installing a compound direct connected engine always have the valve that controls the atmospheric exhaust, the valve that shuts the exhaust from the low pressure cylinder, injection valve, steam valve to condenser pump, and drip to receiver so located that they may be at all times conveniently reached by the operating engineer.

Now to start the engine: First, with the low pressure free exhaust valve (so-called), open, and the valve that controls the low pressure exhaust to condenser shut, start the vacuum pump; after it has made a few strokes, open the injection valve the required number of turns, and allow the pump to run slowly while warming and oiling your engine. Second, open the throttle slightly more than is required to warm up, and with the low pressure steam valve shut allow steam to blow through the high pressure cylinder, the valve controlling the drip to receiver being open, until 5 lb. pressure shows upon the receiver gage so as to blow all water or other substance from the receiver; then close the throttle and observe if the pressure immediately falls; if so, the drip is clean. Third, start the engine, gradually increasing the speed until it begins cutting off or is up to speed, as they say, and is exhausting through the free exhaust provided for the purpose. In the meantime the condenser is operating and perhaps 20 in. of vacuum is showing upon the gage. Fourth, look at the pump and see that it is running properly; if all is right, shut the atmospheric valve, which will drop of its own accord generally

as soon as the prop sustaining it is removed. Fifth, open the valve controlling the exhaust to the condenser and after closing the drip from the receiver and just cracking it from its seat (in which position it must be run) and adjusting the steam to the pump and injection water, the engine is ready to connect to the circuit. If there is a steam trap upon the receiver, have also a by-pass with drip valve located therein, so as to be able at all times to ascertain if the receiver is free from accumulations of water; it is a serious matter if the receiver fills with water, and a steam trap is not always to be depended upon.

As to shutting the engine down, after disconnecting it from the switchboard shut the valve controlling the exhaust to condenser, and when the free exhaust valve opens by reason of the vacuum being destroyed fasten it open somehow, shut steam off from the engine and you can attend to your condenser shutting it down at your leisure. The danger point is passed as soon as the free exhaust is open and fastened there.

I am well aware that a great deal has been written on this subject, and I have been somewhat amused at some methods employed as the greatest and most noticeable thing concerning most of them has been the lack of details. Details go to make up the whole and the whole is far from complete if any of the details have been overlooked. They are a most necessary part of any operation and I hope that these few lines, written in a very crude manner, but not lacking in details, may be of use to some one who may be willing to accept another's experience.

J. W. SMALL,

Chief Engineer, Georgetown, Rowley & Ipswich St. Ry.

BUFFALO, DUNKIRK & WESTERN RAILROAD CO.

The Buffalo, Dunkirk & Western Railroad Co., of Buffalo, N. Y., recently formed by the consolidation of the Dunkirk & Point Gratiot Traction Co., of Dunkirk, and the Lake Shore Traction Co., of Westfield, N. Y., will ultimately have Cleveland, O., for its western terminus. At present it is building from Westfield through Chautauqua County to Buffalo. Some of the towns which it will touch between Buffalo and Westfield are: West Seneca, Blasdell, Woodlawn, Bay View, Athol Springs, Hamburg, Wanaka, Lake View, North Evans, Derby, Angola, Farnham, Irving, Silver Creek, Sheridan, Dunkirk, Van Buren, Brocton, Portland. From a careful estimate of the population and the present steam traffic in the section named, it is believed that not less than 3,000 passengers will be carried into Buffalo by trolley every day. The roadbed will be built so as to permit high speed; for a considerable distance it will parallel the Lake Shore railroad. The power arrangements of the road are completed. No coal will be used in generating electricity, as the company bought farms in the gas belt, which is practically on its line, and will sink gas wells. The power house will have a capacity of from 8,000 to 10,000 h. p. to begin with.

One of the features of the new road will be its freight business. It will carry milk, dairy and farm products to Buffalo at a low rate. The plan is to give the farmer-shipper a key to the sheds to be placed at convenient distances along the road. In the sheds he will deposit his goods billed to commission houses. The products will be carried to Buffalo, the commission houses having been notified in the meantime. The road will run through the heart of the Chautauqua grape-belt, where every year an ordinary crop yields a shipment of upward of 14,000 cars. In order to compete as effectively as possible with the steam railroads it has been decided to have an average running time of 35 miles an hour, including stops.

Grading has begun between Fredonia and Brocton and a private right of way has been secured from Silver Creek to Buffalo. Summer resorts will be established at different points on the lake shore. The fare will be about half that of the steam railroads. Branch lines will be built later to important nearby places.

The capital of the new company has been placed at \$3,500,000. Luther Allen, the president, is president of four other electric roads in Ohio, the chief one being the Toledo & Western Railway Co., and is also president of the Bakers' National Bank, of Cleveland. The directors of the Buffalo, Dunkirk & Western are: Luther Allen, J. W. Holcomb, J. E. Lattimer, E. Bingham Allen, Cleveland; Truman G. Avery, Albert J. Meyer, William J. Connors, Clarence M. Bushnell, Buffalo; Frederick Greene, Fredonia.

PAVEMENTS ADJOINING RAILS.

BY DANIEL B. LUTEN, INDIANAPOLIS, IND.

One of the severest tests that can be imposed upon a pavement in actual service, is to subject it to the traffic immediately adjacent to the rails of street railways. The wheels of vehicles crossing the rails diagonally are slewed sidewise by the projecting edge of the rail, producing severe abrasion of the pavement by the tires. Ordinarily a wheel rolling upon a pavement does not abrade the surface except when brakes are applied; its action upon the pavement is rather a series of impacts or blows, more or less severe, depending upon the roughness of the pavement; it is only immediately adjacent to the rails that the wheels of traffic have any abrasive action on the material of the pavement. Along side-bearing rails this action will of course be most pronounced on the outer edge of the rail. And on account of abnormal length of axles of certain types of wagons, traffic will usually be most concentrated along this same outer edge.

That the wear of the pavement is measureably increased at such points is plainly shown by the photograph reproduced in Fig. 4, of

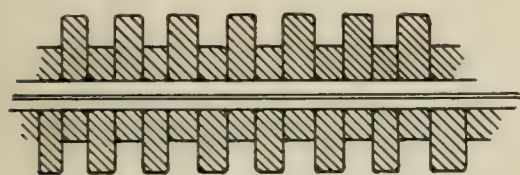


Fig. 1.

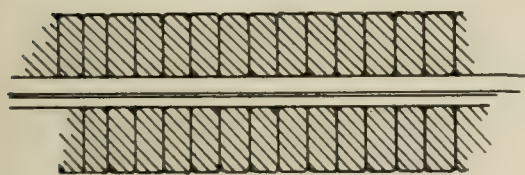


Fig. 2.

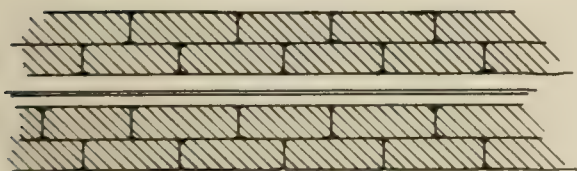


Fig. 3.

the pavement of sheet asphalt on North Pennsylvania St., in Indianapolis, Ind. At numerous points along the outer edges of the rails, the pavement has been worn away and cut through for a width of four or five inches. The design of this pavement was evidently defective in that it did not provide for a harder or more durable material adjacent to the rails to resist the unusual traffic at those points. The fact is coming to be generally accepted that the use of sheet asphalt in close proximity to the rails is to be condemned; if sheet asphalt is to be employed for pavements on such streets, it should be reinforced at the rails by a more durable material; and the material that has come to be commonly accepted as best suited to that purpose is brick.

Stone block has to some extent been employed for the purpose, but on account of its roughness and the impossibility of making a satisfactory junction between stone and asphalt, the wear upon the asphalt adjacent to the stone is almost as severe as upon asphalt adjacent to the rails, and the only effect of lining the rails with stone block is to transfer the line of wear from the edge of the rails to the edge of the stone block. This is well illustrated by the photograph of Fig. 5, of State St., in Grand Rapids, Mich. The stone block in this case was unusually rough, and the destruction of the adjacent pavement is complete. The straight edge shows by its shadow how rough and uneven the surface of the pavement has become. Asphalt block also has been used next to the rails, notably in Fort Wayne, Ind., but lacked the requisite durability.

The use of brick to reinforce the asphalt at the rails has passed through experimental stages to determine the best manner of arranging the brick. It was naturally at first supposed that the most satisfactory arrangement would be to "tooth" the brick into the asphalt as shown in Fig. 1, that is, with whole brick and half brick alternating, with ends against the rail. But it was found



FIG. 4.

that the portions of asphalt lying between the projecting whole brick was soon pounded into depressions and disintegration was commenced that spread rapidly to the adjacent pavement, besides exposing the brick to the blows of the wheels bumping from alternate brick to brick.

In the light of experience, it is not difficult to see why this arrangement of the brick should have proved a failure, and the cause in this case emphasizes the necessity for certain qualities of paving material, and of brick especially. The failure of the pavement along this serrated line of brick is due to lack of uniformity of the material. Asphalt alternates with brick in two inch spaces; the asphalt is softer than the brick, and the latter acts as an obstacle to the wheels, permitting them to drop and pound upon the asphalt, the severity of the blows increasing with the wear; the failure of the softer asphalt in turn reacts upon the harder brick by leaving it exposed to the blows. The line of half brick adjacent to the rails will not be materially injured, but the serrated row of brick and asphalt for the width of a half brick will be worn away. In a similar manner if a hard paving brick were to be imbedded separately and alone in a sheet of asphalt, say transversely to the direction of traffic, and subjected to traffic in both

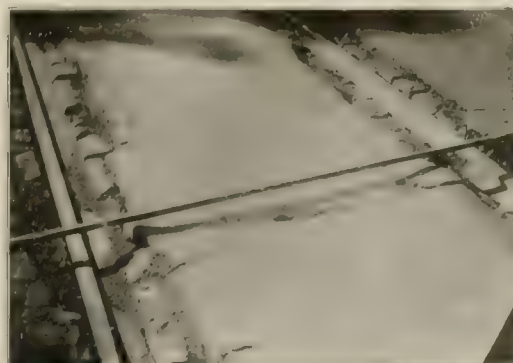


FIG. 5.

direction, depression would soon be pounded in the asphalt on each side of the brick by the wheels dropping from its edge, and in turn the exposed edges of the brick would be worn away by the impact of the wheels, so that in short order a hole would result in the pavement while yet the remaining surface of the pavement would be in its prime.

So in the same way, if a few hard brick are mixed in a shipment

of otherwise uniform brick, they will shorten the life of the resulting pavement, and the same result will follow the use of a large number of softer brick in an otherwise uniform pavement.

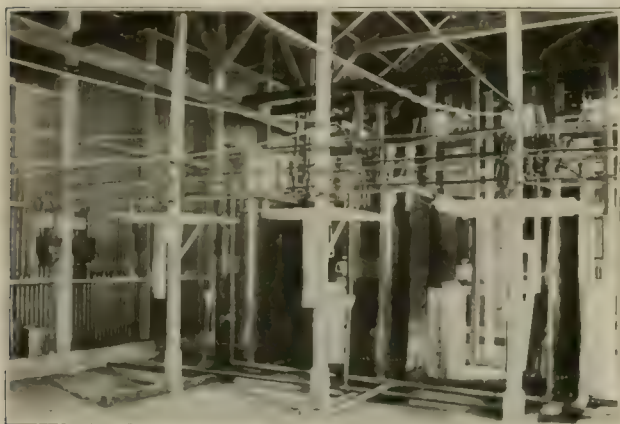
If the entire pavement of the street were laid with brick instead of asphalt, the brick adjoining the rails would then be placed with ends against the rails and wholes and halves alternating, as shown in Fig. 1, exactly the arrangement that results in failure when asphalt composes the body of the pavement; here then might be deemed a favorable opportunity for comparison. If the edge of the asphalt pavement gives way, while that of the brick remains secure, under exactly the same conditions, and such has been demonstrated to be the case, then surely the brick pavement is the more durable. But such a conclusion might be hasty. The asphalt fails because it alternates with a harder material. If the pavement consisted only of asphalt of reasonably uniform composition, and without the brick and rails, it might prove as durable as the brick. But the fact that brick does produce a satisfactory reinforcement for asphalt, next the rails, and resists the traffic there that asphalt is unable to withstand, is sufficient evidence of its greater durability, provided it can be made of as uniform qualities as asphalt. And there is no reason to doubt that it can, if manufacturers will endeavor to secure the greatest uniformity of material for any one shipment.

The arrangement of the brick along the rails, that has received approval through the best practice, is that of Fig. 2, all whole brick arranged side by side with ends against the rail, or that of Fig. 3, consisting of two rows of brick placed parallel with the rail, and breaking joints. In either case wheels slipping along the junction line of the brick and asphalt are easily led up on the brick by the frequent joints, and no serious abrasion results; and the paving material in the line of greatest traffic is uniform. The arrangement of Fig. 2 requires the greater number of brick, but that of Fig. 3 gives the better appearance in the street, presenting a more satisfactory and finished surface.

POWER TRANSMISSION AND DISTRIBUTION IN UTAH.

BY O. A. HONNOLD, DIVISION ENGINEER, UTAH LIGHT & POWER CO.

For about three years the Utah Light & Power Co. has been running three water power stations and two steam stations all in parallel, on its general distribution system. This has been done without any particular complications, and, as has been proved, with very great advantage in the economizing of the water available in



TEMPORARY 10,000-VOLT TRANSFORMER STATION.

the mountain streams. The arrangement is especially interesting, considering that the three water power stations generate and transmit at different voltages.

The Upper Cottonwood Station is equipped with General Electric apparatus, which generates and transmits 16 miles, three-phase current at 12,000 volts.

The Lower Cottonwood Station, equipped with Westinghouse

apparatus, generates two-phase and transmits 14 miles, three-phase current at 14,000 volts.

The Pioneer Station, situated 37 miles north, in Ogden Canyon, has General Electric machinery and transmits three-phase current at 16,000 volts.

The two steam plants generate at 2,300 volts and feed into the general distribution system in Salt Lake.

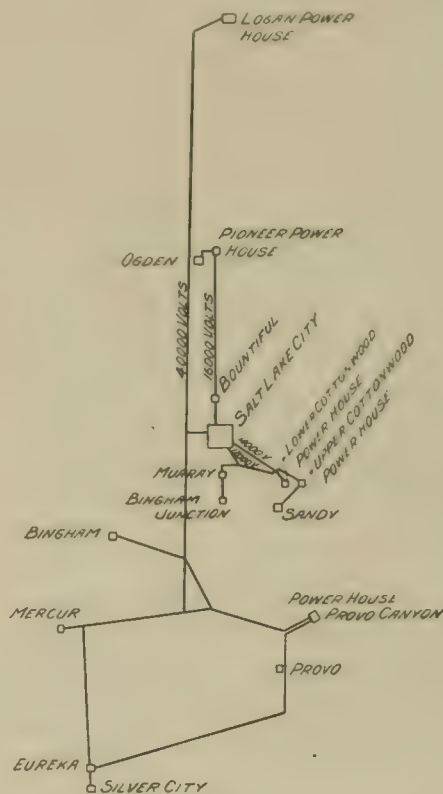
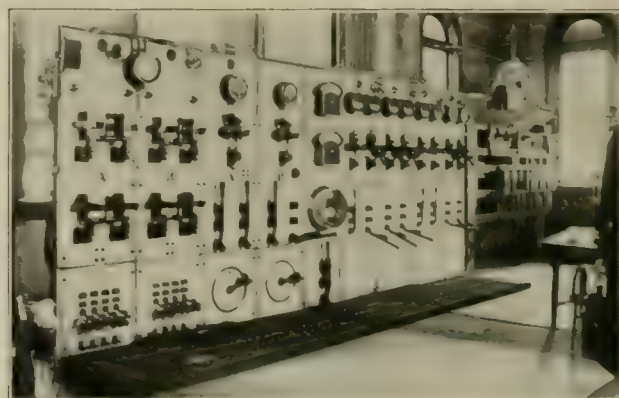


DIAGRAM OF TRANSMISSION LINES.

On Dec. 30, 1902, to this already large system, with its six step-down transformer stations in the valley, and in Salt Lake, connection was made from the Telluride Power Co's. 40,000-volt system. This company has a duplicate pole line connecting Logan Power Station (85 miles), north of Salt Lake, with Provo Station, 45 miles south. Taps are taken off each of these lines at Salt Lake



ROTARY CONVERTER SUB-STATION SWITCHBOARD.

and the paralleling was done on the low tension side. From the first time this latter system was synchronized with other stations and the switches thrown in, no trouble has arisen; the regulation is very materially improved for all.

On this combined system there are operated rotary converters, supplying the street railway system, large induction and synchronous motors operating 550-volt railway generators, Portland cement mills,

brick works, ore sampling works and various other plants scattered throughout the valley and in Salt Lake. On the Telluride company's system are large induction-motor mine hoists, mills, etc., in a half-dozen of the largest mining camps in the state.

Since the general lighting systems for Salt Lake and Ogden, besides several smaller towns, are fed off of this same large network, it speaks well for the regulation obtained, when the class of variable motor service and railway loads carried is considered. The voltage chart shown herewith is taken from the general lighting system in Salt Lake.

The chief advantage in thus running all in multiple is the "momentum" that is back of all the severe changeable loads, motors starting, etc., so that no effect on the general system is noticeable.

There has been started recently an additional steam three-phase unit of 750-kw. capacity, and by October next, another three-phase direct connected unit of 1,000-kw. capacity will be added.

To the present rotary station, for carrying the railway load, will be added in September a 750-kw. synchronous motor-generator set.

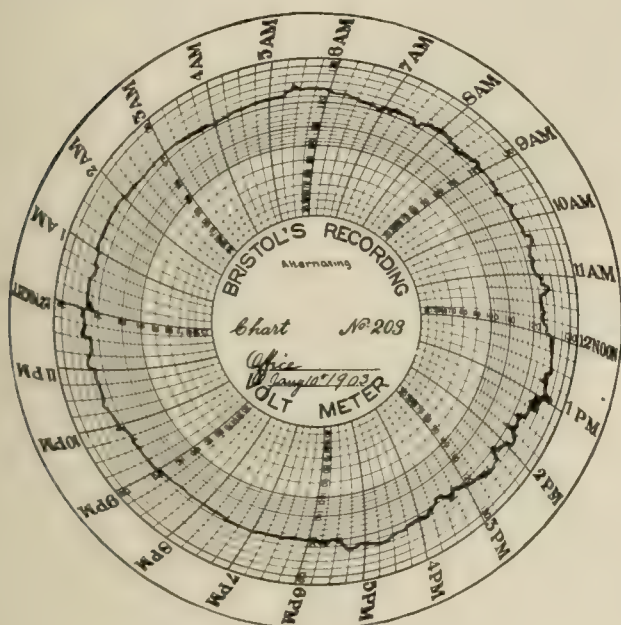
By June next, a sixth water power station, located on Bear River, 80 miles north of Salt Lake, will be completed and will be run in

paradoxical to speak of operating a road extravagantly by reason of lack of funds, such cases do exist. In the first class of extravagantly operated roads mentioned should be placed those in which present conditions only are considered and the question of providing for the future is not taken into account. In this class of roads repairs of special work, overhead construction, replacing ties, etc., are done as cheaply as it is possible to do them, and the policy is to patch the work in some way so that it can be used for the time being. This policy is penny wise and pound foolish, because when a poor grade of material is used or work is done in a temporary manner it means a certain amount of money wasted as it will be only a question of a very short time before the work would have to be done over again. If boiler walls or grate are in poor condition, or the boilers are not kept clean, more money will be paid out for fuel wasted than will be saved by delaying the necessary repairs, and by allowing the conditions to grow worse every day. It may be argued that the company cannot afford to do the repair work or to hire extra help to keep the boilers perfectly clean and perhaps it cannot, but will it not pay to the coal dealer more money in a year or even less time than it would cost to repair and clean the boilers, walls and grates? This work must be done sometime, so why not do it before it involves additional expense? In one instance the writer insisted on shutting down a line for a week in order to repair the steam plant. Although there were two boilers in the plant of the same rated horse power as the engine plant, the engineer could not maintain sufficient steam with either boiler to keep the road in operation. After rebuilding the boiler walls and giving each boiler a thorough cleaning one boiler easily handled the ordinary load on the line and in less than eight months the saving in the coal alone paid the expense incurred for making the repairs besides giving a much better service and enabling the company to have both boilers cleaned regularly.

In regard to the engine room, if the engines leak or the bearings are worn, money is being lost through waste of steam and oil and the danger is ever present of a break-down just at the busiest time. In the case of the rolling stock the motors, trucks, and especially the grates, should be kept constantly in the best condition possible. If the motors or controllers are allowed to get in bad condition a car is liable to be pulled into the barn disabled when it is most needed on the road.

In the writer's experience it pays best to immediately repair any defect in motors or controllers as soon as such defect appears. To allow them to go on until the car is disabled is not only wasteful but has a tendency to injure the company's patronage as it interrupts the service, and it takes but few such interruptions to make the falling-off of patronage noticeable. It is also poor economy to continue the use of motors which are out of date and for which repair parts can only be secured on special orders. Such, for example, are double reduction motors, or those using all brass bearings, and those requiring oil for lubrication. The extra expense for gears, pinions and brasses and the difference of cost between oil and grease will, in a very short time, pay for modern motors, which however, need not necessarily be new. Many of the large roads are discarding good motors of modern design for new ones of larger size, so it is an easy matter to equip a small road with good and reliable second-hand motors which are practically equal to new ones.

There are also roads which still cling to the single motor with rheostatic control. At a recent test the writer sent out a car with a single 30-h. p. motor equipment with rheostat controller over a line $1\frac{1}{2}$ miles in length and having two grades, one of 3 per cent for 900 feet and one of $3\frac{1}{2}$ per cent of 500 ft. The car made the round trip in scheduled time, 20 minutes, and it required 28,000 watt hours for the trip. Afterwards a car with a double 30-h. p. motor equipment and with series parallel controllers was sent over the same route. The motors of the second car were of the same size and kind as that of the first car and the car bodies and trucks were the same weight in both cases. The second car made the round trip in fifteen minutes and required but 20,000 watt hours, showing a saving of 8,000 watt hours. As these tests were made on the same night and within 35 minutes, all the conditions were practically equal. Would it not be economy, therefore, to use double motor equipment and proper controllers, not only for the saving in power?



VOLTAGE CHART.

parallel with these systems. In this station, two 750-kw. Westinghouse units are being installed, and the transmission will be at 28,000 volts. By that time it is expected that the Cottonwood stations and the Pioneer station in Ogden Canyon, will be changed to transmit also at 28,000 volts, thus simplifying greatly the connections at the distribution end, for working in parallel.

The combined capacity of all of above stations, both steam and water, will reach 17,000 h. p.

The accompanying sketch shows the various transmission lines mentioned and also location of power stations.

ECONOMY.

BY G. J. A. P.

In the operation of an electric railway, especially if it be a small road, economy is as essential as it is in any other line of business. It may be questioned, however, if there are not many lines operated on a so-called economical basis which are in reality managed extravagantly instead of economically. The writer has had considerable experience in the construction of electric railways and has found that in a number of cases roads have been operated in a supposedly economical manner when, in fact, they were extravagantly operated, not intentionally, but through a lack of foresight and sometimes through lack of funds. While it sounds

It is not of lesser importance that they be examined frequently and kept in thorough working order. The future of a bridge will be determined by the company's policy for one reason: the saving in not making repairs will amount to 10 years. Headlights should also be of such character that a motorist can see far enough ahead to make sure of avoiding collisions and accidents. The necessity of keeping tracks, special work and overhead construction in as perfect condition as the class of construction will permit is too generally appreciated to require particular mention.

It is not economy to allow a road to get into such physical condition that in order to bring it up to the normal condition will require expenditure of the sum equaling several years' receipts, yet there are roads now in operation where the power plant, rolling stock, tracks, etc., are scarcely fit for service. Some of these roads perhaps are declaring regular dividends but their deterioration will sooner or later require a large sum to place them in condition to even earn their expenses, not to speak of paying dividends. If the earnings of a road are such that it cannot afford to pay the cost of keeping it in proper condition is it economy to continue the operation of such a line? Where a road cannot earn its operating expenses (and in this is included the keeping of everything in good condition), and unless the franchise has considerable value, it would be economy to close it up before it becomes merely scrap iron and can only be sold as such. There have been roads in operation for years on the verge of bankruptcy, which have been sold at a handsome figure, but such cases are rare and the franchises alone constituted the real value owing to their connection with interurban projects. Other roads may also be found which do not properly cover as much territory as they should and consequently lose traffic which properly belongs to the line.

GROWTH OF ELECTRIC RAILWAYS.

The census preliminary report on street and electric railways in the United States for the year ending June 30, 1902, shows a total of 987 operating companies, with the net income aggregating \$30,955,233; dividends, \$15,958,216; surplus, \$15,047,017. The gross earnings were \$241,584,697; operating expenses, \$139,012,004; net earnings, \$102,597,693; income from other sources, \$2,907,156. During 12 years the length of line (first main track) increased from 5783 miles to 16,647 miles, or 187.85 per cent; number of cars from 32,505 to 60,290, or 85.48 per cent; number of fare passengers carried from 2,023,010,202 to 4,813,466,001 or 137.94 per cent. There were 1,216 persons killed and 47,428 injured during the year.

The average number of salaried officials shown by the report was 2,749, salaries \$4,625,015; clerks 4,301, salaries \$2,573,936; all other employees 131,133, wages \$77,437,324.

The balance sheet for all the companies shows the following total assets and liabilities: Assets—Cost of construction \$2,088,863,677; other permanent investments, \$128,458,625; cash on hand, \$27,342,313; bills receivable, \$22,247,704; supplies, \$10,340,448; sundries, \$150,964,350; total, \$2,428,317,117. Liabilities—Capital stock, \$1,210,277,080; funded debts, \$929,328,656; bills and accounts payable, \$94,858,371; interest due, \$13,748,010; dividends due, \$2,342,827; sundries, \$130,580,472; profit and loss, \$41,171,792; total, \$2,428,317,117.

The financial statistics do not include 19 companies with 739 miles of track which failed to answer inquiries.

With a view to developing and increasing the earning hours of its system, the Lake Shore Electric Railway Co., of Toledo, O., contemplates conducting its electric package business during the day and the electric freight business at night. Heretofore the freight was carried during the day.

THE WORCESTER & CONNECTICUT EASTERN RAILWAY CO.

The Worcester & Connecticut Eastern Railway Co. now owns or controls in addition to its own lines, the following electric railway properties: The Worcester & Webster Street Railway Co.; the Webster & Dudley Street Railway Co.; the People's Tramway Co., and the Danielson & Norwich Street Railway Co. The system as a whole aggregates 55 miles of single track, extending from the city of Worcester, Mass., southward to the village of Moosup, Conn., serving some 60 towns and villages. Near Danielson, Conn., con-



ROUTE OF THE WORCESTER & CONNECTICUT EASTERN RY

nection is made with the Providence & Danielson Electric Ry., running to Providence, R. I., and thus connecting the prosperous Quinebaug Valley with the cities of Worcester, Mass., and Providence, R. I.

The population of Worcester is 118,000; the population tributary exclusive of Worcester is in excess of 60,000; the population along the connecting line of the Providence & Danielson Electric Ry. is estimated at 15,000; and the population of Providence and Pawtucket is about 215,000; making a tributary population in excess of 408,000. The company has the right to carry freight in bulk over its lines in the state of Connecticut. These railways have all been constructed within the past four years and are well built and equipped. The plans contemplate the several properties will be merged into one operating company.

The company owns a water power on the Quinebaug River below Danielson the power house being equipped with hydraulic machinery to develop 2,000 h. p. and an auxiliary steam plant of 1,000 h. p. While it is expected that the entire system will be operated from this station the company has in addition a modern steam plant of 1,200 h. p. capacity located at Oxford which is available as a reserve station.

There are two pleasure resorts along the line, Wildwood Park, located midway between Putnam and Danielson on Alexander's Lake, a beautiful sheet of water, at which point the company has provided attractive park buildings, consisting of theater, dancing pavilion, restaurant, launches, boats, and the usual accessories, and Beacon Park, located at Webster Lake, a favorite resort for Worcester and Webster people, but which in the past has not been readily accessible.

The New York, New Haven & Hartford Railroad Co. controls the Worcester & Connecticut Eastern Railway Co. through its ownership of the majority of the capital stock and the electric railway properties will be operated in harmony with the steam railroad.

The directors of the Worcester & Connecticut Eastern Railway Co. are: Chas. F. Brooker, Geo. J. Brush, Edwin Milner, F. S. Curtis and H. M. Kochersperger, who are all officers or directors of the New York, New Haven & Hartford R. R.; Fred A. Jacobs, treasurer E. A. Jacobs Manufacturing Co.; E. D. Robbins, vice-president New England R. R.; H. Hobart Porter, Jr., and E. N. Sanderson, of Messrs. Sanderson & Porter, New York City.

HEATING AND VENTILATION OF RAILROAD SHOPS.*

BY J. I. LYLE, M. E.

As time progresses our standards for comparison are being constantly changed, being ever carried higher and higher and nearer the ideal. Today we demand the best, knowing that in all likelihood it will be surpassed by something better within a short time. I remember while serving my apprenticeship in a railroad shop the temperature of the shop often dropped below 40° and frequently to freezing point. It was considered by those in charge as being amply heated with an overhead steam system, but I do not believe the amount of work produced on such cold days amounted to more than 75 or 80 per cent of the normal output. There were about 159 employees earning approximately \$250 per day, and considering the output to be 85 per cent the loss on cold days amounted to something like \$37.50. An efficient heating plant for this shop would cost about \$3,750 complete. Without considering the cost of steam, of which there was plenty of exhaust going to waste, allowing 6 per cent interest on the cost, 5 per cent for depreciation, and 1 per cent for repairs and painting, making a total of 12 per cent, or \$450 per year, is the amount that the cost of the heating plant should earn. With the 85 per cent output in cold weather it would take only 12 days to make the expenditure a paying investment. Practically all railroad shops have exhaust steam which is available for heating, so any system not adapted to the economical use of exhaust steam should not receive serious consideration. In considering the advisability of utilizing exhaust steam and returning the water of condensation to boilers the question of back pressure and cylinder oil carried in the steam should be considered. By means of separators and filters a sufficient amount of oil can be removed without any question, to make the use of exhaust steam desirable. In regard to back pressure and the minimum required for different systems of heating it will be found that ordinarily 5 lb. is carried on most installations, and while this could be reduced in moderate weather, the general practice is to establish this as the minimum and increase the pressure in extremely cold weather. With a carefully designed plant, however, this is higher than should be necessary in general. The minimum pressure required for circulation depends more upon a proper proportioning of the supply main and the distributing branches than upon the return main. A great many plants today require a higher pressure to secure circulation than would otherwise be necessary had proper consideration been given to the dripping of the main and its branches.

Wherever possible the use of traps in return lines should be avoided, as a pump and receiver or the boiler feed pump controlled by a pump governor make the best kind of trap. By the use of one of the so-called vacuum systems, however, exhaust steam can be circulated without back pressure on the engines, thereby procuring increased efficiency of the engines and maximum results from the heating surface owing to the removal of all air trapped in the system. The Webster system which maintains a vacuum upon the return line by means of a steam pump uses thermostatic traps and valves on the drips and returns of all the various units to prevent the steam passing to the return line and to allow air and water to pass freely. The Paul system is an auxiliary attachment for the separate removal of the air from the various units by means of a vacuum maintained on a system of air piping by the use of a steam ejector. To procure good results from either of these systems the workmanship should be of the best, as leaks are very detrimental. The three systems adapted to the use of exhaust steam are:

First. Direct steam heat consisting of pipe coils placed on the walls or overhead through the building.

Second. Direct hot water where the exhaust steam is used in some form of feed water heater to heat the water circulating through the building.

Third. The fan system where steam coils consisting of wrought iron pipe are placed in groups, and the air drawn over these coils by a fan and forced into the building.

The sole advantage of direct steam for shops is its extreme simplicity, but this is offset by the disadvantages of having the heating surfaces distributed where they are subject to damage from many sources. It is often difficult to locate the coil surface to procure proper drainage. With the installation of overhead cranes covering considerable area it is difficult to install a direct system of either steam or hot water and an installation of this type frequently requires changes in location of shafting and machinery to make room for the required amount of heating surface. Often to secure a good circulation system it is necessary to install considerable trenching, which should be eliminated from shops as much as possible, as it becomes a pocket for the collection of dust, waste, etc., and frequently becomes full of water from leaks.

Direct hot water has the advantage in comparative simplicity and in the control of the temperature, which can be effected by controlling the temperature of the water or the rapidity of its circulation. The hot water heater can be located between the low pressure cylinder and the condenser where the plant is operating condensing, thus utilizing exhaust steam that would otherwise not be available. It has the disadvantage of having a heating surface spread throughout the shop and the heating surface requires very careful attention to prevent leaks. It cannot be shut down for any length of time in winter without complete draining in order to avoid freezing. The cost of installation is greater in most cases than either a direct or blower installation. It usually requires circulating pumps and has the attendant disadvantage of moving machinery to be cared for.

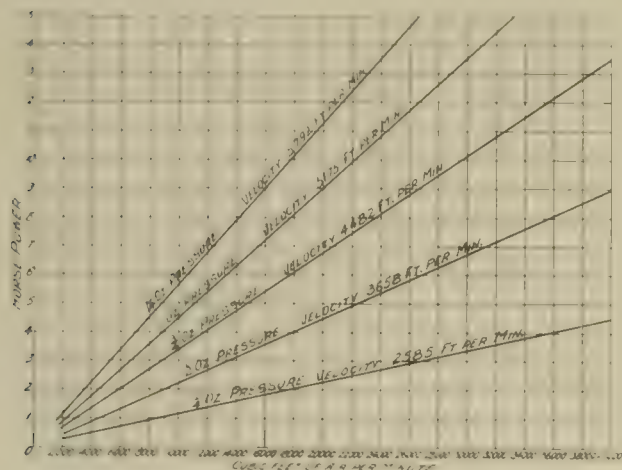
The fan system has the advantages of having all the heating surface in one place, nearly all of which can be set vertically, thus procuring perfect drainage. The warm air being forced into the building a constant circulation of the air is maintained, thus heating the building more evenly than with any other system. The forced circulation gives less difference of temperature between the floor and the roof than when natural circulation is used, and ventilation of such buildings as blacksmith shops and foundries can be effected. Control of the temperature can be effected either by varying the speed of the fan or shutting off sections of the heater. The disadvantages of this system are in having a fan and engine or motor to be cared for and in having large hot air pipes placed overhead, which are sometimes hard to place on account of the height of the building. Two types of fans are used for heating: the disk or propeller type, and the centrifugal or steel plate type. The latter is used almost exclusively, as the former has not been successful except for very small installations, owing to their inability to produce the necessary pressure for distributing the air through long ducts. With the centrifugal type of fan the most economical results for heating are obtained when running the fan in the coldest weather, so that the periphery of the wheel will travel at from 4,500 to 5,200 ft. per minute. The velocities correspond to 34

*Abstract of a paper presented at a meeting of the New York Railroad Club, March 20, 1903.

and 1 ounce pressure per sq. in., which is sufficient to give a positive control of the air to effect the proper distribution through the ducts. Practice differs greatly in the construction and location of the ducts, the most common scheme being to make the ducts of galvanized iron and to carry the horizontal runs overhead through the truss work with warm air outlets 15 to 40 ft. apart and from 8 to 20 ft. above the floor. The best practice for large shops is to use large volumes of air at rather low temperatures than small volumes at a high temperature. The outlets are usually from 10 ft. to 20 ft. above the floor and in this design advantage is taken of the fact that warm air discharged high up travels toward the walls where it is cooled and becoming heavier, falls to the floor, thus the walls assist the circulation. The coldest wall will cool the greatest amount of air, consequently more air will be drawn in that direction. With high outlets no air currents are felt by the occupants on the floor. These plants are in successful operation where air is discharged from 100 to 175 ft. from the ends of the building, and in foundries it is blown as far as 250 ft.

Masonry or concrete ducts laid under the floor with stand pipes from 8 to 12 ft. high at intervals are often used. Another method used is one in which no distributing pipes are employed, but the hot air is discharged from the fan into the building overhead and the air returned to the apparatus through underground ducts with openings located at the floor line distributed through the shop.

The velocity of the hot air in the main ducts leading from the fan should never be greater than 2,500 ft. per minute and this ve-



locity should be reduced gradually in the different branches so that the air is discharged from the outlet at from 800 to 1,200 ft. per minute. Where the outlets are high 1,200 ft. per minute can be used without objectionable results, but where a thorough distribution is desired and the outlets are within 6 to 8 ft. from the floor the velocity of the air should not be greater than 800 ft. per minute. Provision should be made for re-circulating the air, also for the use of cold fresh air from out doors. It is occasionally found that a building can be heated easier by using part outside air and part return air than to use all return air. This is accounted for from the fact that where the fan is exhausting from the building as in re-circulating the pressure maintained in the building is not greater than that of the outside air, so that the leakage of air around windows, doors and crevices may be very great, while by the use of part fresh outside air a slight pressure can be maintained which will largely prevent this inward leakage. Cold air will of course be entering the building in either case, but in the latter case the outside air will pass through the heater where it can be heated more economically than by mixing it with the heated air in the building as it leaks in. If this point were more generally understood many heating plants that are today not giving entire success would be made to give very satisfactory results by simply using a portion of outside air through the heaters.

It has been attempted from time to time to develop a formula for determining the capacities of fans under all conditions. The majority of these formulæ, however, have been too complicated to use in every-day practice. Nearly all of the fan manufacturers use empirical formulæ for fans under different conditions. The

capacity of the steel plate centrifugal exhaust fan (inlet on one side only) when running under free delivery will be given approximately by the formula

$$C = 1.57 D^2 W R$$

In which C = capacity in cubic feet per minute, D = diameter of the blast wheel in feet, W = width of the blast wheel at the periphery in feet, R = revolutions per minute.

By free delivery is meant to set the fan in the room and simply draw the air into the inlet and discharge into the same room without any piping. In factory buildings where short pipes of rather large diameter are used, thus reducing the friction, the formula $C = 1.25 D^2 W R$ will be found to be approximately correct. With long ducts terminating in many small outlets the capacity will reduce from 10 to 20 per cent as given by the last formula. The capacity of the fan within the limits used in heating varies directly as the speed of the fan. The pressure produced by the fan depends first upon the peripheral velocity of the blast wheel and varies as the square of the velocity; second, upon the delivery; third, the temperature of the air. It is not good practice to use high velocities or long runs of piping where they can be avoided.

Whether a steam engine or an electric motor is better for driving the fans depends upon local condition. If there is not sufficient exhaust steam to do the heating an engine driven fan is the more economical, as its exhaust can be used. An engine-driven fan also has the additional advantage of being independent of the electric plant, so that the heating plant can be operated at times when the electric plant is shut down. Where electric current is constantly available together with sufficient exhaust steam an electric motor is the most convenient and economical. Where engines are used it is preferable to have them direct connected, but belted electric motors are preferable because of the large size of motor necessary for direct connection on account of the slow speed of the fan.

The accompanying curves give the horse power required to move a given volume of air at different velocities or pressures.

MASSACHUSETTS NOTES.

The bill enabling street railways to carry merchandise and baggage on approval of the local authorities and the railroad commissioners has become a law in Massachusetts and several of the roads have already asked the privilege of boards of aldermen and selectmen. This is the first stage and after that they will have to go before the railroad commissioners. At the last moment the matter was held up for a day or two while an amendment similar to the "missing link" law was contemplated to allow the commissioners to give a road authority to carry express in case one town along a line should refuse this privilege and in so doing hold up the whole thing. It was finally passed without this amendment and in this form it was signed by the governor.

An opinion by the attorney general has thrown some light on street railway and railroad competition in the state. The Boston & Maine company is before the legislature with a petition to allow it, a steam road, to purchase the stock of street railway companies and the attorney general sustains the contention that the road cannot do this now, while the New York, New Haven & Hartford and the New York Central, holding charters in other states and leasing roads in Massachusetts can. As the result of this opinion the petition of the Boston & Maine will undoubtedly be approved.

Appearances indicate that the railroad commissioners are about to issue an order regulating the crossing of steam and trolley roads in the state. The board finds that while it is the custom to stop a trolley car at a railroad crossing and have the conductor go ahead and look up and down the track before the car proceeds there is a difference in his course of action after making this investigation. In some cases he signals for the car to come ahead and waits on the crossing for it to come up to him while in other places he goes way back to the rear platform before starting the car up. The commissioners do not like this last arrangement and are expected to issue an order forbidding it.

We believe that the city of Denver is the only municipality who has exerted itself to especially favor a particular class of persons using its streets. The franchises under which the Denver City Tramway Co. operates provide that each car shall carry racks to accommodate three bicycles.

THE THIRD RAIL FOR HIGH SPEED ELECTRIC SERVICE.

An interesting paper on the "third rail" system was read by Mr. Ernest Gonzenbach, at a meeting of the Western Society of Engineers held Mar. 18, 1903. The class of interurban roads discussed by Mr. Gonzenbach are those having a schedule speed of 20 miles an hour and over. The term high speed as applied to interurban railways is not determined so much by the maximum speed of the cars in miles per hour as it is by the number of stops these cars make.

These interurban railways at first were built along highways, but have gradually commenced to be built on private right of way, and is only within recent years that any marked movement has occurred toward their closer identification with standard railroad practice. The majority of interurbans continue to use the trolley and overhead system of feeders to supply power to cars, but new conditions are presented when the trolley is used to supply power to cars or trains requiring from 500 to 1,000 amperes for operating at speeds of from 40 to 60 miles per hour. The contact area of a single trolley, while sufficient for the demands of ordinary street cars, is entirely inadequate for interurban cars running at their maximum speed. Trolley wheels in this service are worn out at the rate of one every three to five days and even the best do not last over a week. The trolley wire is rapidly worn due to constant arcing and soon breaks at the weak spots. Experience shows that trolley wire wears most on grades and curves where the cars take the largest amount of current. There is also serious chance for trouble when the trolley leaves the wire at high speed, in which case not only the trolley pole becomes useless, but more often the pipe brackets carrying the wires are ripped off the poles for a considerable distance and sometimes the car roof is damaged.

These troubles are not encountered when cars are operated at comparatively low speed. The third rail is particularly suited to meet these objections and provides a satisfactory method of running at high speed although it was not originally designed for this work. Its first use was on the intramural railway at the World's Fair in 1893, and it was soon afterwards adopted by the Chicago elevated railways. These roads adopted the third rail with a view of avoiding overhead wires rather than on account of any special advantages in the supply circuit. Its first application on a surface railroad was on the Nantasket Beach branch of the New York, New Haven & Hartford Ry. Afterwards the same road equipped several of its branch lines in Connecticut with this system. The first strictly electric railway to use a third rail surface system was the Albany & Hudson Ry., next came the Grand Rapids, Grand Haven & Muskegon, and the last and most prominent is the Aurora, Elgin & Chicago. At the present time there are a large number of projects planned and building using the third rail system.

[Since this was written the Wilkesbarre (Pa.) & Hazelton Railroad Co. has completed its protected third-rail system which is now in operation.—Ed.]

The third rail is by no means a *sine qua non* for interurban railways and for a certain class of railways the trolley will always be the most suitable. If the road is largely on streets and highways or its right of way is located adjacent to and parallel with a highway then the trolley is the most suitable because in such cases high speed as we are here considering it, cannot be maintained. When a considerable portion of the roadbed is private right of way not too close to the highway the third rail becomes advisable from the dollar and cents standpoint, as well as for engineering reasons, and it is the only really satisfactory method for cars taking a considerable amount of current at high speed.

The present practice is to locate the third rail at one side of the tracks and this practice is to be commended on account of the facilities with which it enables the ordinary track work to be done, and the ability to install the third rail at higher elevation from the ties than if it were placed in the center of the track, also the convenience of current collecting shoes on the car which may be located at one side of and suspended from the journal boxes. There is also less liability of short circuits. This location of the live rail has now become practically standardized so that arguments in its favor are unnecessary.

The distance from the gage line of track rail to center line of third rail is about 26 in. in elevated practice and about 27 in. in surface

work. The elevated standard is one to be commended for surface work, as it permits the interchange with the elevated cars, it gives an extreme width over the third rail shoes no greater than that of the car itself and thus avoids lifting mechanisms, etc., to protect the shoe when the car is in the city streets using the trolley. The distance from the top of the track rail to the top of the third rail is generally about 6 in., which is a convenient height for allowing ample space for the insulators under the third rail. This construction necessitates ties for the third rail which must be longer than the standard track tie. In elevated service the insulators are usually placed 5 to 6 ft. apart and in surface work 10 ft. has become standard. This means that every fifth tie must be approximately 9 ft. long in order to accommodate the insulator. Where all hardwood ties are used these extra long ties may be of the same material as the others, but where cedar ties are used it is better practice to make the third rail tie of hard wood like oak or chestnut.

The early third rail systems all used wooden blocks to insulate the third rail and they are still used on some roads now building. For elevated service these blocks will serve fairly well, especially when they have been dipped in some insulating compound. There is perfect drainage of the structure and water cannot possibly accumulate on elevated track. It is nevertheless noticeable that the new elevated railways of Boston and New York have not used wood at all. The objections to wood are that it absorbs water and allows a heavy leakage which often destroys the insulator. It forms a very excellent insulator when new, but as a surface road cannot have perfect drainage, water will accumulate and be absorbed. As an example, the insulation resistance of the third rail of the Albany & Hudson Ry. for a few months after its installation was very high. Trouble with the wooden insulators did not appear until the following spring when the snow, which had been packed around them, without the least interference to service, began to gradually melt, and this caused the ties and insulators to become permeated with moisture and introduced serious leakage. In several instances insulators were found burning and it was noticeable that they were invariably burned in the center while the outside remained intact, clearly indicating that the water had been absorbed by capillary attraction from the tie. It was impossible to determine the total leakage current because at the same time there was a great deal of trouble from crossing cables, and the two sources of leakage could not readily be determined separately. After the spring thaws were over and the sun and leakage current had dried out the insulators the resistance became higher. Readings taken at various points along the lines, not including the cables, showed a large variation between sections, and the same section with no change in weather would hardly give two readings alike from one day to another. The highest insulation reading was about 12,000 ohms per mile and the average was about 6,000 to 7,000 ohms, while the readings would often go as low as 2,000 ohms under ordinary weather conditions. It was found that a single charred wood insulator would permit a leakage of about 2 amperes, but this value will depend greatly upon local circumstances. The ties which supported the burning insulators did not appear to have been damaged. The wood insulators on the Aurora, Elgin & Chicago Ry. have not been in use long enough to permit conclusions to be drawn, but the indications are that they will be found to have a very low insulation resistance and already a number of burned ones have been found and replaced. There is no reason why the same standard of insulation demanded for overhead construction should not be reached in third rail work.

The conductor rail is usually of a standard T-rail cross section, but is rolled from a grade of steel containing a very small amount of carbon and manganese. For a resistance of the conductor rail of 7.5 times that of copper of equal cross section the makers supply a rail containing about 12 of 1 per cent of carbon, and 14 to 15 of 1 per cent of manganese. The standard mixtures used in rolling service rails have a conductivity of about 1-12 that of copper of equal cross section. It is therefore apparent that the value of steel rails for use as electrical conductors depends not so much on the price per ton as on the conductivity, and as a general rule, old rails sold as re-layers will usually net enough cash to buy the low carbon rail of equal conductivity and leave a cash balance beside.

One of the small details which has proved important on high speed third rail roads is that of joint plates. The early roads and the elevated roads both used a plain strap to connect rail ends. The

flaming is comparatively unimportant at low speed, but at a high speed a slight unevenness will cause the shoe to rump and cause a disagreeable flash. To avoid this the rail ends must be carefully aligned and the burr taken off the two adjacent edges with a file. The Manhattan type of joint plate was adopted on the Aurora, Elgin & Chicago Ry. and is giving very satisfactory service. It requires several months of operation to wear down the third rail to a smooth surface so that no sparking will occur. While cast welded joints might have some advantage for third rail work they could not be expected to exceed the convenience and efficiency of the foot bonds hydraulically pressed in place which are almost universally used in this work.

Expansion and contraction of the third rail is not as serious a matter as in the service rail. While joint spacing is usually used, the writer's experience leads him to recommend a close butting of the joints, leaving no space whatever and drawing the joint plate tight. The rail may then be rigidly anchored midway between two highway crossings, and while the movements of the rail end may be as much as 12 to 15 in. it occurs at crossings where the rail is naturally terminated and is of no consequence.

The highway crossings are an important part of the third rail installation. The ideal method would be to provide standard underground single ducts and draw in cables, but this is expensive. The cable used should have the same conductivity as the rail, which in most cases would be about 1,000,000 c. m. size. This cable costs over \$1 per lineal foot when installed and is exceedingly expensive to replace should it fail. These cables terminate out of doors close to the ground and are exposed to water and mechanical shocks, and they must be capable of withstanding the excessive overloads liable to occur in railway work. They should therefore have a paper insulation in preference to rubber as the latter is liable to melt from overheating. It is very easy to purchase ordinary weather proof cable and install it in a trough filled with pitch and tar; this method is cheap, but its durability and insulating quality are as yet uncertain. Lead covered paper cables would seem to be the most advisable and if properly installed should not give much trouble, although they should receive the same care and attention which the large operating companies give their underground cables. Periodical tests should be made and as soon as any cable shows signs of weak insulation the cause must be ascertained and remedied. The terminals must be arranged so that there is no possibility of current leaking to the lead sheath even in the wettest weather. In order to guard against this possibility a small copper wire should be soldered to the lead sheath and connected to one of the track rails. It is very important to be able to disconnect each cable from the rail for the purpose of testing, and in order to prevent the contraction and expansion of the rail from doing mechanical injury to the cable it is good practice to make the connection between the two by three or four extra flexible pieces of cable bonded to the rail on one end and the other end sweated into a lug attached to the cable terminal by a screw.

The third rail shoes carried on the car weigh from 14 to 18 lb. each and are supported by two cast links which allow some freedom of movement to the shoes. The shoe is held on the rail merely by gravity and is usually supplied with a perfectly flat and chilled wearing surface. In renewing shoes the author has had this surface cast concave with a radius of 12 in., which is the radius given to the top of steel rails. In this way much larger contact area is secured and sparking is reduced to a minimum. A mild steel shoe has been found very much superior to the chilled cast iron. The life of shoes is as yet uncertain, but the writer's observations lead him to believe the average life of a shoe lies somewhere between 15,000 and 25,000 car-miles. As the cost per shoe and pair of links is about \$1.35, the cost of renewal is exceedingly low and not to be compared with trolley wheel renewals.

At present all roads are equipped with shoes depending on gravity for contact, although the Boston elevated supplements this by a long coil single turn spring giving about 15 lb. additional pressure. Lately Mr. W. B. Potter, of the General Electric Co., has designed a shoe which is worked by springs and which is designed to extend out horizontally and make contact with a rail under a covering also designed by him. Whatever the merits of this protected third rail may be it is certain that the shoe designed for it, or a modification of it, would meet all the objectionable features of the gravity shoe.

Sleet is probably the most serious of all objections to third rail operation and it is well known that in the early days on many new roads operations have been suspended for hours on account of sleet. Sleet cutting devices in numerous forms have been tried, but few of them have been very successful. The steel scrapers in use on most of the Chicago elevated roads seem to be the most successful so far. The New York elevated uses steel brushes worked by air pressure, while the Boston elevated has been very successful in the use of a steel brush held against the rail by a spring, giving a total pressure of about 35 lb., which is just enough to press the brush against the rail without bending the wires of which it is composed. The Albany & Hudson uses a modification of the Chicago scraper held against the rail with a very heavy pressure, and the Aurora, Elgin & Chicago has been using salt, supplemented by steel brushes, with success.

Choosing the size of the third rail for an interurban high speed railway corresponds to designing the distributing system of an ordinary electric railway. When there are auxiliary feeders the size of the working conductor is unimportant, but when the latter forms the sole feeder then it must be carefully chosen. On roads of ordinary size the current is delivered to the rails through rotary converter sub-stations and the number and location of these sub-stations will affect the size of the third rail. At present the tendency is to use fewer sub-stations and heavier rail, but in the writer's opinion this practice is erroneous, although when sub-station attendance is high it may apparently be the least expensive. Unfortunately a practice has grown up of making sub-stations miniature power stations and providing in them all sorts of apparatus. Such a station requires skilled attendants and wages form the largest item of sub-station expense. Sub-stations are often located by the manufacturer of the electrical apparatus, who places them so as to get the most ideal power distribution regardless of any other purpose they might conveniently serve. If they were located more numerous and judiciously and more simply designed they might serve as passenger, express and freight depots and as distributing centers for power and lighting supply and other by-products of an electric plant, and their attendance would be but a small part of the expense chargeable to motive power. Practically they should be situated as near the heart of towns and villages as possible and the size of the third rail determined afterwards.

AN INTERESTING LETTER.

Occasionally the mail of the electric railway general manager is enlivened by a complaint that is couched in language sufficiently original to make it prominent among the ordinary run of "kicks." We are indebted to Mr. A. T. Potter, general manager of the roads at Providence, R. I., for this good specimen:

Mr Potter Plesse to take notic of this letter to Stop
yours Cars Runing So fast down th Scholl house hill in
from Apponag and Estwiguich for you dont Stopnt we
shall arest the motmen and oblige from
Frends and Nabors
we dont wont get kiled
not this winter

HOW TO SEE LYNCHBURG, VA.

The Lynchburg (Va.) Traction & Light Co. tells how to see Lynchburg in a very attractive folder, recently issued, in which half-tone illustrations and a map of its line are depended upon to instruct the reader where and how to go, rather than a volume of reading matter. One ride of 18 miles that costs 15 cents is described, among the attractions of which are excellent views of the historic James River and the Blue Ridge Mountains. The folder announces also, that during the summer season there will be free music and dancing at Rivermont Park, afternoon and evening, and free vaudeville performances every night in the Casino.

At the annual meeting of the stockholders of the Philadelphia Co., May 4th, the old directors were re-elected.

RECENT STREET RAILWAY DECISIONS.

EDITED BY J. L. ROSENBERGER, ATTORNEY AT LAW, CHICAGO.

CARE REQUIRED IN LOOKING AND LISTENING FOR CAR —RIGHT TO RELY ON USUAL SIGNALS BEING GIVEN IN OPERATING CAR.

Stanley vs. Cedar Rapids & Marion City Railway Co. (Ia.), 93 N. W. Rep. 480. Feb. 7, 1903.

While attempting to cross a street at an intersection of streets in a buggy in which he was riding, the plaintiff was struck by a street car. The supreme court of Iowa holds that ordinary care to discover the car by looking and listening was all that was required of him under the law. He had the right to rely on the usual and ordinary signals being given by the defendant's employes in operating the car; and, while he was bound to use his senses of sight and hearing, he was not bound as a matter of law to know all that could have been discovered by the highest degree of prudence and caution.

DUTY TO PEDESTRIANS—FAILURE TO GIVE CUSTOM- ARY SIGNALS AND TO HAVE CAR IN CONTROL— EVIDENCE NOT LOCATING COLLISION JUST AT THE POINT ALLEGED.

Louisville Railway Co. vs. French (Ky.), 71 S. W. Rep. 486. Jan. 8, 1903. "Not to be officially reported."

The defendant (railway company), in operating dangerous machinery (trolley cars), at a high rate of speed, over the streets of a great city, the court of appeals of Kentucky holds, is bound to know that men, women, and children have an equal right to its use, and will be upon it; and it is defendant's duty to be constantly on the lookout, and to take all reasonable precautions to avoid injuring them, and this duty obtains not only at the footway crossings, but at every other point of a public street, and one of these precautions is to give notice of their approach by the customary signals, and, when necessary to avoid injury to other persons, to slow up, and, if necessary, stop their car. This duty, under the circumstances, is no more than ordinary care. If it be true that the defendant failed to give notice of their approach to the footway crossing by the customary signals, and put it out of their power to stop the car by the high rate of speed at which they were going, after they saw, or could by the exercise of ordinary care have seen, the danger of the plaintiff, they were guilty of negligence. The petition in this case proceeded upon the theory that the collision occurred upon the footway crossing, and, whilst there was testimony conducing to show that the actual collision was a short distance from the footway crossing, it was the intersection of the two streets, and this slight divergence between the averments of the petition and the testimony as to the actual point of collision was, in the court's opinion, wholly immaterial.

DUTY OF TRAVELER ON STREET TO TURN ASIDE TO LET CAR PASS—ERRONEOUS INSTRUCTION AS TO INSUFFICIENT HEADLIGHT AND CON- TRIBUTORY NEGLIGENCE.

Metropolitan Street Railway Co. vs. Rouch (Kan.), 71 Pac. Rep. 257. Jan. 19, 1903.

In an action for damages for an injury occasioned by a collision between a street car and plaintiff's buggy while he was driving on or dangerously near the street car track, the supreme court of Kansas holds that an instruction to the jury to the effect that the rights of the plaintiff as a traveler upon that portion of the street occupied by the railway track and the rights of the street car company were equal, should have been qualified so as to include the duty of the traveler to turn aside to permit an approaching car to pass.

In such an action, an instruction that, even if the jury should find from the evidence that the plaintiff was negligent in having his buggy on or near the track of the defendant, so that it was struck by a car, still plaintiff would be entitled to recover if they should further find that the injury was caused entirely by the negligence of the defendant in failing to provide a headlight sufficient to enable the teamster to discover an obstruction in time to stop the car

and prevent injury, and that the injury to the plaintiff would not have happened, notwithstanding the negligence of plaintiff, if such headlight had been on the car, is self-contradictory, and therefore erroneous, in that it postulates negligence in the plaintiff proximately causative of and directly contributive to the collision and injury, in the presence of which no negligent act of the defendant could be a sole or entire cause.

The instruction mentioned in paragraph 2, above, was further erroneous in that it permitted the jury to disregard negligence on the part of the plaintiff proximately causative of and directly contributive to his injury. Such negligence is sufficient to defeat recovery.

CARE REQUIRED FOR PROTECTION OF PASSENGERS— INJURY TO ONE BY STONE THROWN BY STRIKE SYMPATHIZER.

Fewings vs. Mendenhall (Minn.), 93 N. W. Rep. 127. Jan. 23, 1903.

A carrier of passengers, the supreme court of Minnesota holds, is charged with the highest degree of care and foresight consistent with the orderly conduct of its business, in respect to the protection of its passengers from injuries resulting from its acts or omissions, from the acts or omissions of its servants, and from the acts of strangers who are under its control or direction; but it is charged with ordinary care and prudence only to guard against the lawless acts of third persons not under its direction or control.

Defendant was engaged in operating a street car system, and his employes had inaugurated a general strike, which was bitterly contested, and resulted in much violence on the part of the lawless element among the strikers and their sympathizers. Defendant continued to operate his cars, and plaintiff was injured, when a passenger on one of them, by being struck upon the head by a stone thrown from the street into the car by a strike sympathizer, a person in no way under the control or direction of defendant. In this action to recover damages for such injury, it is held: (1) That defendant was not guilty of negligence in attempting to operate his cars during the strike; and (2) that the evidence was insufficient to justify a finding of actionable negligence against defendant as respected the act resulting in plaintiff's injury.

The rule of ordinary care and prudence is not so exacting, the court holds, as to require the person charged with its exercise to take unreasonable or extremely doubtful precautions to guard against the wilful and lawless acts of strangers. The failure of defendant to pull down the blinds of the car in which plaintiff was riding, or stretch a heavy canvas over the windows outside the car, was not negligence justifying a recovery against him.

SPECIAL FRANCHISE TAX ACT UNCONSTITUTIONAL.

People ex rel. Metropolitan Street Railway Co. vs. State Board of Tax Commissioners (N. Y. Sup.), 80 N. Y. Supp. 85. Jan. 23, 1903.

Chapter 712 of the New York Laws of 1899 amends subdivision 3 of section 2 of the tax law by adding to the subjects of taxation therein specified, the right or franchise to construct, maintain, or operate upon, over, or under the streets or public places of any town or municipality in the state, the tangible property thereon, which was already specified in the section as being real estate, and therefore assessable. The value of such tangible property, plus the value of the right to maintain and operate the same, are thereafter to be assessed and taxed together, and is denominated in the act as a "special franchise." The act further provides that the assessment of such special franchise shall be made by the board of tax commissioners. That board is required to fix the valuations of all such special franchises, wherever found in the state, and to report such assessment or valuation to the proper local assessor; and such local officer is required to place such special franchise upon his roll of the taxable property in his district, at the valuation so received, and the tax is thereupon levied and collected against the same in the same manner and for the same purposes as against the other property on such roll. This provision, it was claimed, violates the "home rule" provision of the state constitution, for the reason that it de-

proves the local assessors of a portion of their duties as such assessors, and directs the performance of the same duties by officers who are not chosen by the electors or any authorities of such locality; and the third appellate division of the supreme court of New York holds that so much of the act as provides for the assessment of a special franchise by the state board of tax commissioners is unconstitutional and void.

CARE REQUIRED OF ONE CROSSING TRACKS—DUTY OF
LOOKING AND LISTENING AND SOMETIMES
TAKING OTHER PRECAUTIONS—RULE
AS TO CROSSING STEAM RAILWAY
TRACKS APPLIED.

Burns vs. Metropolitan Street Railway Co. (Kan.), 71 Pac. Rep. 244.
Jan. 10, 1903.

A traveler on a city street, who is about to cross the tracks of an electric street car company, the supreme court of Kansas holds, must exercise his faculties of sight and hearing, and under special circumstances must use other careful and prudent means to ascertain whether a car is approaching. In Thompson's Commentaries on the Law of Negligence (volume 2, section 1438), the court says, the learned author states that it is the general disposition of courts in their later expressions to apply the rule prevailing in respect to steam railways, and to hold that a failure of a traveler to use his faculties of sight and hearing before he attempts to cross a street railway is negligence per se (in and of itself). Street cars run many times more frequently than trains on steam railways, and are more silent in their movements. The shorter the intervals between street cars, the better the public is served. The chances of escaping injury taken by the traveler who crosses the tracks of a steam railway without looking or listening are greater by far than those of a person who in the same negligent way goes over street railway tracks in a populous city. Certainly no less vigilance ought to be exercised in the latter case than in the former. Concerning the direction to the jury that the plaintiff ought not to recover if, in addition to looking and listening, he could, by the exercise of "other careful and prudent acts," have avoided injury, no error is found in this requirement. It was asserted that the view of the plaintiff (who was riding in an express wagon and was injured in a collision while attempting to cross electric car tracks) was obstructed by two hacks standing between him and the approaching car. This fact, considering his familiarity with the operation of the cars, made it a proper matter for the jury to determine whether he ought not to have stopped and waited with his wagon, or even made inquiry of bystanders who had an unobstructed view of the approaching car.

WHEN CONTRIBUTORY NEGLIGENCE NO DEFENSE TO
ACTION FOR INJURY—DUTY TO PERSON IN DAN-
GER—IMPLIED KNOWLEDGE OF DANGER—
MOTORMAN SPELLBOUND WITH FRIGHT.

Barry vs. Burlington Railway & Light Co. (Ia.), 93 N. W. Rep. 68.
Jan. 21, 1903.

In view of the duty which rested on the motorman of the defendants' car to be on the lookout to avoid injury to persons using the public street, the supreme court of Iowa holds that in determining whether he did see the deceased in front of his car long enough before the fatal injury was inflicted to have avoided it by the exercise of reasonable care, which, under the circumstances, would be the great care and foresight which a reasonable and competent motorman should use to avoid such an injury when the danger thereof was apparent to him, the jurors might take into account what would have been necessarily apparent to the motorman in the exercise of such care. And if, under all the circumstances, including the fact, which the evidence tended to establish, that the deceased was carried some 20 feet, while clinging to the dashboard of the car, after it came in contact with him, before he was run over, they found that the motorman did see the deceased in danger in time to have avoided the fatal injury to him, they would have been justified in returning a verdict for the plaintiff, notwithstanding the conceded negligence of the deceased in placing himself in danger.

Even in railway cases the court says that it has held that it was not necessary to show by the testimony of the employee in charge of the train that they actually saw the danger of one who was imperiled by reason of his contributory negligence, but that their knowledge of

such danger could be found from circumstances indicating that they must have been aware of such danger. And in this case the finding of the jury that the motorman, who was shown to have been on the front platform of the car, from which he could easily see the surface of the street immediately in front, as he was advancing—and the fact that it was his duty, not only under the rules of the company, which were admitted in evidence, but also under the general requirement of the exercise of care in operating the car—did see the deceased in time to have avoided the fatal injury to him, would have had support in the evidence.

The court says that it is not to be understood as making any departure from the well-settled rule, recognized in the state of Iowa and by a majority of the authorities in other states, that contributory negligence will defeat recovery notwithstanding the concurrent negligence of the defendant. The effect of its holding is simply to say that, under the circumstances, the jury could have found that the motorman had knowledge of the danger of the deceased, due to his contributory negligence, in time to have avoided the fatal injury to him. If, instead of using the means within his control to stop the car after the danger to the deceased became apparent, he negligently failed to do so, or, as indicated by the testimony of one witness, became spellbound with fright, and allowed the car to run on, after seeing the danger of the deceased, without shutting off the power or reversing it, and thus an injury was inflicted which might have been avoided, then the liability of the defendant would be sufficiently shown. The controlling consideration for the court, when asked to direct a verdict for the defendant, was whether it appeared from the evidence that the motorman, in the exercise of the care required under the circumstances, was not aware of the danger in time to have avoided the fatal injury.

INJURY TO CONDUCTOR BY ANOTHER CAR WHILE
TRYING TO OPEN GATE AFTER CHANGING TROL-
LEY AT CROSS-OVER—SUFFICIENT LOOKING
FOR CAR—MOTORMAN SEEING PERSON
NEAR TRACK OR IN PLACE OF DAN-
GER—STREET RAILWAYS IN-
CLUDED IN "RAILROAD"
FELLOW-SERVANTS
ACT.

Stocks vs. St. Louis Transit Co. (Mo. App.), 71 S. W. Rep. 730.
Jan. 20, 1903.

When the conductor on a new, inclosed vestibule car which had become disabled had changed the trolley and given the signal to the motorman to go ahead, at a cross-over, to take the car into the sheds, he undertook to board the car, but found difficulty in opening the gate, and, while trying to do it, was struck by an east-bound car that came up on the inside track. The jury were instructed, in effect, that if, after the conductor had changed the trolley, he looked west, and saw no approaching car, and immediately gave the signal to the motorman to go ahead, and attempted to get on the car through the gate to the vestibule, he was not guilty of negligence in failing to continue to look and listen for an approaching car; and the court of appeals at St. Louis, Mo., thinks this was so. It says that the situation of the conductor was like that of a footman about to pass over a crossing of a street on which there are street railway tracks, who, having the opportunity to see, looks, and sees no car. He would then have a right to assume that he might cross in safety, and if, in attempting to cross, by the negligence of a motorman in charge of a car, he should be struck and injured, it could not be asserted successfully that he was guilty of contributory negligence. The conductor was in the performance of the duties incident to his employment. He had changed his trolley, and was trying to board the car through the only means of ingress to the rear platform. According to his uncontradicted testimony, before attempting to board the car he had looked in the direction from which the car came that struck him, and saw no car approaching, and immediately, while his attention was absorbed in directing the movement of his own car and in his effort to board it, he was struck and injured. Negligence could not be inferred from such conduct.

Then, the court holds that, if one is seen near by and approaching a railway track by the engineer or motorman in charge of a train or car, but not in a place of danger, and a warning signal is given, the engineer or motorman has a right to assume (unless it appears that the warning is unheeded) that the person will not, in disre-

gard of the instincts of self-preservation, deliberately place himself on the track, or in a place of danger, and is not required to stop or check his train or car for fear the man may act extraordinarily, and contrary to sanity, by putting himself in a place of known danger. But no such assumption can be indulged where the plaintiff, when discovered by the motorman or engineer, is standing in a place of peril, and when it is apparent, if he does not move out of it, he will be struck and injured unless the car or train is checked or stopped. In such circumstances the engineer or motorman has no right to assume that the person will move out of the place of danger in time to avoid injury. His duty is to assume, if he does not move when the signal is given, that he may not do so, and to use his best endeavor to stop or check his car in time to avoid injury.

When the word "railroad" is used in a statute, there is no definite rule of construction, the court holds, as to whether it includes street railways. It may or it may not include them. The meaning of a word must depend on the context and the general intent of the statute in which it is used. And the court holds that corporations owning and operating street railways are included in section 2873 of the Revised Statutes of Missouri, which provides: "That every railroad corporation, owning or operating a railroad in this state, shall be liable for all damages sustained by any agent or servant thereof while engaged in the work of operating such railroad, by reason of the negligence of any other agent or servant thereof; provided, that it may be shown in defense that the person injured was guilty of negligence contributing as a proximate cause to produce the injury."

CARE REQUIRED IN OPERATING STREET RAILWAY—
DUTY OF MOTORMAN TO BE ON LOOKOUT—DUTY
TO INFANT SEEN ON OR APPROACHING
TRACK—SOUNDING OF GONG NO DE-
FENSE—DUTY TO SEE THAT TRACK
IS CLEAR—PRESUMPTION AS TO
ADULT APPROACHING
TRACK.

San Antonio Traction Co. vs. Court (Tex. Civ. App.), 71 S. W. Rep. 777. Jan. 7, 1903. Motion for rehearing overruled Feb. 4, 1903.

Among the appliances of modern civilization, the court of civil appeals of Texas says, there is none perhaps that is attended with more constant danger to life and limb than the operation of street surface railroads in cities and towns by means of electricity. Operating, as they do, in the busiest and most frequented localities, propelled by a subtle and powerful agency, at a higher rate of speed than other vehicles allowed upon streets and thoroughfares, it has been found necessary to require of their operators a high degree of care and caution in their conduct towards pedestrians and those using other and different kinds of vehicles. Having in view the danger to human life in the operation of such cars, it is uniformly held that it is the duty of the motorman in crowded city streets to be on the lookout, and to employ all reasonable means to avoid accidents, and to recognize and respect the equal rights of others in the use of the streets.

The requirement of care, as above stated, applies to all adults or infants; but in the case of the latter of tender years, who have not reached the years of discretion, a higher degree of care is demanded when discovered in a position of probable danger. The same degree of care towards such an infant as would be required towards an adult would not be a defense to a charge of negligence, but would, as has been said, amount to what is termed "gross negligence." The employe of the carrier can, when he sees an adult approaching its track, usually indulge in the presumption that he is sane and will not place himself in a position of danger; but not so in the case of a child, who has not reached the years of discretion. No presumption can be indulged in in regard to such a child, but the carrier must govern its actions with a view to the unreasonable conduct usually evinced by that class of persons.

When a young child is discovered approaching the tracks with the apparent intention of crossing it in front of a moving car, or if it be discovered upon the track, the sounding of gongs or ringing of bells would be no ground of defense, because to the child without discretion they would be meaningless, and nothing short of the greatest effort to stop the car and avert the danger would free the street car company from negligence.

It is the duty of street surface railway companies in cities and

towns to keep a careful lookout for persons or vehicles, not only on the track, but those appearing likely to enter upon the track in proximity to the cars. Street railways have the same right on the streets as the general public has, and no greater, and they must act with a view to the right of the public, and the duty rests upon them to see that their tracks are clear.

In this case, a child walked from the direction the car was coming, obliquely on the track, about 12 feet ahead of the car. The court says that if the child was seen, or could have been seen by the exercise of care, approaching the track with the apparent intention of getting on the track, or if it was seen or should have been seen on the track and every care was not used to prevent the injury, the company was liable. If the child was seen before or after getting on the track the street railway company would be held to a higher degree of care than in the case of an adult; for, while there was no proof as to the discretion of the child, it will be held, as a matter of law, that an infant of four years of age is lacking in that discretion which would warn it of the dangerous position occupied by it.

Under the facts in this case, the motorman must have seen the child approaching the track, and when it got on the track, with the car running at the slow speed it was, it was clear that by the use of ordinary care the car could have been stopped and the injury averted. If the motorman was engaged in conversation, or was looking to the sidewalks and away from the car track, and did not see the child approaching or on the track, he was derelict in his duty, and guilty of negligence which would be imputed to his master, and render it liable for the injuries inflicted upon the child.

REFUSAL TO STOP TO TAKE ON PASSENGER—NO DUTY
TO PREVENT PEOPLE BOARDING CAR CROSSING
RAILROAD TRACKS—BOARDING MOVING CAR
—SIGNAL UNNECESSARY WHEN INTEN-
TION KNOWN—INTOXICATION OF
PERSON INJURED ATTEMPTING
TO BOARD CAR.

South Chicago City Railway Co. vs. Dufresne (Ill.), 65 N. E. Rep. 1075. Dec. 16, 1902. Rehearing denied Feb. 4, 1903.

An allegation that the defendant (railway company) did not stop the car after the plaintiff had given notice of his intention to take passage, in consequence of which, while he was attempting to take passage, he was thrown to the ground, the supreme court of Illinois holds, did not state a cause of action for the plaintiff's injury. If a refusal to stop cars on notice would give rise to a cause of action, it would necessarily be for damages resulting from the refusal to stop, which might consist of delay or loss of time, but the refusal to stop and accept him as a passenger would not be the proximate cause of the injury alleged.

The place where the accident occurred was where three sets of steam railroad tracks had to be crossed. The street cars were compelled to stop, and the conductor to go forward and see if the way was clear, in the case of each set of railway tracks, and upon signals the cars would pass over such tracks. In this process they ran so slowly that persons could get on them if they saw fit, so far as the speed of the cars was concerned. The court says that it was not the business of the motorman to keep them off, nor the duty of the conductor. To hold that the defendant must prevent people from committing acts of negligence by getting on cars in motion at other than the stopping places would be to make it a guardian and protector of the public, and responsible for a failure to prevent acts of negligence. The mere fact that the negligent, heedless, or reckless should choose to get on the cars without due regard for their own safety would not change the responsibility of the defendant. It could only be held responsible for its own act of negligence, and to hold that it must prevent negligent acts in others, or assume the same responsibility as it would at a regular stopping place, would be equivalent to abolishing contributory negligence altogether. It was different from a case where a company, by the action of its conductors, encouraged the practice of boarding moving trains at a certain place, and it was held that it became its duty to run the trains in reference to the practice which it recognized and aided. The defendant being compelled to pass over these systems of tracks in the manner it did, there could be no inference that the speed was reduced to enable passengers to get on. If getting on the cars while crossing the tracks of the steam railroads

or negligence, it would of course make no difference how many persons were guilty of such acts of negligence.

It is not negligence, as a matter of law, for a passenger to get on a street car when it is in motion; but the question is one of fact, depending upon the rate of speed of the car and all the circumstances.

Evidence that a large number of people approached the cars and got on, with the knowledge of the motorman and conductor, was uncontradicted. Plaintiff was the last one to get on, and the motorman and conductor had notice of his intention to board the car. Under these circumstances, the court holds, it was not necessary for him to signal the motorman or conductor to manifest his desire, and it was not error to give an instruction to the effect that if the plaintiff did not signal the motorman or conductor, and the motorman did not slacken the speed of the cars or bring them to a stop for the purpose of inviting the plaintiff to get on, the verdict must be for the defendant.

If the plaintiff, by intoxication, exposed himself to danger, and received his injuries for the want of such care as a reasonably prudent person would have exercised if sober, he would be guilty of contributory negligence. Mere intoxication will not relieve a person from the responsibility of avoiding danger in attempting to get on a street car, to the same extent as if he had been sober. The rule is that voluntary intoxication will not excuse a person from such care as may reasonably be expected from one who is sober.

STARTING OF CAR ON SIGNAL OF STRANGER WHILE PASSENGER IS ALIGHTING—ABSENCE OF CARE AND FORESIGHT NECESSARY TO LIABILITY—NO LIABILITY FOR ACTS OF STRANGERS.

Krone vs. Southwest Missouri Electric Railway Co. (Mo. App.), 71 S. W. Rep. 712. Jan. 5, 1903. Rehearing denied Feb. 2, 1903.

It was requested that the jury be instructed that if they believed from the evidence that the conductor stopped the car at a certain street to let the plaintiff and another woman get off, and that the other woman got off, and, before the plaintiff could get off, some one, not an employe of the defendant, without the knowledge or authority of the conductor, rung the bell, and gave the motorman the signal to start, and in pursuance of said signal the motorman started the car, and the plaintiff fell off, then there was no negligence on the part of the defendant, and the plaintiff could not recover in this case, and their finding would be for the defendant. The court of appeals at Kansas City, Mo., says it cannot see upon what theory this instruction was refused, for if it was true that some person other than the conductor, and not in the defendant's employ, gave the signal which started the car while the plaintiff was attempting to get off, causing her fall and injury, it was not the result of any negligence on the part of the defendant, but that of a careless or mischievous stranger, over whom the defendant had no control. There must be absence of care and foresight in order to make the carrier liable for an injury to a passenger. Railroads are not to be held liable for injuries caused solely by the acts of persons who do not hold to them any relation of express or implied agency.

CONTRIBUTORY NEGLIGENCE A DEFENSE WHERE INJURY IS CAUSED BY ONE CONTINUOUS ACT OF NEGLIGENCE AS BY DRIVER NOT LOOKING FORWARD AT ALL.

Bortz vs. Dry Dock, East Broadway & Battery Railroad Co. (N. Y. Sup.), 79 N. Y. Supp. 1046. Jan. 23, 1903.

The proximate cause of an injury being one continuous act of negligence in careless driving by the driver of a horse car who had his head averted and evidently was not aware of any one being on or near the track until the accident occurred, the first appellate division of the supreme court of New York holds that it was error to modify a requested instruction on contributory negligence by charging the jury, in effect, that, if they found the facts to be as stated in the request, the contributory negligence thereby established would not prevent a recovery, if by the exercise of reasonable care and prudence the accident could have been avoided, thus eliminating from the case the whole subject of contributory negligence, for the reason that the jury would be entitled to find that the car was not operated by the driver with reasonable care and prudence. The court considers the case entirely unlike those in which a new

element is introduced to show that, notwithstanding contributory negligence, by the exercise of reasonable care and prudence of a defendant or its servants the accident could have been avoided.

LEGISLATIVE AUTHORITY REQUIRED—ELECTRIC ROAD NOT AN ADDITIONAL SERVITUDE CHANGING SYSTEM WHEN FIRST AUTHORIZED BY PRIVATE CONTRACT ONLY.

Humphreys vs. Ft. Smith Traction, Light & Power Co. (Ark.), 71 S. W. Rep. 662. Jan. 10, 1903.

The supreme court of Arkansas holds that, while the county court has general jurisdiction of all matters pertaining to the public roads of the county, yet the public roads referred to are the common highways of the county, constructed for the convenience of the public as a way for the passage of pedestrians, horsemen, animals, and private vehicles, etc., and that, without legislative grant, the county court cannot add to or enlarge the servitude on public highways, to the extent of granting permission to private persons or corporations to construct and operate street railways over the public highways of the county.

Again, the court hold that if, in this case, the grant of the right of way to the horse-car system had been by one having authority, and not a mere permission and waiver of claim for damages by abutting owners, the change from a horse car to an electric system, with the necessary changes of appliances, would not amount to an additional servitude, but only to an improvement, which is allowable, and without further express grant. But in this case the plaintiff was bound only by her contract, and any change in the location of the track which was essentially different from that in view of which they contracted, and which worked an injury to her property or business, created a liability in her favor and against the company. Likewise the erection of poles and wires.

DUTY OF TEAMSTER TO LOOK AND LISTEN FOR CAR UNTIL PAST FURTHER TRACK—INSTRUCTION OF JURY.

Sanitary Dairy Co. vs. St. Louis Transit Co. (Mo. App.), 71 S. W. Rep. 726. Jan. 20, 1903.

It is the law here and elsewhere, says the court of appeals at St. Louis, Mo., that it was the duty of the plaintiff's driver, before he attempted to drive across the street, to look and listen, according to his opportunity, for an approaching car on the south track, and that his duty was continuing until he passed the track. And if the car on the northwest corner obstructed his view when he first got on the street, after passing that obstruction it was his duty then to look for an approaching car before driving on the south track. The law has established specifically what is "ordinary care" in a traveler approaching a railway crossing before attempting to pass over it, and it is the duty of trial courts, whenever the question is to be submitted to a jury, to define in the terms the law has laid down what constitutes ordinary care, and not leave it to the jury to draw their own conclusions as to what ordinary care is in such circumstances.

NATURE OF CONSENTS OF ABUTTERS AND THEIR RIGHTS TO SELL SAME.

Hamilton, Glendale & Cincinnati Traction Co. vs. Parish (Ohio), 65 N. E. Rep. 1011. Nov. 18, 1902.

The consents of owners of lots abutting on a street to the construction and operation of a street railroad on such street, the supreme court of Ohio holds, are not property rights that can be appropriated under the power of eminent domain. Such consents are not property rights, but rights in their nature personal to each owner of an abutting lot. Such personal rights were bestowed by the general assembly on owners of abutting lots as a check upon the power of municipal authorities to authorize street railroads to be constructed and operated against the wishes of the owners of lots on such street. The owners of abutting lots are free to give or withhold such consent, upon such terms as to them severally may seem proper, and there is no public policy in the state of Ohio against giving such consent for a valuable consideration moving from the street railroad company to such lot owner.

MUELLER BILL APPROVED.

The Mueller enabling act, permitting municipal ownership of street railways, was approved by the governor of Illinois late on the evening of May 18th.

CHICAGO ENGINEERING & CONSTRUCTING CO.

The Chicago Engineering & Constructing Co., of Chicago, has been organized with a capital of \$250,000, and has acquired the engineering and contracting business of Weston Brothers, 711 Merchants Loan and Trust Bldg., Chicago. The officers of the company are: President, Charles V. Weston; Vice-president, George Weston; Secretary and General Manager, George A. Yuille; Counsel, Hervey B. Hicks. These officers and Addison E. Wells, Fred A. Wells and Edward B. Burling, all of Chicago, constitute the directors.

FINANCIAL.**DETROIT UNITED RY.**

The statement of the Detroit United Ry. for March, 1903 (all properties), is as follows:

| | 1902. | 1903 | Increase. |
|-----------------------------|-----------|-----------|-----------|
| Gross earnings | \$303,140 | \$327,026 | \$24,480 |
| Expenses and taxes | 174,673 | 195,325 | 20,652 |
| March net | 128,467 | 132,301 | 3,834 |
| Other income | 2,281 | 3,041 | 760 |
| Total income | 130,748 | 135,342 | 4,594 |
| Charges | 76,627 | 82,533 | 5,906 |
| March surplus | 54,121 | 52,809 | *1,312 |
| Three months' gross | 848,634 | 923,644 | 75,010 |
| Expenses and taxes | 498,354 | 568,369 | 70,015 |
| Three months' net | 350,280 | 355,275 | 4,995 |
| Other income | 7,376 | 12,366 | 4,990 |
| Total income | 357,656 | 367,641 | 9,985 |
| Charges | 227,103 | 243,253 | 16,150 |
| Three months' surplus | 130,553 | 124,388 | *6,165 |

*Decrease.

The earnings for April were \$319,256.64, compared with \$280,750.65 for April, 1902.

INTERNATIONAL TRACTION CO.

Following is the statement of income account of the International Traction Co., Buffalo, for March, 1903:

| | 1902. | 1903. | Increase. |
|--|-----------|-----------|-----------|
| Gross earnings | \$260,729 | \$295,916 | \$ 35,186 |
| Operating expenses (excluding taxes) | 152,983 | 170,294 | 17,310 |
| Net Earnings | 107,745 | 125,621 | 17,876 |
| Fixed charges | 124,580 | 130,861 | 6,274 |
| Net income | 16,840 | 5,239 | **11,601 |
| Net income, July 1st to date..... | *636,365 | 135,742 | **500,622 |
| Operating ratio (exclusive of taxes) | .596 | .584 | **0.012 |

*Includes earnings of Pan-American Exposition period.

**Decrease.

The comparative statements for the quarters ending March 31, 1902-03, follow:

| | 1902. | 1903. | Increase. |
|--|-----------|-----------|-----------|
| Gross earnings | \$748,068 | \$859,473 | \$111,404 |
| Operating expenses (excluding taxes) | 438,463 | 494,907 | 56,443 |
| Net earnings | 309,604 | 364,565 | 54,961 |
| Fixed charges | 373,630 | 378,303 | 4,672 |
| Net income | 64,026 | 13,737 | **50,283 |
| Net income, July 1st to date | *636,365 | 135,742 | **500,622 |
| Operating ratio (exclusive of taxes) | .599 | .585 | **0.014 |

*Includes earnings of Pan-American Exposition period.

**Decrease.

The Metropolitan West Side Elevated Railway Co., of Chicago, earned \$16,000 over and above 4 per cent on the preferred stock last year, and this in the face of extraordinary expenses, including an unusual expense of \$45,000 for coal. It also had use of only part

of the extensions for the year. The writing off of \$20,000 on old accounts cut down the surplus. This year's traffic is estimated at over 125,000 passengers daily, which will more than pay for the preferred dividend.

TOLEDO RAILWAYS & LIGHT CO.

The statement of the Toledo Railways & Light Co. for March compares as follows:

| | 1902. | 1903. | Increase. |
|--------------------------|-----------|-----------|-----------|
| Gross earnings | \$111,174 | \$127,012 | \$15,838 |
| Operating expenses | 53,151 | 65,452 | 12,301 |
| Net earnings | 58,023 | 61,559 | 3,536 |
| Deductions | 37,833 | 40,715 | 2,882 |
| Surplus | 20,189 | 20,844 | 654 |
| Operating ratio | 47.81 | 51.53 | 3.72 |

CINCINNATI, NEWPORT & COVINGTON.

Following is the condensed statement of the Cincinnati, Newport & Covington Light & Traction Co. for March:

| | 1902. | 1903. | Increase. |
|---|-----------|----------|-----------|
| Gross receipts | \$ 86,237 | \$94,829 | \$ 8,592 |
| Operating expenses | 36,188 | 39,456 | 3,267 |
| Damages, taxes, rents and tolls..... | 13,728 | 16,839 | 3,111 |
| Total expenses | 49,916 | 56,295 | 6,378 |
| Net earnings | 36,320 | 38,533 | 2,213 |
| Fixed charges | 21,140 | 22,608 | 1,467 |
| Net profit | 15,180 | 15,925 | 745 |
| Operating ratio | 41.96 | 41.60 | ..... |
| Same, including damages, taxes, rents and tolls | 57.88 | 59.36 | ..... |

Following is the company's statement for the quarter:

| | 1902. | 1903. | Increase. |
|---|-----------|-----------|-----------|
| Gross receipts | \$250,446 | \$275,304 | \$24,857 |
| Operating expenses | 108,119 | 115,451 | 7,331 |
| Damages, taxes, rents and tolls..... | 40,691 | 50,025 | 9,334 |
| Total expenses | 148,810 | 165,476 | 16,665 |
| Net earnings | 101,635 | 109,828 | 8,192 |
| Fixed charges | 62,820 | 66,848 | 4,028 |
| Net profit | 38,815 | 42,980 | 4,164 |
| Operating ratio | 43.17 | 41.93 | ..... |
| Same, including damages, taxes, rents and tolls | 59.41 | 60.10 | ..... |

PHILADELPHIA CO., PITTSBURG.

The annual report of the Philadelphia Co. for the year ending Mar. 31, 1903, shows the gross earnings to have been \$3,930,318.38; operating expenses and taxes, \$1,758,172.04; net earnings, \$1,599,918.71; total income, \$3,147,603.15; net income, \$3,028,980.60; surplus, per balance sheet, \$1,991,664.71. The first annual report of the Pittsburg Railways Co. for the year ending Mar. 31, 1903, shows gross earnings of \$8,276,565.08; operating expenses, \$4,802,623.44; net earnings, \$3,473,941.64; total income, \$3,592,390.50; net income, \$2,532,843.06; surplus, \$206,961.79. The gross earnings increased \$1,006,729.81 over the preceding year; passengers carried, 164,407,446; car mileage, 33,577,214 miles; net earnings per car mile, 10.32 cents. The company built 27 miles of new tracks, making the total 411 miles.

LOUISVILLE RAILWAY CO.

The earnings of the Louisville Railway Co. for the first quarter of 1903 showed a substantial increase over the corresponding quarter in 1902, and it is predicted that at the present ratio of increase the gross earnings for the present year will not fall short of \$2,000,000. The gross earnings for 1902 were \$1,772,000, or an increase of about \$155,000. On a basis of 55 per cent last year operating expenses amounted to \$974,600, leaving net earnings of \$797,400. On the same basis, if the gross earnings reach \$2,000,000 this year the net should be \$900,000.

Authoritative announcement has been made that a holding company is to be formed to take over the Columbus (O.) Railway Co. and the Columbus Edison Co., the common stockholders of both companies to be guaranteed dividends beginning July 1st at the

rate of 3 per cent for two years, 4 per cent the third year and 5 per cent thereafter.

The gross passenger receipts of the Lake Shore Electric Railway Co. for April were \$41,414.89; increase, \$10,748.90, or 35 per cent.

MINIATURE RAILWAYS.

With the advent of the park season a large number of miniature railways will be in evidence in many pleasure resorts, and it is notable that after several years of successful operation these amusement devices exhibit an increasing popularity, and their patronage is drawn not only from the younger element, but to a considerable extent from those of mature years.

These small roads and trains are built by the Miniature Railway Co., of New York, and are in fact complete steam railroads on a small scale, the roadbed being laid with small T-rails on miniature ties and rolling stock comprising locomotives operating with their own steam, tenders and passenger cars. The locomotives are exact reproductions of standard 8-wheel locomotives, but are only about 6 ft. in length, and they have been successfully used in industrial work where space is limited, as well as for amusement purposes.

Miniature railways have been a prominent feature of a number of expositions, including those at Charleston, the Pan-American, Omaha, and Glasgow, Scotland, and have proved paying amusement features wherever they have been introduced in street railway parks.

BAKER HEATER PATENTS.

William C. Baker, successor to the Baker Heater Co., advises us that the United States Circuit Court of Appeals (the court of last resort in this litigation) has affirmed the decision of the United States Circuit Court enjoining the Crane Co. from infringing upon the Baker combination cock and filling apparatus for car heaters. In its opinion the court said in part: "The claim and so much of the specification as relates thereto are as follows: 'In car-heating apparatus it has heretofore been usual to provide an expansion-vessel above the body of the car, into which the pipes from the heating apparatus ascend, so that the water circulates through the expansion-vessel in heating the car. There is more or less leakage in the apparatus, involving a loss of water that has to be made up from time to time by filling water into such expansion-vessel to keep the same at the proper height; and a supply-cock has been used with a funnel connected by a screw coupling; but when the supply-funnel is left in its position for use it is liable to become charged with cinders and dust. In my present improvements the supply-funnel and the screw connecting it to the cock are constructed in such a manner that when the funnel is turned up into position for use the screw is tightened. The cock is screw-threaded at one end and screwed into the expansion-vessel at or near the water-line, and at the outer end of the cock is a screw-socket, receiving the screw-threaded end of the funnel, and the parts are constructed in such a manner that when the collar is screwed up firmly against the end of the socket the funnel will be vertical and in position for the reception of water for the expansion-vessel, and when the water has been filled in through this funnel the attendant simply gives the funnel a half rotation, partially unscrewing it, and the funnel hangs downward and is not liable to become detached and cannot become obstructed by cinders or dust. * * * I claim as my invention: 1. The combination, with the expansion-vessel and the cock having a horizontal screw-threaded socket, of the funnel having a bend and a horizontal screw-threaded connection to the cock, whereby the funnel is allowed to hang down when partially unscrewed and held firmly by the friction when turned up for use, substantially as specified.'

"* * * We think that the described screw-threaded connection in this combination is not the mere equivalent of a union nut; that in effect another element, the shoulder, has been introduced, making a different combination; and that the new combination produces a result wanting in the old, namely, the automatic action of the shoulder of the funnel upon the end of the cock in making a sufficiently tight joint and frictionally holding the funnel at the right point and at no other."

CONVENTION ACCOMMODATIONS.

Those who are in the habit of attending the annual street railway conventions are well aware of the fact that three months in advance is none too early to make arrangements for hotel accommodations during the convention, and all those who contemplate attending the Saratoga meetings in September, next, will be interested in the announcement that Congress Hall will make special rates for this occasion, a concession which we believe is not being made by the other houses there.

Congress Hall is one of the largest and best of the Saratoga hotels, having accommodations for 1,000 guests. It is situated directly opposite the headquarters and exhibits of the convention, and its long street frontage and beautiful piazzas make it very attractive. This house is well and favorably known and has already on hand a very considerable number of applications for rooms for the first week in September, when our conventions will be held.

NEW ENGINEERING BUILDING FOR U. OF P.

The plans for the new engineering building for the University of Pennsylvania have been completed. It will be 300 x 160 ft., with a wing 40 x 50 ft., 3 stories and basement, with a total available floor space of 128,000 sq. ft. The construction will be fireproof. The exterior will be of dark brick, with sandstone trimmings, and the architectural treatment will be of a high order. Beside laboratories, reference library, reading room, etc., there will be rooms for the use of engineering societies, engineering museums, class and instructors' rooms. The building will be ready for occupancy by the fall of 1904.

CANADIAN WESTINGHOUSE COMPANY.

It was announced May 10th, that a Canadian Westinghouse company would be organized to manufacture in Canada, the apparatus needed to supply that market. The plant will be located at Hamilton, Ont., and the Westinghouse Air Brake Co. included, thus enabling the latter's real estate and plant at Hamilton to be utilized to advantage. The capital of the new company is to be \$2,500,000, of which the Air Brake company will take \$850,000, and the Electric company \$950,000, the remaining portion being subscribed for by Canadians. Messrs. Ahearn & Soper, who have heretofore represented the Westinghouse interests in Canada, have been largely instrumental in arranging for the new Canadian company and both will be on the board of directors.

A NEW TROLLEY CATCHER.

A trolley catcher recently invented by Seth J. Buckland, of Springfield, Mass., originator of the Buckland device for reclaiming tram-girder rails, is being tried on the cars of the Springfield Street Railway Co., and is said to be working admirably. The device is very simple and consists of five parts; a spool, take-up spring, and a pivot lever, with a wire to operate it, enclosed in an iron case. It is claimed for it that it is but half the size and weight of other trolley catchers; also that it never skips and will not allow the pole to fly up over four inches, and many times only two, in case it leaves the trolley wire.

CHICAGO OFFICE OF CHRISTENSEN CO.

The Christensen Engineering Co. announces that its constantly growing business has made it necessary to provide increased office facilities in Chicago; consequently a large office, fully equipped with every convenience, has just been opened in the Old Colony Building, where representatives of both the air brake and the electrical sales departments will be pleased to welcome the customers and friends of the company.

Mr. Charles G. Burton, manager of the Chicago agency for the sale of the company's "Ceco" electrical machinery, has removed from the Merchants' Loan & Trust Building into the new office.

The air brake department is in charge of Mr. J. E. Eldred, jr., who is well known in the electric railway field, having for a considerable time represented the Christensen company in the sale of air brake equipments.

STANDARD PAINT CO. HOUSE-WARMING.

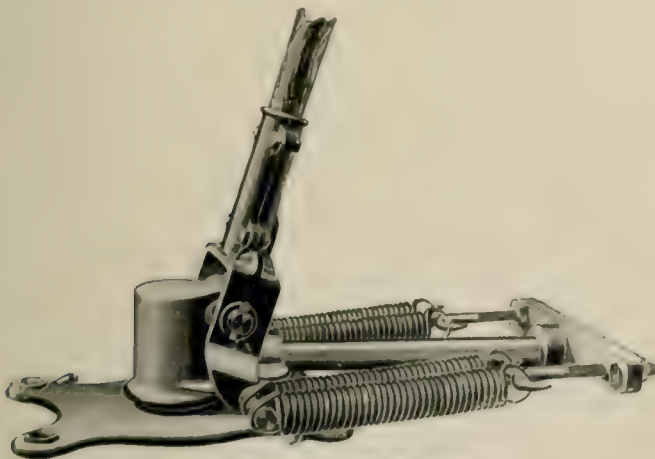
To celebrate the completion of its new factory building in South Bound Brook, N. J., the Standard Paint Co. gave its employes a house-warming Wednesday evening, April 22d, to which were also invited numerous persons prominent in the business world. Not only was the occasion felicitous, but it served to introduce the employes to their new home under most favorable auspices. The visitors were unstinted in their praise of the new plant and its appointments.

The Standard Paint Co. was organized in 1886 with Ralph L. Shainwald as president, Silas S. Packard, since deceased, vice-president, and Felix Jellinik, secretary and treasurer. Mr. Shainwald and Mr. Jellinik have continuously held their offices; Mr. Max Drey is the present vice-president. The first factory was erected at Bound Brook on a part of the present site. A portion of the factory at the beginning consisted of a frame building formerly used as a planing mill. This building has long since disappeared, and the site is now occupied by a brick and iron structure forming a part of the present mills. The Standard company was the first to place upon the market an odorless, water-proof insulating paper, and the first to make a liquid insulating compound which could be applied without heat; it was also the first manufacturer of a ready roofing (Ruberoid) which was odorless, weather-proof and elastic. The demand for these so increased beyond the capacity that extensions of the plant and purchases of additional land have been continuously necessary. There has not been a time during the past five years when the company has not been behind its orders. Within the last two years the pressure became so great the company was obliged to consider doubling its capacity. The result was the purchase of an additional large tract of land contiguous to the Bound Brook property, with the buildings thereon, and the erection of the largest new building which the company has yet added to its plant. It is three stories, brick and iron, 350 to 375 ft. long. As the factory now stands a building about 500 ft. long will be devoted entirely to the manufacture of "Ruberoid" roofing.

It is estimated that in Bound Brook the company and its employes disseminate \$75,000 per year. Among the employes there is a mutual benefit insurance association for the sick and disabled, to which the company contributes annually an amount equal to the total contributed by the men. Another unique feature is that quite a number of the employes are shareholders in the company. This policy of mutual interest has been encouraged by the company among its men.

STERLING ROLLER BEARING TROLLEY BASE.

The accompanying cuts show the Sterling roller bearing trolley base No. 1, made by the Sterling-Meaker Co., of Newark, N. J.

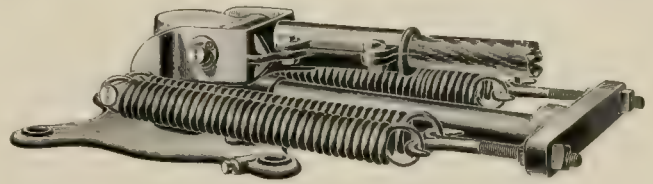


STERLING TROLLEY, RAISED.

It is pointed out that this base differs broadly in construction from any other, and comprises only a few, and very strong, parts. The base proper, cap, fork, clamp and bar are of malleable iron, the

shaft and rollers of cold rolled steel, the hooks of wrought iron, and the springs of excellent quality.

Using four springs, instead of two, or one, is designed to equalize the tension, rendering it nearly uniform at all angles, and enables it to be graduated to the needs of the service. It is claimed that the ordinary tension of the springs is fully equal to all but the



STERLING TROLLEY, LOWERED.

extraordinary requirements of high speed roads, and that higher pressure can be easily created.

The bearings of this base are on steel rollers, instead of balls, and are claimed to insure perfect ease of revolution, thereby permitting the trolley wheel to run on its center around corners. The total height of the base with the pole down is 6¾ in., making it especially desirable for use on cars running under low bridges.

ELECTRICAL APPARATUS FOR NORTHWEST.

What is perhaps the largest contract for electrical generators ever placed for use west of the Rocky Mountains has been awarded by Stone & Webster, of Boston, managers of electric power, traction, and lighting plants along Puget Sound, to the General Electric Company. The order is for six machines, two to be furnished to the Tacoma Industrial Co. for use in its development of the White River and four to the Pierce County Improvement Co. for the work of developing the Puyallup River, including the flow from the Mount Rainier glaciers. The generators will be three-phase, 60-cycle, of 3500 kilowatt capacity each, at 2300 volts and 225 revolutions. Deliveries will commence next September.

Both of these developments are now being carried forward and it is announced that every effort will be made to complete them at the earliest possible date to meet the growing demands for power in the Puget Sound district and to supply the electric Interurban road between Seattle and Tacoma as well as the railway and power distributing systems in those cities which are now controlled by Stone & Webster.

ELECTRIC HEATERS FOR NEW YORK SUBWAY.

The Consolidated Car-Heating Co. has closed a contract with the Interborough Rapid Transit Co. of New York, for furnishing 12,680 electric heaters; 12,000 of the heaters are of the panel type, and 680 of the cross-seat type for cabs. There will be 24 panel heaters in each car, 20 of them being placed under the longitudinal seats and 4 under stationary cross-seats, which are to be paneled. The panel heaters are of Consolidated standard construction with cast iron front and back, but somewhat smaller than those shown in the company's catalog.

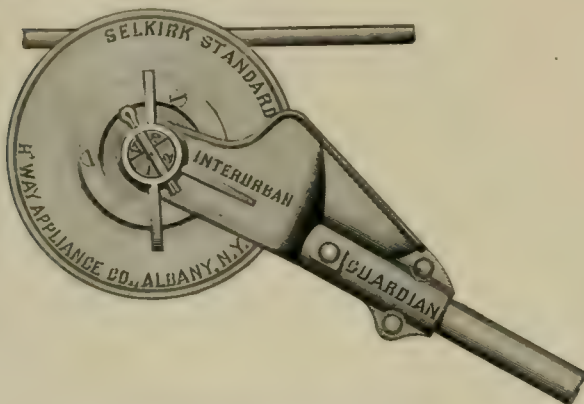
In a car equipment of 24 panel heaters and 2 cab heaters there is required one mile of wire for the heater coils. The heater fronts are to be finished in black japan. Heaters are to be arranged for three gradations of heat.

This order was awarded to the Consolidated company after careful consideration and tests, and is we believe the largest order ever placed for electric heaters, with the exception of the Manhattan Railway order for 21,600 heaters given the Consolidated company in July, 1901.

The Consolidated company has received the following large orders recently: Manhattan (Elevated) Railway, of New York, 2,300 panel heaters and 125 cab heaters; St. Louis & Suburban Street Ry. equipments for 100 cars, 16 heaters per car; Ford, Bacon & Davis, equipments for 30 cars for Kansas City, 12 heaters per car, and 25 equipments for Nashville; Washington Ry. & Electric Co., equipments for 20 cars. Orders for the St. Louis & Suburban and for the Kansas City cars were taken by Chicago office; all others by the New York office.

NEW FORM OF TROLLEY WHEEL AND HARP.

A new trolley wheel, in which the central or wearing portion of the wheel is removable, has been placed on the market by the Railway Appliance Co., 12 Plain St., Albany, N. Y. The wheel itself consists of a grooved central conductor upon which the wheel travels when pressed against the trolley wire, this central conductor being formed of a special alloy or mixture of metals designed to give best service, conductivity and endurance. The flanges of the wheel are malleable iron clamping plates, held tightly against the central piece or conductor by means of screws or rivets so that a perfect electric connection is preserved between all sections of the wheel. All seating surfaces between the central piece and the side flanges are finished to insure accurate fitting. The outwardly projecting flange portions of the side or clamping plates have their inner surfaces flat and straight and are vertical instead of flaring to prevent the wheel from jumping laterally from the line wire. The wheel is mounted on an axle of hardened steel 3 in. in length, $\frac{3}{4}$ in. in diameter with a fixed key for holding with the wheel so that the wheel and axle rotate as one piece. The bearings of the journals of the axle are steel, cylindrical in form and are held in place from turning in the sleeves of the harp by means of cotter pins. It will be observed the various parts of the wheel are readily removable for renewing all worn parts. A chamber is provided within the axle for holding a charge of suitable lubricating compound, which lubricant, when the wheel is in action feeds from the center toward



SELKIRK STANDARD TROLLEY.

each end of the axle and escapes to the surface of the journals through suitable ports.

The harp is of malleable iron and is provided with inclined upper edge guards which extend from the forward end rearward, and also with inclined vertical side guards, which guards operate to guard the wheel from entanglement with span wires, suspended switch plates, crossing plates and with other portions of the overhead construction. It is believed this design offers the least possible obstruction to the free passage of the wheel along the line wire and also guards against damage to the overhead work or to the wheel in the event of the trolley leaving the wire.

The appliance is sold under the name of the "Selkirk Standard Trolley" and is made in sizes suitable for both city and interurban service. Service trials with these types of wheel indicate that when lubricated with the "Selkirk" standard lubricant the central conductor will run over 6,000 miles in city service and from 20,000 to 25,000 miles and over for the interurban wheel before the central portion will require to be renewed.

SUCCESSOR TO ALLSTON FOUNDRY CO.

The National Brake Shoe Co. has succeeded to the business and to all patent rights, including the foundry and manufacturing plant, of the Allston Foundry Co., of Boston, Mass. The president of the new company is William W. Whitcomb; treasurer, Emuel L. Gifford. With increased facilities for manufacturing, the business will be conducted on a larger scale than heretofore. The general offices will remain at No. 620 Atlantic Ave., Boston.

THE WIGHTMAN RAIL BOND PATENT DECLARED VOID.

The Mayer & Englund Co., of Philadelphia, advises us that the patent suit filed against it by the Morris Electric Co., of New York, Dec. 18, 1900, in the Circuit Court of the United States, Southern District of New York, claiming infringement of patent No. 460,615, of Merle J. Wightman, dated Oct. 6, 1891, and owned by the Morris Electric Co., on account of the Mayer & Englund Co. manufacturing and selling its "Protected" rail bond, was decided April 7th. Judge James P. Platt in his opinion said: "The device of the patent in suit consists of a flexible conductor provided at its ends with attached solid blocks headed in holes in the rails. The purpose of this device is the connection of the adjoining adjacent ends of rails of a railway track electrically in order that the current may pass through said conductor from one rail to another.

"The claims on controversy in this suit are 8 and 9, which read as follows:

"8. An electric union for railway rails, consisting of a flexible conductor provided at its ends with attached solid blocks headed in holes in said rails, as and for the purpose described."

"9. An electric bond or union for the end of railway rails, consisting of a flexible conductor provided with solid heads crimped around the end of the conductor, and provided with a lug or projection, as and for the purpose described."

"In view of the prior art disclosed in the patents relied upon by defendant, as well as of the electrical conducting devices including electrical unions for railway rails and for other purposes shown to have been in public use prior to the patent in suit, I am led to the conclusion that claims 8 and 9 of said patent are not for subject matter patentable novel at the date of the said patent and that they are void."

NEW YORK OFFICE FOR E. P. ROBERTS & CO.

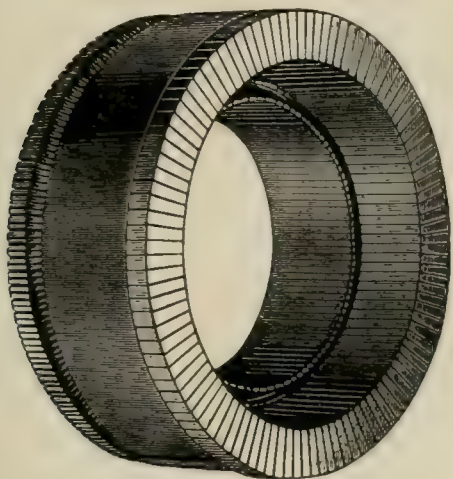
The engineering firm of E. P. Roberts & Co., Cleveland, has found its eastern business increasing so rapidly that it has opened an office in the Broad Exchange Building, New York, where eastern clients can receive the personal attention of its representative. The office has been placed in charge of Mr. William C. Andrews, until recently associate editor of the Street Railway Journal. Mr. Andrews is a graduate of the School of Mines, Columbia University, receiving the degree of electrical engineer in 1895, and is well known in the electric railway field. Beside his intimate association with railway construction and operation in his editorial work he has had considerable practical engineering experience in the manufacture of both direct and alternating current apparatus. E. P. Roberts & Co. do a general consulting engineering business in electric railway and lighting work, some of the roads upon which they are now engaged being the Northern Texas Traction Co., the Muncie, Hartford & Fort Wayne, and the Dayton & Muncie Traction Co. Mr. Andrews will take with him into his new work the best wishes of a host of friends, including those associated with the staff of the "Review."

NEW PLANT FOR CONTINUOUS RAIL JOINT CO.

Messrs. Geo. G. Frelinghuysen and Frederick T. Fearey, representing the Continuous Rail Joint Company of America, have concluded the purchase of about twenty acres of land at Troy, N. Y., with the rolling mills, machine shops and numerous other buildings formerly owned by the Troy Steel Co., part of which they have been operating under lease for the past three years. The property has a dock frontage on the Hudson River and the New York Central Railroad runs through it. The new switch has just been completed from the New York Central company's tracks around the rolling mill. The Wynantskill Brook runs across the entire plot, giving an excellent and constant supply of fresh water. The plant will hereafter be known as the Albany Iron & Steel Works Department, of the Continuous Rail Joint Company of America. The output of the products of the company will be greatly increased. It is well known in railroad circles that the "Continuous" rail joints have been applied to over 15,000 miles of railroad track. The general offices have always been and will remain in Newark, New Jersey.

NEW QUARTERS FOR CAMERON COMPANY.

The H. P. Cameron Electrical Manufacturing Co., of Ansonia, Conn., is now located in its new factory at Ansonia, which is equipped with new and additional machinery placing the company in a position to handle promptly its rapidly growing business in commutators and bars. The company makes a specialty of commutators and commutator bars and removed from its former location at Syracuse, N. Y., in order to be in the center of the copper manufacturing district where it could secure better prices and quicker delivery for the copper used. The commutator segments made by



COMMUTATOR FOR G. E. 800 MACHINE.

this company are from hard drawn pure copper put through the dies to finished sizes, and it is claimed that in uniformity of density, temper and texture they are superior to those made by other processes. The accompanying illustration shows an assembled commutator for a G. E. 800 machine. The company has been engaged in this line for the past 15 years and has made a point of catering to the demands of street railway companies for the output, although a very considerable portion goes to the manufacturers of dynamos and electrical machinery.

ALLIS-CHALMERS TO MAKE GAS ENGINES.

The Allis-Chalmers Co. has just closed a contract under which it secures the exclusive right to manufacture and sell the Nurnberg gas engine in the United States, and the selling rights for several foreign countries. The arrangement was concluded through Mr. A. Rieppel, of Nurnberg, Germany, managing director of the Augsburg-Nurnberg Manufacturing Co. who visited America for the purpose of making arrangements by which his concern and the Allis-Chalmers Co. could get into closer touch with the trade throughout the world.

The Augsburg-Nurnberg company has been well known for many years as one of the largest and most successful builders of structural iron work, engines, cars, bridges, etc., in Europe. The works employ about 16,000 men and now have over 2,000 at work on the bridges, etc., of the new railroads being built by Germany in China.

The company's latest success has been with gas engines, both for gaseous and liquid fuel. It has long built these engines in smaller units up to 400 h. p. and operated with petroleum, but for the use of waste gas as well as producer gases and in larger units it has recently developed an entirely new design, the result of many years of experience. This engine, which is of the double-acting four-cycle type, generally in tandem arrangement, is best adapted for the various purposes of modern power development up to the largest units required by municipal central stations and iron and steel works.

Mr. Rieppel's company is very proud of the record made with this engine, it having received within a few months orders for some 50,000 h. p. of engines for installation in Germany and Spain, chiefly for generating electric energy and for blast furnace and spinning mill work. One of these engines now being built is for an

important spinning mill in northern Germany, where the engine will be operated by producer gas.

Mr. Rieppel is now on a tour of inspection throughout this country, after which he will visit the new and extensive works of the Allis-Chalmers Co. at West Allis, where these engines will be built.

ANNOUNCEMENT.

Messrs. Wilkinson, Reckitt, Williams & Co., public accountants and auditors, have recently opened new and larger offices at the following locations: New York City, 701-702, 52 Broadway; Philadelphia, 516 Stephen-Girard Bldg.; Chicago, 801-805 Marquette Bldg.

Mr. George Wilkinson will reside in the East, and conduct the New York, Philadelphia and eastern business, while Mr. Ernest Reckitt and Mr. John J. Williams will remain as heretofore in Chicago, and look after the interests of the firm in Chicago and the West.

The professional standing of these gentlemen and their long experience in matters pertaining to accounts, gives a value to their certificates which is well recognized and accepted by bankers and business men. In the accounts of transportation companies they have had considerable experience, as is evidenced by the fact that they are the auditors of the White Pass & Yukon Route in Alaska, and of the Goodrich Transportation Co., of Chicago, while some years ago Mr. John J. Williams was the auditor of the Calumet Electric Street Railway Co., of Chicago, and developed that company's accounting methods, many features of which were later incorporated in the standard system of accounts adopted by the Street Railway Accountants' Association. On several occasions their services have been called into requisition by the courts to investigate the books of account of the parties to the suit and report direct to the court the result of such examination.

They are in a position to act as receivers or trustees in bankruptcy cases. Recently one of the members of the firm was appointed receiver by the court in the case of a failure involving total liabilities of almost one million dollars, and no difficulty was experienced in obtaining a bond of half a million dollars from the American Surety Co. to secure all parties interested.

The London agents of the firm are Messrs. Woodthorpe Bevan & Co., an old established firm of chartered accountants of high standing, which enables Messrs. Wilkinson, Reckitt, Williams & Co. to take care of their clients' interest both in this country and in Europe.

WEATHERPROOF TELEPHONE.

The Connecticut Telephone & Electric Co., of Meriden, Conn., is introducing widely a new style of weatherproof telephone especially designed to meet the needs of street railways. The instrument is a complete telephone in itself. The iron box is divided into two compartments, the left hand one containing a hand microphone and a lighting arrester, and the right hand one the batteries, a 50,000-ohm magneto generator of the latest type. The generator is covered to prevent injury, the crank projecting through the door convenient for use when the box is opened. On the under side of this instrument is mounted a gong box, containing two 3-in. gongs, which are thus placed so as to be audible for a long distance. The whole apparatus is so designed that it may be removed from the iron box by taking out two screws.

The cases are finished in a manner similar to U. S. mail boxes. The instrument can be wired to suit the conditions under which it is used.



The Union City, Winchester & Muncie Traction Co. recently purchased from the Westinghouse Electric & Manufacturing Co. two alternating current generators which will be used in connection with an extension to the Dayton & Northern division. When the extension is completed through electric cars will be operated from Dayton, O., to Muncie, Ind.

HUNT SIMPLEX SWITCH.

The accompanying drawings illustrate a street railway switch and operating mechanism which we believe will be found interesting by those connected with the track and operating department of street railways. This is the invention of Mr. O. D. Hunt and is known as the Hunt "Simplex" street railway switch. The switch point is operated by a shaft about 20 ft. long, and levers which are arranged as shown diagrammatically in Fig. 1. The shaft is located in a conduit placed in the center of the track. This conduit is most

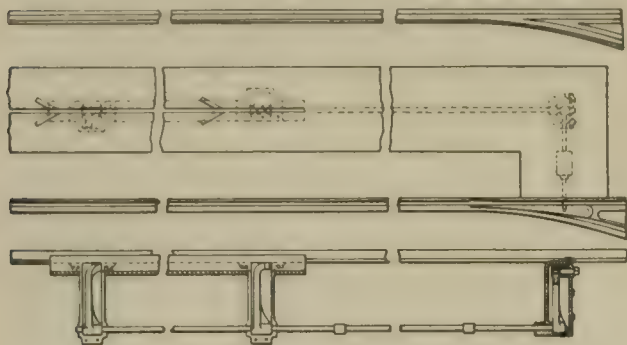


FIG. 1.

simply formed of two channel bars of the same height as the rails which are fastened to the ties by spikes driven through holes in the lower flange. These two channels constitute the sides of the conduit. Suitable holes are drilled in the upper flanges of the channel to receive corresponding projections in the bottom of the steel cover plate so that the latter is held firmly in its proper position. A slot about $\frac{5}{8}$ in. wide is cut in the center of the cover plate, extending to within a short distance of each end. The rock shaft is provided with two upwardly and latterly extending steel arms which leave the shaft at slightly different angles, one arm passing diagonally just across the slot opening to one side of the slot when the switch point is in one position and the other arm passing diagonally just across the slot opening to the other side of the slot when the switch point is in the other position. A detachable foot lever in the vestibule of the car is connected with a rod under the car which extends back to the simple tripping device attached to the truck or bottom of the car. When the lever is depressed as shown in Fig. 3 the point or toe of the tripping device is moved downward to the slot in the steel plate. This plate is provided with several pairs of fins so that if the tripper should happen to be three or four inches

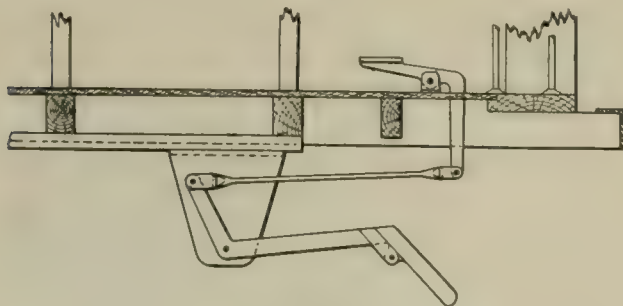


FIG. 2.

out of adjustment, which is considered an almost impossible situation, the fins will move it over until it enters the slot and engages the only arm which is then across the slot line. The arm extends diagonally and at such an angle that when the tripper pushes the arm out of the way and to the side of the slot, the arm has only moved $1\frac{1}{4}$ in., which is sufficient to move the switch point. The other arm is 6 ft. in front of the first arm, one turning the switch one way and the other arm turning the switch the other way. The distance is designed to be ample to enable the motorman to remove his foot before engaging the second arm, or if he desires to operate the second arm the distance between arms enables the motorman to apply the tripper after he has passed the first, or if he inadvertently depressed

the lever and tripper as soon as he reaches the slot the switch will be operated both ways, the second arm giving the desired direction.

The head of the rock shaft connects with a rock arm which leads by a rod to the switch point. In this connecting rod is inserted a double compressing spring so arranged that if a stone or ice should clog the switch point on either side, the tripper will do no harm in engaging either or both the arms; the rock shaft responds to the operation, the motion being cushioned by the compression spring, which operates either way.

Another safeguard is the adjustment of the toe of the tripper. This is on a hinge, but held sufficiently rigid to engage and operate the arm by a torsion spring. By this precaution, if the toe of the tripper should be depressed into the slot and not withdrawn when the end of the slot is reached, or if it should be by inadvertence depressed over any part of the track, the toe upon meeting fixed resistance folds back like the blade of a jack knife as shown by the dotted lines in Fig. 3.

The excavated bed in which the rock shaft operates should be drained by some simple method to prevent the formation of ice, but should this be neglected the conduit is so constructed that a considerable quantity of water and ice can collect below the working parts of the switch without interfering with its free working; if the switch point is kept in a condition to work with a pinch bar the "Simplex" device will operate it; also the mechanism will not interfere with the free operation of the switch point with a pinch bar.

The steel slot plate is made removable. The $\frac{5}{8}$ -in. slot opening will admit some mud, and occasionally this mud should be removed

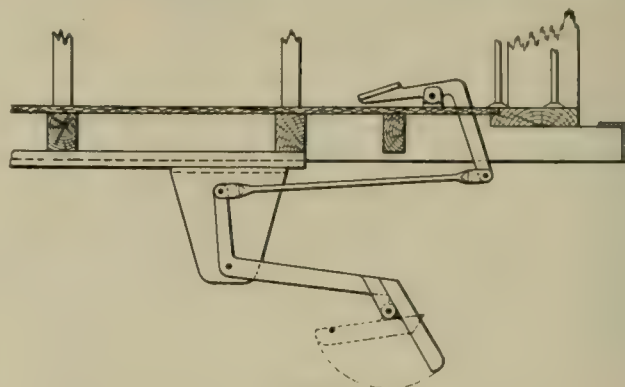


FIG. 3.

from the rock shaft bed, but mud will not interrupt the free working of the switch. The motion of the rock shaft is so slight and so frequent and the operating force so positive that the switch will work freely even if the conduit is full of mud.

Fig. 2 gives a diagrammatic view of the tripping lever which is attached to the car. The tripping lever may be varied in its details so that it can be applied to either a single or double track. Fig. 3 shows the tripping device as depressed, the dotted lines showing the position taken by the toe when abnormal obstruction is encountered.

The device is being practically demonstrated by the Columbus Railway Co., Columbus, O., and will be exhibited by model at the A. S. R. A. convention at Saratoga in September. It is made by George B. Donavin & Co., 616 N. High St., Columbus, O.

J. G. WHITE & CO.

The New York & Jersey Railroad Co., which is to build a tunnel between New York and Jersey City, has retained J. G. White & Co., of New York, as consulting electrical engineers. Their work will cover the electrical equipment of the company's tunnels and terminals, rolling stock and equipment, system of electrical conductors, signal and interlocking apparatus, lighting of tunnels and terminals, conduits and cables for carrying electric current, and other details, which will also include the elevators, ventilation and heating of the terminals. The chief engineer for the railroad company is Charles M. Jacobs, who is also chief engineer for the proposed tunnels of the Pennsylvania R. R. under the Hudson River, and who supervised the construction of the East River gas tunnel.

NEW PUBLICATIONS.

NATURAL WOODS AND HOW TO FINISH THEM. Published by Berry Brothers, Limited, Detroit, Mich. Second edition, cloth, 77 pages. This is a condensed, practical treatise of methods of wood finishing, based upon actual experience, and is intended to serve as a useful reference for architects, as well as a help to decorators and wood finishers. It will be sent free to any such who ask for it.

THE WIRELESS, a daily newspaper publishing dispatches transmitted by wireless telegraph, is published by the Los Angeles Times at Avalon, Santa Catalina Island, 33 miles from San Pedro, Cal. The first issue was on March 25th and from the start the transmission of news across the channel has been uninterrupted and without error. The system is that of the Pacific Wireless Telegraph Co.; it has no connection with the Marconi system. The unique paper has four pages, each 13 x 10½ in., four columns to a page. It began with a three-column folio, but was enlarged at the sixth issue and the price per copy raised from 3 to 5 cents.

THE INVESTORS MANUAL for 1903. Published by The Economist Publishing Co., 189 La Salle St., Chicago. Quarto, 116 pages. The Investors Manual, which is issued as a supplement to the Economist, is intended to present in convenient form all important facts and statistics relating to the operation and financial condition of the leading Chicago corporations, the securities of which are listed on the stock exchange or for other reasons command public attention, and the Manual has become recognized as an authority in the field which it covers. In 1896 the Economist company issued a supplement on the Chicago street railway corporations. This was followed the next year by the first issue of the Investors Manual, which has since appeared annually, the present number being the seventh issued under that name. Now, as heretofore, an important feature is the statistics on Chicago street railways, including maps of the systems. From time to time the scope of the book has been increased by adding data concerning other corporations until the index of the present issue shows that over 650 railroad, railway and industrial corporations are covered.

ANNOUNCEMENT.

On April 21st Judge Platt, of the United States Circuit Court at Hartford, issued an injunction against the defendants in a bill of complaint brought by the International Register Co., of Chicago, Ill., against the Recording Fare Register Co., Nelson William Wait, M. DeForest Yates, Jerry M. Hayes, Charles F. Littlejohn, Frank B. Kennedy and William H. Honiss. The injunction "restrains the defendants from using or attempting to use any of the patterns, drawings, sketches or other property of the New Haven Car Register Co. or the International Register Co., complainant, or making or causing to be made, any representations to customers, agents, or any person or persons whomsoever that they are able to fill orders, making use of said sketches, drawings, patterns or other property of this complainant, from filling or attempting to fill any of the orders or contracts of the New Haven Car Register Co., or the complainant; from selling or causing, procuring or offering to be sold any of the drawings, patterns, sketches or other property of the complainant; from using the name of the New Haven Car Register Co. in the advertisements or announcements; from advertising that the individual officers or employees, or any of them, of the Recording Fare Register Co., Incorporated, were formerly in the employ of the New Haven Car Register Co. in such manner as to in any way deceive customers into the belief that they are dealing with the successors to the New Haven Car Register Co.; from using any and all information in reference to the business of the New Haven Car Register Co. obtained while in its employ, and which information could only have been obtained by the confidential relationship existing by such employment, from using any list or copy of a list of customers of the New Haven Car Register Co.; or from doing any other act or acts, either individually or in concert, which shall be in any manner a misrepresentation or misappropriation of the good will and property of the said New Haven Car Register Co. or the complainant until the further order of the court, under a penalty of \$10,000 in case the injunction should not be complied with."

The defendants moved to dissolve this injunction and in addition to filing numerous affidavits, called as witnesses the defendants Yates, Hayes and Kennedy. After a two days' hearing the court rendered its decision May 11th denying the motion to dissolve, sustaining the injunction in every particular.

THE INTERNATIONAL REGISTER CO.,
By Arthur H. Woodward, Pres.

ST. LOUIS FAIR DEDICATION.

The occasion of the dedication ceremonies in connection with the Louisiana Purchase Exposition held in St. Louis on April 30th and May 1st and 2d was welcomed by the street railway companies of St. Louis as affording an opportunity to demonstrate their ability to properly care for the exposition traffic in 1904. The St. Louis Transit Co. had in operation April 30th, 1,075 cars, the greater number of which were operated over nine routes having as termini six loops, three on the east and three on the west of the Exposition Grounds. The number of passengers carried was 1,880,000.

The St. Louis & Suburban Ry. also had admirable arrangements for handling the heavy traffic. This company has its World's Fair terminal quite near the Administration Building.

The East St. Louis & Suburban Ry. operating in the territory east of the Mississippi River and across the Eads Bridge, on April 30th had 65 cars in service; of these 40 crossed the bridge, the regular bridge service requiring only 12 to 15 cars.

GROWTH OF A NEW ENGLAND SUPPLY HOUSE.

It is always a pleasure to record the success of a business enterprise such as that of the Stuart-Howland Co., of Boston, which has in three years grown from a small beginning to be one of the largest of its kind in the world, having branches in New York, Cleveland, London and Paris. The company's spacious store and warerooms at Boston serve to exemplify the remarkable growth in the use of electrical appliances; practically everything electrical is represented and standard street railway, lighting and telephone supplies are carried in large quantities.

A little more than three years ago this company was organized and started in business with a comparatively small but well selected stock of lighting supplies. Within a few weeks the agency for the well-known Russell-Tomlinson telephones was secured and a telephone department added; then the urgent demand for street railway supplies caused the company to secure several agencies of well-known manufacturers, purchase a stock and open a street railway department. New salesmen were added frequently, it being the policy to engage all especially able salesmen who applied for positions and make places for them. Work along these lines brought orders, especially in the street railway department. Finding that the manufacturers it represented had difficulty in filling orders promptly, the Stuart-Howland Co. secured the services of competent engineers and undertook the design and manufacture of a complete line of overhead and pole equipment. Having the benefit of extended experience the designers were able to avoid weakness in construction and yet not increase the aggregate weight. The result of their work is shown in 6 different types of overhead insulation, 12 types of bracket arms, 15 or 20 of ears, and as many more of trolley wheels, as well as a great variety of other appliances used in the construction and maintenance of street railways. The aim was to make the entire line symmetrical, substantial and carefully finished, and in proof of how completely this object was attained the company claims that although last year it sold and delivered the complete overhead and pole equipment (excepting wire) of its own manufacture, for over 1,000 miles of line, all of which was fully guaranteed, not one complaint was received, nor was one piece returned as defective.

Having been unable to take care of all its orders last year and wishing to avoid a repetition this year, the company has been making up stock during the winter, and reports that it has now on hand ready for shipment 18,000 bracket arms and hangers, globe strains, ears, trolley wheels, signal strand, cross arms, cross-arm braces, etc., in similar proportion.

NATIONAL ELECTRIC CO.

The growth of the business of the Christensen Engineering Co. of Milwaukee, in Christensen air brakes and "Ceco" electrical machinery having made a change in the organization of the company necessary, the stockholders organized the National Electric Co., and on May 16, 1903, the assets, good will, etc., of the Christensen company were transferred to the new one. The purposes, ownership, management and control of the National Electric Co. are identical with those of the old company.

NEW CAR WORKS.

A company has been organized in Peoria, Ill., by Cleveland and local capitalists, including Alex. Hoyt, Senator V. H. Burke and A. L. Jacobs, which will be known as the Peoria Car Co. It is capitalized at \$1,000,000 and will engage in the building of railway cars and equipment. Work on the construction of the company's plant will commence within 60 days.

ADVERTISING LITERATURE.

THE C. W. HUNT CO., Staten Island, N. Y., issues an illustrated folder on coal handling machinery, industrial railways, electric locomotives, conveyors, hoisting engines and manila rope.

THE AMERICAN LINSEED CO., 100 William St., New York, in a 15-page pamphlet, 5 x 7 in., tells about soap, and especially about "pure linseed oil soap," which is stated to be just the thing for cleaning cars. "Lubrix," a machine compound, is also a feature of the booklet.

WESTINGHOUSE ELECTRIC & MANUFACTURING CO., Pittsburg, Pa., has issued Special Publications Nos. 5 and 7, the former being a reprint of a paper read by Mr. H. P. Davis before the Ohio Electric Light Association, entitled, "Some Pertinent Features of the Modern Meter," and the latter an illustrated catalog of Westinghouse Transformers.

PAWLING & HARNISCHFEGGER, Milwaukee, Wis., have issued Bulletin No. 13, on "Traveling Electric Hoists". It is in catalog style, 36 pages, illustrated, and shows examples of different types of machines installed since the previous bulletin was issued. The utility of these hoists is shown and the service described. Applications to which they are already applied are given, as well as a partial list of companies using the apparatus.

THE AMERICAN AIR COMPRESSOR WORKS, 26 Cortlandt St., New York, has just issued catalog "A," 6 x 9 in., 52 pages, with 14 pages of advertisements. It illustrates and describes the different types of "American" air compressors, air receivers, vacuum pumps, carbonic acid gas and high pressure compressors, and the "American" air lift pumping system. There is also information relative to pneumatic tools, and a table showing the flow of air through various size orifices.

THE PITTSBURG BLUE PRINT CO., of Pittsburg, Pa., has issued a 4-page circular, 6 x 9 in., containing half-tone illustrations of its self-contained copying machine and its automatic lamp controller for cylindrical electrical copiers. The latter is a new device, simple in construction and operation, that combines all the automatic features obtainable in the cylindrical electrical copier. The self-contained copier is designed for use where it is not convenient to fasten the bracket, lowering device, etc., to the wall.

THE UNDERFEED STOKER CO. OF AMERICA has published recently two pamphlets which will be found very interesting by steam users. One is entitled "The Evolution of the Jones Underfeed Stoker," and comprises a history of the stoker's development from its earliest forms to the present design. This is a paper by George C. Tewksbury read before the New England Cotton Manufacturers' Association. This pamphlet is copiously illustrated with views showing the construction and operation of the stoker. The second pamphlet describes the installation of the Jones Underfeed stokers in the plant of the Municipal Heating Co., Syracuse, N. Y. Copies may be had by addressing the company at No. 837 Marquette Bldg., Chicago.

THE SHERWOOD MANUFACTURING CO., of Buffalo, N. Y., has just issued catalog No. 11, 80 pages, 6 x 9 in.; it supersedes all previous editions, except injector and ejector catalog No. 7.

Its contents are classified in the following order: Injectors, ejectors, oil cups, multiple oilers, oiling devices, lubricators, boiler oil injectors, oil pumps, grease cups, flue scrapers and blowers, gage cocks, three way cocks, water gages, pressure gages, pop valves, hose connections, and steam carriage and automobile specialties. In addition to the engine and boiler supplies enumerated the company makes a specialty of fine brass work for engine rooms, nickel plating and special brass work to order. The new catalog is well illustrated and conveniently indexed. It contains also Klein's discount tables, printed by permission of the owner of the copyright.

THE WILKINSON MANUFACTURING CO., Bridgeport, Pa., recently issued a new catalog which treats of "The Wilkinson Stoker" comprehensively and convincingly. The first page shows a likeness of Mr. A. Wilkinson, M. E., president and founder of the company, together with a bird's eye view of the new works erected in 1900. A description of the plant follows, and then "the story of the stoker briefly told". The catalog concludes with 40 or more testimonials from large manufacturers in whose plants these stokers are used. It is pointed out that the value of these recommendations lies in the fact that they were not given first-hand to the Wilkinson Manufacturing Co., but to a prospective customer, who in turn handed them to the company with his order. They are very strong testimonials. The catalog is illustrated throughout and bound in such a way as to be convenient to read, as well as to fold for the pocket.

THE GENERAL ELECTRIC CO. has issued the following publications: Bulletin No. 4,315 (supersedes No. 4,198), "Thomson Astatic Instruments for Continuous Current Switchboards". Bulletin No. 4,317, "Horizontal Cylinder Air Compressors". Catalog and Price List No. 7,573 (supersedes No. 7,556), "Parts of Form 2 Carbon Feed Enclosed Arc Lamps for Alternating Current Multiple Circuits". Catalog and Price List No. 7,574, "Parts of C-6 Controller". Catalog and Price List No. 7,575, "Parts of Type B Series Parallel Controllers". Catalog and Price List No. 7,576 (supersedes No. 7,530), "Railway Line Material". Pamphlet No. 9,121, "Permanency of Transformer Insulation". Supply Catalog No. 7,577, "Parts of R-43, R-45 and R-47 Controllers". Index to Supply Catalogs, dated Mar. 3, 1903. Price List No. 5,107, "Principal Parts for Forms 10 and 11 Direct Current Series Enclosed Arc Lamps". Price List No. 5,108 (supersedes No. 5,099), "Fan Motors". Flyer No. 2,112, "Marking of Motor Gears and Pinions". Flyer No. 2,113, "Advice to Customers Regarding the Placing of Orders".

TRADE NOTES.

THE BROWN CORLISS ENGINE CO. is looking for a number of good agencies to handle its work in different parts of the country.

J. HOLT GATES & CO., 1436 Monadnock Building, Chicago, have taken the agency of the Skinner Engine Co., of Erie, Pa. They are also representatives of the Quincy Engine Co., of Quincy, Ill., for large Williams vertical cross-compound engines. This firm is now in a position to erect complete steam and electric plants.

THE BRITISH WESTINGHOUSE ELECTRIC & MANUFACTURING CO., LIMITED, has received the contract for 12 new cars to be used on the lines of the Suburban Tramways Co., Aberdeen, Scotland. The specifications include the British Electric Company's car bodies, Westinghouse equipment and Brill trucks.

THE WHEELING TRACTION CO., of Wheeling, W. Va., is in the market for mechanical track brakes to be applied to cars operated on heavy grades. Also, from 500 to 1,000 white chestnut poles 30 ft. long and 7½ to 10 in. in diameter at the top; and steel coal dump cars of from 3,000 to 6,000-lb. capacity. C. E. Flynn, general manager.

THE WASHINGTON CO., 39 Cortlandt St., New York, general sales agent for the Franklin water tube boiler, reports an order from the American Locomotive Co. for 2,400 h. p. of Franklin boilers to be installed at the Schenectady Locomotive Works. This will make a total of 4,200 h. p. of this type of boilers in the Schenectady works.

PAWLING & HARNISCHFEGGER, Milwaukee, Wis., were but slightly inconvenienced by the fire that destroyed one of their buildings April 15th. They leased the shops recently vacated by the Nordberg Manufacturing Co., purchased new machinery and started

up about May 1st. The new shops, with their other buildings, afford better facilities for building cranes and hoists than before the fire.

G. M. GEST, conduit contractor, of New York and Cincinnati, reports having closed a contract with the Edison Illuminating Co. to install two miles of conduit, the section comprising six and eight ducts, in Roxbury District, Boston, Mass. Mr. Gest has just completed an installation for the same company in South Boston, some of the sections containing 196 ducts.

THE BROWN CORLISS ENGINE CO., Corliss, Wis., reports receipt of orders for engines as follows: Saxony Worsted Mills, Newton, Mass., one 16 and 26 by 42-in. cross-compound; Berlin Mills Co., Gorham, N. H., four 24 x 42-in. simple engines; Pfister & Vogel Leather Co., Milwaukee, Wis., one 28 x 48-in. heavy duty corliss; F. R. Payne, Williams, Ia., one 12 x 30-in. girder frame corliss.

THE AMERICAN CAR SEAT CO., of Brooklyn, N. Y., announces that after April 28th the Western Electrical Supply Co., of St. Louis, Mo., acting agent, will no longer represent its interests, and that the western territory will be attended to by Mr. H. E. Acklerly, direct representative. Therefore, it is requested by the American Car Seat Co. that all communications, etc., be sent direct to its main office, 18 Guernsey St., Brooklyn, N. Y.

THE SLATER ENGINE CO., Warren, Mass., reports the receipt of several new orders during the past four weeks, including the following: Whiting Paper Co., North Wilbraham, Mass., one 800-h. p. cross-compound engine; Liberty Brewing Co., Springfield, Mass., one 150-h. p. engine; Thomaston Face & Ornamental Brick Co., Thomaston, Me., one 200-h. p. engine. The company is also building a 50-h. p. engine, which will be finished quite handsomely, for the Durfee Textile School, Fall River, Mass.

THE ALLIS-CHALMERS CO. directors declared the regular quarterly dividend of $1\frac{3}{4}$ per cent on preferred stock April 15th. The company reports that the volume of business upon its books far exceeds that of any time since organization, notwithstanding that the output has been increased to a large extent. There seems to be an unlimited demand for all kinds of high-grade machinery. The general offices have been removed to the fourteenth floor of the New York Life Building, corner of La Salle and Monroe Sts., Chicago.

THE PITTSBURG & LAKE SUPERIOR CO., of Escanaba, Mich., which is one of the largest concerns engaged in the white cedar business, and is now one of the largest producers and wholesale dealers in poles, has recently established a concentrating yard at Escanaba. This yard is considered to be a model in arrangement and will enable the company to give patrons even better service than heretofore. Herbert W. Reade, secretary and treasurer of the company, took a trip recently through Ohio and Indiana, in the course of which he booked a number of large orders.

JOHN A. MEAD & CO., 13 Broadway, New York, have been awarded the contract for furnishing a complete coal and ash conveying system for the new power plant of the Omaha & Council Bluffs Railway Co., which has been designed and is now being erected under the direction of Lichter & Jens, of St. Louis. The Mead company has also received contracts for doubling the coal and ash conveyor equipment of the Union Traction Co. of Indiana, at Anderson, and for a complete conveying plant for the Ingersoll-Sergeant Drill Co. at its plant in western Pennsylvania.

THE DEMING CO., Salem, O., recently completed an addition to its plant that will double its power pump output. The new building is 224 x 84 ft.; height to crane runway, 28 ft.; middle portion 34 ft. wide; bays 25 ft. wide. It is equipped with a 10-ton Northern Engineering Co. electric crane, 150-h. p. Buckeye engine, 80-kw. Crocker-Wheeler power arc light generator, and a 25-kw. Sprague incandescent lighting generator. The Deming Co. manu-

factured the 9 x 10-in. double-acting, triplex pump used in feeding the boilers at the Metropolitan West Side Elevated Railway Co's. plant in Chicago.

GEORGE WELSBY SCOTT, consulting engineer, of Chicago, announces his removal from Room No. 758 "The Rookery" to larger offices at Nos. 1301-02 Security Building, where the increased facilities will enable him to more fittingly care for the interests of clients. Mr. Scott is prepared to furnish plans, specifications and estimates for the construction and equipment of industrial properties, power plants and mechanical undertakings generally; to improve and extend existing properties; to investigate and develop mechanical projects, and to make expert examinations, reports, valuations, opinions, recommendations and collect testimony.

THE JONES UNDER-FEED STOKER CO. OF AMERICA has consolidated its New York and Boston offices as its "Eastern Office," located at 429-430 Board of Trade Building, Boston, Mass. It announces that this move was largely dictated by the rapid growth of its business in New England, where bituminous coal is used almost exclusively for steam-making purposes, as contrasted with the territory around New York, where anthracite, a fuel not adapted to the under-feed system, is usually employed. The new eastern office is in charge of Mr. Elwood E. Taylor and Mr. George C. Tewksbury. The company issues an illustrated booklet describing its new quarters fully.

ADAM COOK'S SONS, New York and Chicago, recently received a letter from the J. C. Blair Co., Huntingdon, Pa., in which it was stated that the bearings of an embossing machine equipped with the Cook compression cups and heavy "Albany Grease" were running cold, while the bearings of another machine on which regular oil was used were very hot. The Blair company had tried all kinds of heavy oils and automatic oilers, as well as the various styles of journals made, for the past 10 years, the letter states, but nothing gave satisfaction until the Adam Cook's Sons' compression cups and "Albany Grease" were used. The letter concludes with an order for additional compression cups.

THE COLUMBUS STEEL ROLLING SHUTTER CO., Columbus, O., has appointed the F. P. Smith Wire & Iron Works, 100-102 Lake St., Chicago, sole agent in Chicago and adjacent territory. Similar agencies are being established in all the large centers. The company manufactures steel rolling doors, shutters and partitions, which involve special features of construction, including a weather surface presenting no pockets or recesses for the accumulation of water, snow or dirt, a perfectly balanced spring within the roller, a slatting construction which offers the minimum of friction and the maximum of strength, and a device that makes the unlocking of the slats impossible. Among recent contracts closed is one with the Nashville, Chattanooga & St. Louis Ry.

THE GREEN ENGINEERING CO., Chicago, manufacturer of the Green traveling link grate, reports the following contracts closed recently: St. Joseph Railway, Light, Heat & Power Co., St. Joseph, Mo., four stokers for 500-h. p. boilers; Omaha & Council Bluffs Railway & Bridge Co., Council Bluffs, Ia., six stokers for 500-h. p. boilers; Chicago, Rock Island & Pacific Ry. shops, East Moline, Ill., six stokers for 300-h. p. boilers; Oak Park (Ill.) Yaryan Co., one stoker; Edison Yaryan Co., Chicago, four stokers. The company also reports that the results of the equipment of the Rock Island depot in Chicago with five of its stokers, and the new Schlesinger & Mayer building, also in Chicago, with two stokers, are eminently satisfactory, and that they are absolutely smokeless.

THE UNDERFEED STOKER CO. OF AMERICA advises us of the following contracts received recently for installing Jones under-feed stokers: I. W. York & Co., Portage, Wis. (2d order); Montreal Milling Co., Hurley, Wis. (3d order); Jarvis Terminal Cold Storage Co., Jersey City, N. J.; Worcester Consolidated Street Railway Co., Northboro power station, Northboro, Mass. (2d order); East

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EACH SHIPMENT IS COMPOUNDED SPECIALLY.

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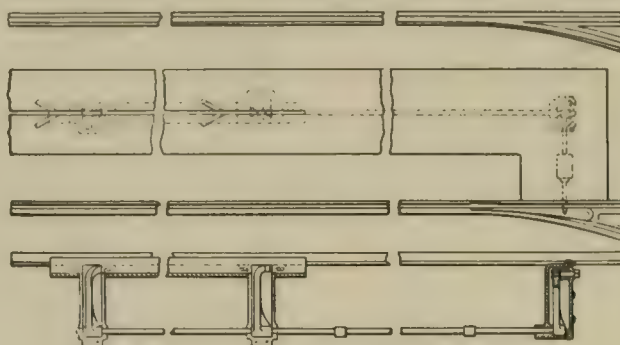
2238-50 N. 9th Street, PHILADELPHIA.

The Simplest is Always the Best

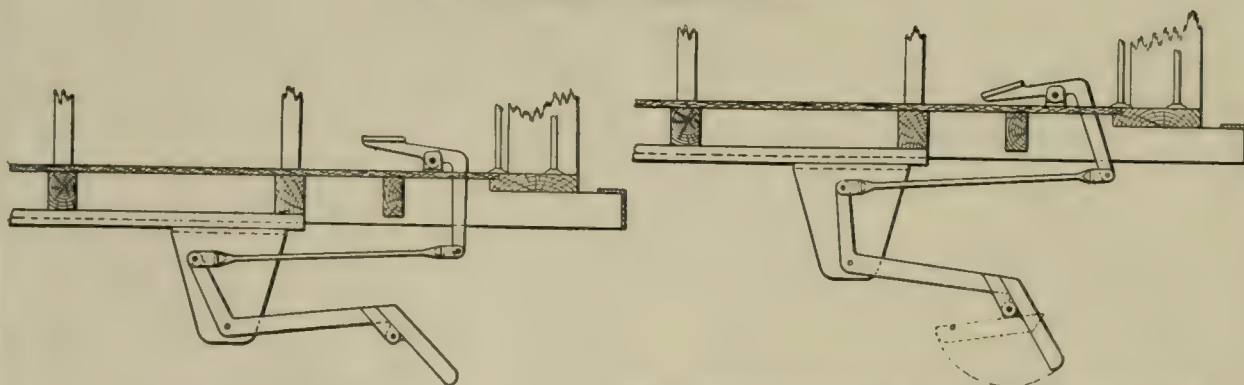
After years of devising and brain-racking. After the trying of Cog Wheels, Gearings and Trip Levers. After the Application of Electricity and Springs in a thousand ways. After millions of Dollars have been trifled away. After failures, disappointments and despair ❖ ❖ ❖ ❖

The **HUNT** Simplex Street Railway Switch

*Has been Perfected, Practically Demonstrated and
THE COMPLEX PROBLEM IS SOLVED*



Plan and Section of Conduit and Switch.



Tripping Device raised.

Tripping Device depressed (dotted lines show position of toe when obstruction is encountered.)

LOOK AT IT YOURSELF. Was there ever anything more simple? Was there ever anything more practical? The motorman does it with his foot without stopping the car, and does it every time. No misapplication,—No backing up—No delays. Easily installed. Very cheaply maintained. No derauling of rear trucks, no burning of fuses or breaking of circuits. Attaches to switch now in use. Practically no wear at all on the operating parts. Action almost imperceptible.

This switch will be seen and demonstrated by Model at the National Convention at Saratoga in September. Inquiries are solicited and invited from all street railway companies and capitalists. This switch device does not hamper the free operation of the switch point with the pinch bar as commonly used.

THE GEO. B. DONAVIN & COMPANY

Government Contractors, Manufacturers, Inventors, Promoters

Sole Proprietors,
The HUNT SYSTEMS ST. RAILWAY SWITCHING

COLUMBUS, OHIO.

A full description of this will be found on Page 304 of this issue.

ern Hydraulic Pressed Brick Co., Winslow, N. J.; Standard Scale & Supply Co., Beaver Falls, Pa.; Galesburg Paving Brick Works, Galesburg, Ill.; Massachusetts Electric Co., Boston, Mass.; Oil Well Supply Co., Pittsburg, Pa. (3d order); Canton & Akron Railway Co., Canton, O.; Kemp Manufacturing Co., Toronto, Ont.; Thomas Davidson Manufacturing Co., Montreal, Can.; F. X. Drolet, Quebec City, Can.; Ingersoll Packing Co., Ingersoll, Ont. (2d order); William March Co., Quebec City, Can.; Quebec Asylum, Quebec City, Can.; Dominion Radiator Co., Toronto, Ont.; Dorchester Penitentiary, Dorchester, N. B.; Canadian Pacific Ry., Windsor St. station, Montreal, Can.

WESTINGHOUSE, CHURCH, KERR & CO. report recent orders for Roney mechanical stokers as follows: Potomac Electric Power Co., Washington, D. C., third order, increasing equipment to 2,700 h. p.; New York Central & Hudson River Railroad Co., four stokers, 2,000 h. p., for new elevator at Weehawken, N. J.; International Railway Co., Buffalo, N. Y., sixth order, increasing capacity to 6,900 h. p.; Ingersoll-Sergeant Drill Co., Phillipsburg, N. J., 12 stokers; Boston Edison Co., Boston, Mass., complete equipment for new central lighting station; Pennsylvania Railroad Co., seventh order, for Altoona, Pa.; American Bridge Co., ninth order; Stirling Co., for Berwind White Coal Mining Co., Windber, Pa.; American Locomotive Co., fifth order. The company also reports recent export orders for power apparatus from Potosi, Mex.; Tripoli, Greece; Lima, Peru; Durango, Mex. (2 orders); Salina Cruz, Mex., and Victoria, Australia. Two 1,000-kw. steam turbine generating outfits for the De Beers mines at Kimberly, South Africa, have been shipped, being the largest yet exported.

THE W. T. VAN DORN CO., Chicago, manufacturer of the Van Dorn automatic coupler, has removed to No. 929 Monadnock Block. Mr. Van Dorn reports business exceedingly good, couplers for interurban roads especially being in great demand. The company has just shipped or delivered the following orders: Brooklyn Rapid Transit Co., for elevated service, 550 complete drawbar couplers; John Stephenson & Co., additional order; Aurora, Elgin & Chicago Ry., a large order; Union Traction Co. of Indiana, 45 equipments; New York, New Haven & Hartford R. R., additional order for electric division; St. Louis Car Co., and John Stephenson & Co., one carload each for Interborough Rapid Transit Co., New York; Chicago South Side Elevated Railroad Co., 20 car equipments; Manhattan Railway Co., New York, a large consignment. Recent orders received were from Jackson & Battle Creek Traction Co., for 12 drawbar equipments same style as Manhattan "L"; Chicago & Milwaukee Electric Railway Co., 12 equipments; Colorado Springs Rapid Transit Co., Anaconda Copper & Mining Co., and a large number of smaller orders. The Van Dorn couplers are made in 17 sizes.

THE ELECTRIC STORAGE BATTERY CO., of Philadelphia, among recent contracts for installations of the "Chloride Accumulator" in railway service, has closed two with the Portland Railroad Co., to be located at Yarmouth and Underwood Park, Me. The battery at Yarmouth consists of 216 cells, having a capacity of 134 kw. h., and is placed midway from the power house on the same branch, and consists of 252 cells with a capacity of 604 kw. h. Contracts have also been closed with the Seattle Electric Co., Seattle, Wash., for a battery of 288 cells, with a capacity of 628 kw. h.; the Waterville & Oakland Ry Co., Waterville, Me., for a battery of 220 cells with a capacity of 205 kw. h.; the Reading Power Co., at Reading, Pa., for a battery of 264 cells with a capacity of 740 kw. h. The Portland & Brunswick Railway Co., Brunswick, Me., has increased the capacity of its battery by the addition of plates, and the Camden Interstate Railway Co. has contracted for the third battery of "Chloride Accumulators" on its system, this last one to be located at Huntington, W. Va., and consist of 288 cells, with a capacity of 314 kw. h. The company has also recently installed two batteries each of 700 kw. capacity for the United Traction Co., Albany, N. Y., and has closed a contract with the Savannah (Ga.) Electric Co. for a battery of 480 ampere hours capacity. About June 1st the Cleveland, Painesville & Eastern Railway Co. will install a battery of chloride accumulator with a capacity of 480 kw.

E. P. ROBERTS & CO., consulting engineers, of Cleveland, O., announce that owing to the increasing demands of their eastern business they have opened a branch office at 25 Broad St., New York City, under the management of William C. Andrews, E. E., eastern representative. It is believed that the increased financial and en-

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ARE STANDARD

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ENGINEERS
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OVERHEAD LINE MATERIAL.

For Single
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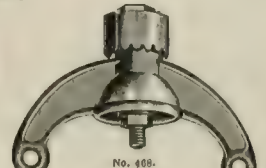
No. 408.
Type C.



No. 405.
Trolley Splicers,
Strain Ears, Feeder
Ears, etc.



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No. 409.
Ears for Round Figure S.
and Groove Forms of
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Solid Type
Insulators.



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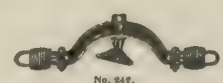


No. 430.

Type D. For Single
and Double Wire.



No. 400.



No. 415.



No. 435.

Complete Equipment for
Overhead Construction.

THE CREAGHEAD ENGINEERING CO.

ENGINEERS AND
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engineering advantages afforded by the New York office will prove of value to those contemplating the construction or reorganization of electric railway, power and lighting plants, or desiring advice on electrical, mechanical or civil engineering problems. The company is prepared to take up work in any location and its large experience in making preliminary reports, plans, specifications, investigation of existing properties, supervision of operating plants, etc., enables it to make unprejudiced and conservative estimates on the construction or reorganization of electric railway and lighting plants, power transmission, steam and hydraulic plants, heating and ventilating plants, etc., and to act as consulting and supervising engineers for the entire undertaking until completion and during operation. A partial list of work with which E. P. Roberts & Co. have been associated includes 73 electric railways, 64 central stations for the distribution of electric light and power, gas, heat and water, and 135 isolated plants. Among the electric railways referred to may be mentioned the Dayton & Muncie Traction Co., Muncie, Hartford & Ft. Wayne Railway Co., Northern Texas Traction Co., Southern Michigan Traction Co., Davenport (Ia.) & Clinton Railway Co., Du Bois (Pa.) Electric & Traction Co. The members of the firm are E. P. Roberts, M. E., and I. H. Sherwood, E. E. The chief assistant engineers are M. A. Munn, C. E., Alwin Hofmann, M. E., and Bret Harter, E. E. The total force employed is 28. The business was established in 1893.

WONDERLAND FOR 1903.

"Wonderland" for 1903, issued by the passenger department of the Northern Pacific Railway Co., contains 112 pages of matter written by Olin D. Wheeler, descriptive of the country contiguous to the railway system. It is very attractively gotten up and profusely illustrated. Some of the special features of this number are: "The Travels of Father Hennepin, the Franciscan Friar, in the Northwest in the 17th Century;" "The Mandan Indians of the Upper Mississippi River;" "Irrigation in the Northwest;" "Yellowstone National Park;" "The Columbia River, the So-Called Oregon."

The covers of 1903 Wonderland form a work of art of a very high order, being a reproduction of a painting by Alfred Lenz depicting a mountain fastness in the foreground of which a North American Indian stands out in dignified relief. The book will, as heretofore, be sent to any address by sending six cents to cover postage to Charles S. Fee, general passenger agent, St. Paul, Minn. It is worth sending for.

FOUR-TRACK NEWS FOR MAY.

This month's Four-Track News contains an interesting sketch of old-time Albany under the caption, "An Ancient American City," by L. K. Becker. "Literary Concord," by Jennie Campbell Doug-



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**SIMPLE STRONG AND
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GENERAL OFFICES NEW YORK
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lass, affords glimpses of Ralph Waldo Emerson's home; the "Old Manse," made memorable by Hawthorne, and Louisa M. Alcott's "Orchard House". W. S. Dunbar contributes "The Development of the Steamboat," a very readable article illustrated by reproductions of rare old prints. The foregoing are but a few of the many choice bits published by George H. Daniels, Grand Central Station, New York.

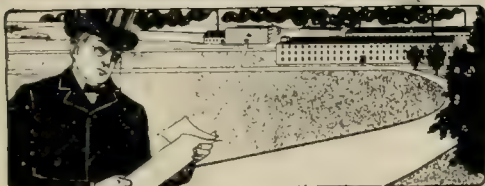
SUMMER VACATION TRIPS.

Write the undersigned for a copy of Wabash Summer Tour Book outlining many attractive summer vacation tours, with maps, rates, etc.; also illustrated folders telling all about the N. E. A. excursions to Boston and Epworth League excursions to Detroit in July.

F. A. Palmer, Ass't Gen. Pass. Agt.,
311 Marquette Bldg, Chicago, Ill.

WABASH R. R. EXCURSIONS TO BOSTON.

The Wabash R. R. has arranged for excursions from Chicago to Boston and return in connection with the 42d annual convention of the National Educational Association, to be held in Boston, July 6-10, 1903. Tickets will be sold good to leave Chicago July 2, 3, 4 and 5 and will be good without deposit for return passage not earlier than July 8th, nor later than July 12th. For a slight additional cost tickets may be extended to September 1st. The rate will be one



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has a vital interest in making them as small as possible.

Your oil bill is probably over twice as large as it ought to be.

Anyhow, we are willing to make you a positive guarantee that we can reduce it at least 50 per cent. by the use of a

CROSS OIL FILTER.

This machine reclaims and purifies the lubricating oil that you are now throwing away as useless. By using this oil over and over again you can very quickly make the Filter pay for itself.

Our word is good, but we would rather you would see it work for yourself. We will send the Filter on 30 days' trial. If it doesn't cut your oil bills down one-half, there's no money to pay.

"We have been using one of your Oil Filters for the past two seasons, and it has reduced our lubricating bill a little over 55 per cent."

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Can you afford to wait longer? We think not.

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AKRON, OHIO, U. S. A.

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For the complete design, construction
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Special attention given to

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Securities Accepted and Negotiated, Examinations, Reports, Estimates, Plans, Specifications and Supervision.

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THE BUILDING AND EQUIPMENT OF STEAM
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STREET RAILWAY PATENTS.

This list of patents furnished by T. Reed Chitt, Patent Attorney, Washington, D. C., from whom all information concerning patents, etc., can be obtained.

No. 722,068. March 3, 1903, P. J. Wilson, Ben Lomond, Cal. Station indicator.

No. 722,007. March 3, 1903, George Gibbs et al., New York. N. Y. Car platform vestibule.

No. 722,154. March 3, 1903, John Shelton, Denver, Colo. Car brake mechanism.

No. 722,187. March 3, 1903, Thomas W. Russell, Boston, Mass. Snow removing flange.

No. 722,789. March 3, 1903, Adolf Selz, Flemingsburg, Ky. Trolley wheel for electric tram cars.

No. 722,280. March 10, 1903, John A. Brill et al., Philadelphia, Pa. Convertible car.

No. 722,579. March 10, 1903, Carl E. L. Helbig, Dresden, Germany. Fender.

No. 722,608. March 10, 1903, Robert L. McCartney, Ottumwa, Iowa. Trolley for electric railways.

No. 722,691. March 17, 1903, Gottlieb Geiger, Cleveland, O. Life guard for tram cars.

No. 722,772. March 17, 1903, Chas. A. Terry, New York City, N. Y. Current collecting device for electric railways.

No. 722,795. March 17, 1903, Carl Ansoerge, Chicago, Ill. Railway coach.

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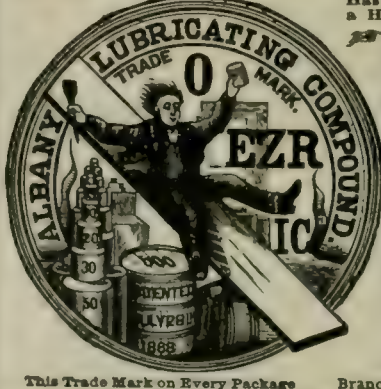
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No. 722,080. March 17, 1903, Adolph Hepola, Hibbing, Minn. Safety operating mechanism.

No. 723,182. March 17, 1903, James A. Reader, Ann Arbor, Mich. Automatic street indicator and advertiser.

No. 723,297. March 24, 1903, Wm. H. Nightingale, Philadelphia, Pa. Duplex air brake system.

No. 723,300. March 24, 1903, David E. Pepin, Ware, Mass. Interchangeable turnout for railways.

No. 723,360. March 24, 1903, F. H. Burnham, Essex, Mass. Controller reverser.

No. 723,690. March 24, 1903, Geo. W. Linder, Baltimore, Md. Switch for electric railways.

No. 723,739. March 24, 1903, E. G. Schwarz, New York, N. Y. Station indicator.

No. 723,867. March 31, 1903, T. W. Heatley, Cleveland, O. Switch turner for electric railways.

No. 723,916. March 31, 1903, Daniel P. Powell, Denver, Colo. Safety device for car fender.

No. 723,927. March 31, 1903, B. F. Schmoldt et al., Cleveland O. Wheel fender.

No. 724,009. March 31, 1903, C. Hengen, North Amherst, O. Trolley wheel.

No. 724,169. March 31, 1903, F. W. Dressel, New York, N. Y. Signal lamp for railway cars.

No. 724,180. March 31, 1903, Lawrence Griffith, Yonkers, N. Y. Pneumatic switch apparatus.

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| 1200 " | Detroit Portland Cement Co., Fenton, Mich. | 1000 " | |

TOLEDO, OHIO

No. 724,194 March 31, 1903, Thomas Maroney, Buffalo, N. Y. Car replacer.

No. 724,277. March 31, 1903, John H. Fowler, Somerset, Ky. Car replacer.

No. 724,271. March 31, 1903, R. L. Ellery, Portsmouth, N. H. Radial car truck.

No. 724,358. March 31, 1903, John M. Wilbur, Colorado Springs, Colo. Switch operating apparatus.

No. 724,479, April 7, 1903, Chas. H. Jerrard, East Ham, England. Apparatus for cleansing tram rails.

No. 724,493, April 7, 1903, George J. Peacock, Pittsburg, Pa. Oiler.

No. 724,508, April 7, 1903, Chas. V. Rote, Lancaster, Pa. Combined rail and wheel car brake.

No. 724,766, April 7, 1903, Chas. A. Willard, St. Louis, Mo. Street car safety guard.

No. 724,821, April 7, 1903, Fred Davison, Bath, N. Y. Car operated automatic tramway switch mechanism.

No. 724,927, April 7, 1903, Chas. A. Olsen, Pittsburg, Pa. Trolley.

No. 724,937, April 7, 1903, John Rawles, East Galesburg, Ill. Street car fender.

No. 725,079, April 14, 1903, G. C. Hawkins, Boston, Mass. Electric car.

No. 725,116, April 14, 1903, J. J. Moore, St. Louis, Mo. Safety gear and signal system for railways.

No. 725,221, April 14, 1903, Troy Cope, New Waterford, O. Electric switch.

No. 725,286, April 14, 1903, H. J. Powell and O. H. Schneider, Frostburg, Md. Car brake.

No. 725,300, April 14, 1903, Chas. A. Tyndall, Troy, N. Y. Sign attached to trolleys.

No. 725,446, April 14, 1903, James H. Hulings, Parsons, W. Va. Car fender.

No. 725,650, April 21, 1903, Chas. E. Badger, Minneapolis, Minn. Switch operating mechanism.

No. 725,667, April 21, 1903, Chas. A. Bray, Schenectady, N. Y. Trolley pole.

No. 725,985, April 21, 1903, Frank C. Newell, Wilkesburg, Pa. Electromagnetic brake.

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No. 724,949, April 7, 1903, H. B. Rowland, Philadelphia, Pa. Ventilator for motors for cars.

No. 725,995, April 21, 1903, Edward G. Shortt, Carthage, N. Y. High speed brake mechanism.

No. 726,061, April 21, 1903, Wm. A. Heyes, Wigan, England. Safety device for preventing accidents from trolley wires.

No. 726,129, April 21, 1903, A. U. Willing et al., Oelwein, Iowa. Drop handle brake for cars.

No. 726,225, April 21, 1903, Henry Klein, Hoboken, N. J. Machine for cutting, crushing and dislodging ice or sleet on the 3rd rail of electric railways.

No. 726,269, April 28, 1903, Edward A. Everett, Detroit, Mich. Electric track circuit and method of insulating same.

No. 726,345, April 28, 1903, A. D. Ray, Cleveland, O. Fastening for car fenders.

No. 726,361, April 28, 1903, John A. Shea, Philadelphia, Pa. Electrical switch lock.

No. 726,390, April 28, 1903, Wm. E. Zachry, New York. Car fender.

No. 726,501, April 28, 1903, Alex. Bouvier, Concord, Mass. Switch.

No. 726,600, April 28, 1903, to L. Wheeler, et al., Wheaton, Ill. Rail contact shoe and support therefor.

No. 726,612, April 28, 1903, John L. Abiez, jr., Homestead, Pa. Switch.

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STREET RAILWAY REVIEW

Vol. XIII

JUNE 20, 1903

No. 6

Rockford & Interurban Railway Co.—1.

Growth and Development of the System Which Includes the Rockford & Belvidere Electric Railway Co., the Rockford Railway, Light & Power Co., and the Rockford & Freeport Electric Ry., Now Building—Organization of the Consolidated Company—Operating Features—Electric Express Business.

The Rockford & Interurban Railway Co. comprises an urban system in the city of Rockford with a suburban branch extending to Belvidere on the east, and the Rockford & Freeport Electric Ry., which is now under construction, will be consolidated with the present system, making a through route of 43 miles in length of which Rockford is the central point. This system had its beginning 23 years ago when the first mile of city track was built in Rockford on which two short horse cars were operated. The

the new company extended its lines to South Rockford and to the East side. This company met with great opposition from the old company and eventually went into the hands of a receiver. In 1895 it was sold, and passed into the hands of the present company in 1898.

When the Rockford City Railway Co. and the Rockford Traction Co. were consolidated the name was changed to the Rockford Railway, Light & Power Co. The latter name was changed to the



CROSSING THE KISHWAUKEE RIVER NEAR CHERRY VALLEY.

Rockford Street Railway Co. was organized in 1880 with a capital stock of \$20,000. A state charter was secured Jan. 1, 1881, and a franchise was granted by the city council June 27, 1881. In September of the same year it was decided to build an extension of the line to the Fair Grounds and the capital stock of the company was increased to \$80,000. During the first six years of its existence the company made a little money, but when it commenced to extend the lines to the more thinly populated parts of the city the property ceased to be a paying one. In 1889 the property of the old company was purchased by the present owners and the power was changed to electricity. Under the new management the name of the company was changed to the Rockford City Railway Co. In 1890 a new company was organized under the name of the Rockford Traction Co. which built a road to the West End for the purpose of developing that section of the city. Subsequently

Rockford & Interurban Co. a few months ago when the Rockford Railway, Light & Power Co. and the Rockford & Belvidere Electric Railway Co. were consolidated.

The entire route serves a population of about 65,000 exclusive of the farming population along the line. Starting at Belvidere with a population of 7,000 it passes through Cherry Valley with a population of 400, Rockford 32,000, Winnebago, 400, Pecatonica, 1,200, Ridott, 250 and Freeport 13,300.

Rockford, which is the most important city on this system, is situated on the Rock River, 86 miles from Chicago and is the county seat of Winnebago County. The residence portion of the city includes many handsome houses and the avenues are lined with handsome trees from which Rockford gets its name of the "Forest City". It is also an important manufacturing city, over 400 different articles being made in the city. The manufacture

of furniture predominates, over 4,000 persons being employed in the branch of business, while the vast amount of water power within the city employs about 10,000 people. The most prominent industry at Belvidere is the manufacture of sewing machines, this being the home of the National Sewing Machine Co. which employs from 800 to 900 persons. Cherry Valley contains two large creameries one of which has an average daily output of about 400 lb. of butter, the other furnishes cream to ice cream factories exclusively. Freeport, which will be the western terminus of the system, contains a number of manufacturing interests including a carriage factory, wind mill factory, shoe factory and four breweries. The various factories along the route contribute very largely to the electric express business which the company has been developing during the past year.

The accompanying map shows the distribution of the company's system within the city of Rockford, from which it will be seen that the entire area of the city is unusually well covered by the various divisions of the company's lines. The road is divided into ten

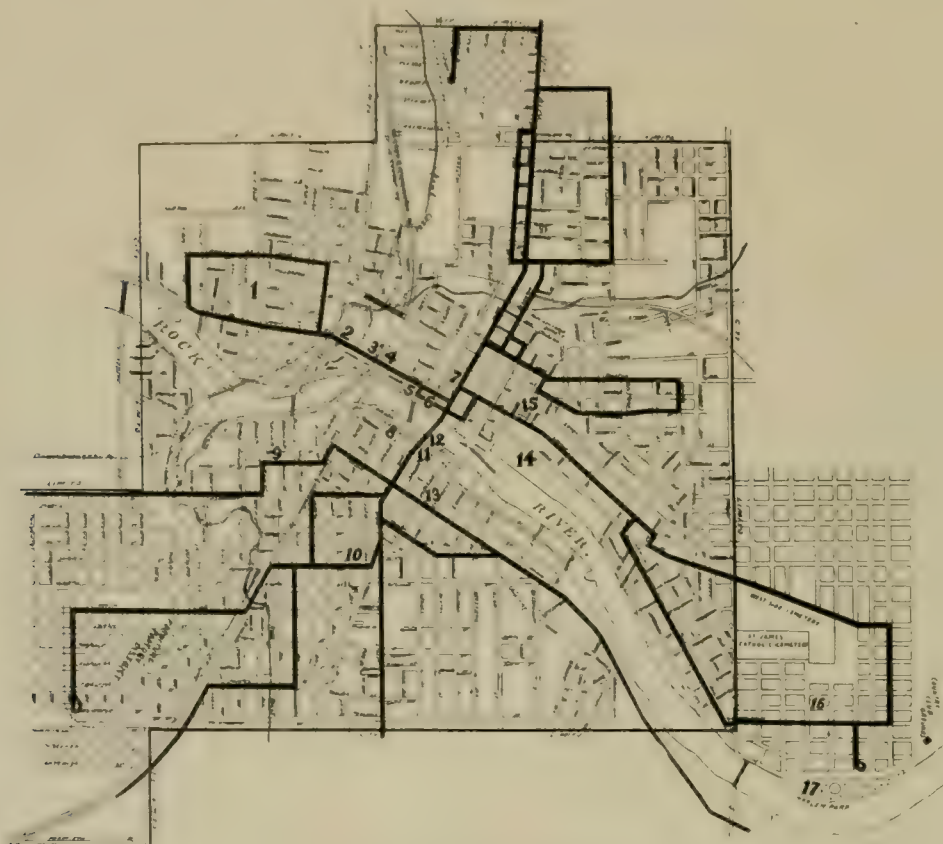
Division No. 6 includes the South Second St. line, 3.825 long, round trip 30 minutes, headway 30 minutes.

Division No. 7 includes the East State and Highland line, which is 3.650 miles long. Round trip 25 minutes, headway 20 minutes.

Division No. 9 includes the Charles, Seventh St. and 18th Ave. line. The total length of this division is 4.650 miles and it is operated as two divisions, two cars running the entire length of the route and one car running over part of the route, a distance of 2.333 miles, and then returning to the down-town loop. The short route requires 20 minutes for the round trip and the long route 40 minutes, the latter cars operating under a 20-minute headway.

Division No. 10 includes the West End line, which is 5.760 miles long. Round trip 30 minutes, headway 15 minutes.

In addition to these city divisions the Belvidere division includes the suburban line, which is 15 miles in length, the round trip being made in two hours, with a headway of one hour. Practically all of the lines are single track with turnouts, there being 22 miles of



MAP OF ROCKFORD CITY LINES.

divisions outside of the suburban division, and the routes are so arranged that every car passes around the main loop which encloses two blocks in the business center of the city. The company's waiting room and offices are located on one side of this loop and the waiting room is the universal transfer point between all the different divisions of the system. No transfers are issued in any other part of the city with the exception that the suburban cars from Belvidere issue transfers to one intersecting line near the city limits.

Division No. 1 includes the South Main, Kent & Island Ave. line, which is 2.951 miles in length. The round trip is made in 20 minutes, the cars running under a ten-minute headway.

Division No. 2 includes the Rockton Ave. and North Winnebago line, 2.570 miles long. Round trip 15 minutes, headway 20 minutes.

Division No. 4 includes the Church St., Harlem Ave. & North End line, 6.200 miles long. Round trip 36 minutes, headway 12 minutes.

Division No. 5 includes the North Second St. line, which is 1.073 miles long. Round trip 30 minutes, headway 30 minutes.

track laid on 20 miles of streets. This mileage, in addition to the interurban division, gives a total of 36 miles of track now in operation. The Rockford, Beloit & Janesville Railroad Co. rents trackage rights from the Rockford & Interurban Railway Co. and the cars of the former company operate around the down-town loop, leaving the transfer station at 5:30 and 7:00 a. m. and on every even hour thereafter until 11:00 p. m. The office and transfer station previously mentioned is located at the corner of State and Wyman Sts. and 922 cars pass this transfer point every 18 hours, making an average headway of the cars on the loop a little less than 1¼ minutes. The track on the paved streets is laid with a 7-in. Shanghai rail and on the macadam streets the company uses a 60-lb. T-rail made by the Carnegie Steel Co. The company has no power house of its own, but rents its current from the local Edison company which supplies 500-volt current to all the city lines and to the suburban line from Rockford to Cherry Valley. At the latter place the trolley circuit is broken and the remainder of the suburban line is fed by a direct current from the Edison company of Belvidere. The accompanying diagram shows a rough

sketch of the various divisions of the Rockford city lines and the arrangement of feeders and breakers. It will be seen that the feeders and circuit breakers are arranged so that in case of trouble occurring on any part of the line this part may be cut off from the system by means of the circuit breakers without disturbing the



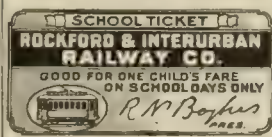
INTERURBAN CAR AT TRANSFER STATION.

operation of any other divisions of the system. The overhead work is of span wire construction supported on wooden poles.

The operation of the road is divided into four departments each of which is in charge of a department head all of whom report directly to the general manager. These departments include the accounting department, the transportation department, passenger and express department and track and line department. The accounting department is in charge of Mr. F. W. McAssey, auditor

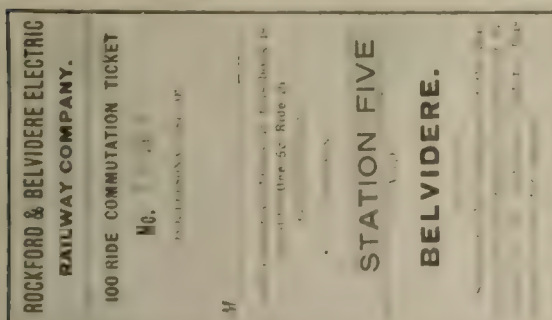


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SCHOOL TICKET.

of the company, who has charge of the ticket accounting, auditing and general accounting of the company. The universal cash fare for all the city lines is 5 cents with the privilege of transferring to any other line at the general transfer point. The company also issues tickets of various kinds some of which are illustrated herewith. The



ROCKFORD & INTERURBAN COMMUTATION BOOK

regular tickets are sold at the rate of 25 for \$1.00, 12 for 50 cents or 6 for 25 cents. These tickets are all consecutively numbered. The company also issues books of school tickets at the rate of 50 tickets for \$1.00. These books are also consecutively numbered and are issued to the purchaser and are not transferable. These

are good only for the person to whom issued on school days between 8:00 a. m. and 5:00 p. m. and are not good if detached. The fare on the suburban division from the city limits of Rockford to Belvidere is 20 cents or 25 cents from the down-town loop, including a transfer to or from any of the city lines. The company also sells mileage books, one of which is illustrated herewith, containing 100 five-cent coupons. These are sold at \$3.50 each and the number on each coupon corresponds to the number of the book. Each coupon represents one 5-cent ride and the conductor detaches enough coupons to cover the distance to be traveled. These tickets are not honored unless attached to the book bearing the same



FEEDING POINTS AND CIRCUIT BREAKERS ON CITY LINES.

consecutive number and no portion of the strip is honored if detached when presented. The following regulations are in force in regard to these mileage tickets:

The tickets are not good unless first presented with the audit check attached. Each coupon in the book represents one 5-cent ride on any part of the line between Station Five and Belvidere and the coupons are void if detached by any one except the conductor. The book must be surrendered to the conductor when the last coupon is detached and it is only good for the personal use of the party by whom it is signed.

When dead head tickets or passes are issued the form shown in the accompanying illustration is used. These passes are bound in

NOT GOOD IF DETACHED.

Rockford & Belvidere Electric Ry. Co.
THIS COUPON GOOD FOR
one 5c. ride.
1050

COUPON BOOK No. 1050

Sold at _____

To _____

190__

COMMUTATION TICKET WITH AUDIT CHECK ATTACHED.

book form and the stub shown in the illustration is filled out and preserved in the book. The coupons which are torn from this stub read in such a way that they can be detached from either end of the strip for a trip between Rockford and Belvidere in either direction.

In addition to the regular tickets described the company issues a number of special tickets for various purposes. One of these tickets is known as a paper carrier's ticket and is illustrated herewith. These tickets are issued to the various newspaper companies in Rockford and the surrounding towns and are used by paper carriers for reaching different suburban routes. These tickets are

each collection from each passenger and these amounts must agree with the reading of the register. This method constitutes a double check on the fares collected. The trip reports are turned in in envelopes printed as illustrated herewith. The envelopes for the city cars are printed on one side only and those for the interurban cars are printed on both sides, one side being used for the fares

ROCKFORD AND INTERURBAN RAILWAY.

SUBURBAN DIVISION.

Conductor's Daily Report _

1917

[illegible]

FACE OF CONDUCTOR'S DAILY REPORT.

Size of original, 7 $\frac{1}{4}$ x 8 $\frac{1}{4}$ in.

within the city limits and the opposite side being filled in for the fares on the interurban division. The trip report includes the car number and route number, the time both in and out, the number of passengers in an out, register readings and the number of transfers. Two columns are used for register readings in case double registers are used. The total is given for each of these columns and the envelope is dated and signed by number by the conductor. A number of boxes are arranged in the transfer station into which the trip reports are dropped. These boxes are opened from the opposite side in the office where the tickets and transfers are counted and the number of fares are recorded. Each conductor keeps his daily report on a printed slip which shows on one side the car number, the register readings in and out and the number

ROCKFORD & INTERURBAN RAILWAY CO.

| CAR NO. | | ROUTE NO. | | | |
|---------|------|-----------------|----------|----------|-----------|
| | TIME | NO. PASS | REGISTER | REGISTER | NO. TRANS |
| OUT | | | | | |
| IN | | | | | |
| TOTAL | | | | | |
| DATE | | CONDUCTOR'S NO. | | | |

CONDUCTOR'S TRIP REPORT ENVELOPE.

Size of original, 7 1/2 x 11.

or more. There are places for holding in and out, giving the train car number, number of passengers, regular tickets, commutation tickets, excursion tickets, city school tickets, suburban tickets, ticket passes, diesel board tickets and total transfers. On the back of the trip slip a blank space in which the total of the items in the opposite side are filled in and which show the total.

receipts for the day. These figures of course, must agree with the figures turned in for each trip report. The method of numbering all tickets consecutively reduces the work of ticket accounting to a minimum. The regular tickets are sold at the transfer station only and not by the conductors and by simply taking the serial number of the tickets remaining in the drawer the amount sold

CONDUCTOR'S REPORT.

| | | Date | No. |
|-----------|------------|--------------------------------|------------|
| Conductor | | | No. |
| Molorman | | | No. |
| CAR NO. | NO. TRIPS. | | |
| | | Between East River, N.Y. & ... | Total time |
| | | | Total time |
| | | | Total time |
| | | Between West River, N.Y. & ... | Total time |
| | | | Total time |
| | | | Total time |

RECEIPTS.

REVERSE OF CONDUCTOR'S DAILY REPORT.

during the day is known by deducting from this number the number on the ticket when the day's sales commenced.

A record of the register readings for each trip is kept by an inspector stationed at the car barn. This record is kept on a slip $5\frac{1}{2}$ in. wide and 20 in. long. The head of this slip showing the column ruling is shown herewith. These records are sent in to the office every morning and are checked off with the conductors' reports. When the cash and tickets are checked up the result is entered on the cash and ticket report which is a blank form $8\frac{1}{2}$ in. wide and 28 in. long. This is divided into eleven columns under the following headings: "Cash From Conductors", "Regular Rockford Tickets", "Commutation Tickets", "Excursion Tickets", "Rockford School Tickets", "Belvidere and Beloit Dead Head Tickets", "Total Fares", "Transfers Received", "Conductor Number", "Transfer Number". In the last column mentioned it is only necessary to take the number on the last transfer on the pad, and as the transfers are numbered consecutively this shows the number of transfers which have been issued. The daily report of earnings is made out on a blank $8\frac{1}{2}$ in. wide by 9 $\frac{1}{2}$ in. long. One of these

ROCKFORD & INTERURBAN RAILWAY CO.
DAILY REGISTER REPORT.

| FOR _____ | | | | 190 _____ | |
|-----------|-----------------|------------------|---------|-----------|----------|
| TRIPS | Motorman No. | Conductor No. | CAR NO. | TRIPS | REGISTER |
| Out | | | | Out | |
| In | | | | In | |
| Out | | | | Out | |
| In | | | | In | |

CAR REGISTER REPORT.

Size of original, 50 x 20 cm.

reports is shown herewith which is filled out for the day's business of June 4, 1902. This was the occasion of the Woodmen's picnic at one of the company's parks and the report shows the company's earnings from all sources for that day. For the convenience of the officers and directors of the company who desire to keep track of the daily operations without going into details a condensed daily

ditions of the business each day and the comparative statements are very useful in showing the trend of the company's business. The company's system of accounting is practically the standard system adopted by the Street Railway Accountants' Association and therefore needs no special description. The vouchers used by the company are attached to each bill received and must be approved both by the president and general manager of the road. At the bottom of the voucher is a form of receipt which must be signed by the person or official in whose favor the voucher is made. This voucher is 10 in. wide by 8½ in. long and on its back is printed the standard form of distribution and every entry on the voucher is entered in this distribution form under its proper heading. In this way the backs of the vouchers show exact distribution of the expenses. The monthly income account and the expense account are printed on the opposite sides of a sheet 8½ in. wide by 14 in. long. Both of these forms follow the standard forms of the Accountants' Association. Both the ticket accounting and general accounting have been standardized and simplified so as to require the minimum of labor in the accounting department.

ELECTRIC EXPRESS DEPARTMENT.

The express business of the company, which is in charge of Mr. J. H. Groneman, general passenger and express agent, was started on June 10, 1902, and although but hardly a year old this branch of the company's business has already reached very creditable proportions. While this business has been well advertised locally its rapid development has been largely due to the energetic management of Mr. Groneman, who has constantly made a personal can-

vass of all the shippers and merchants of Rockford and the surrounding territory. Every possible effort has been made to give prompt service and to offer every possible accommodation to the merchants and other shippers in the vicinity of the road, and the success of this undertaking is shown by the fact that whereas it was at first almost impossible to fill one express car making two round trips daily between Rockford and Belvidere this business has now entirely outgrown the capacity of one car and two other

Rockford and Interurban Railway Company.

Daily Report of Earnings for Wednesday, June 4, 1902.

| No. Car. | DIVISIONS. | Cash from Conductors | Regular Rockford Tickets | Commut Tickets | Excursion Tickets | Rockford School Tickets | Belvidere and Beloit | D. H. | Total Fares | Transfers. |
|----------|---------------------------|----------------------|--------------------------|----------------|-------------------|-------------------------|----------------------|-------|-------------|------------|
| No. 1 | Main Lm. & 1st Ave. | 120 45 | 190 | | | | | 11 | 2610 | 837 |
| " 2 | Rockton Ave. | 173 60 | 196 | | | 3 | | 14 | 3685 | 612 |
| " 4 | Harlem Ave. | 507 40 | 812 | | | 18 | | 50 | 11028 | 1911 |
| " 5 | N. Second | 35 65 | 100 | | | | | 3 | 816 | 199 |
| " 6 | S. Second | 33 25 | 101 | | | 6 | | 18 | 787 | 216 |
| " 7 | E. State | 60 05 | 197 | | | 5 | | 7 | 1410 | 192 |
| " 9 | Seventh & 18th Ave. | 140 85 | 290 | | | 12 | | 19 | 3138 | 856 |
| " 10 | West End | 90 20 | 333 | | | 3 | | 12 | 2332 | 419 |
| | Rockford Div. | 104 80 | 69 | 1171 | | 6 | | 23 | 3365 | 3 |
| | Belvidere Interurban Div. | 288 50 | | 4720 | | 24 | | 80 | 10594 | |
| | Total | 1563 75 | 2288 | 5891 | | 77 | | 234 | 39765 | 5245 |

| Number | Description of Receipts | Amount |
|----------|--|---------------|
| 31275 | Cash Fares, | 5 cents |
| | Rockford Regular Tickets, Nos. 875101 to 877200 inc. | 25 for \$1.00 |
| | Rockford Commutation Tickets, Nos. to inc. | |
| | Belvidere Commutation Tickets, Nos. to inc. | |
| | Excursion Tickets, Nos. to 589 tickets inc. | 45c |
| | " Tickets, Nos. to inc. | |
| | Rockford School Tickets, Nos. to 2529 inc. | 50 for \$1.00 |
| | Belvidere to Beloit, Single Tickets, Nos. to inc. | 50 cents each |
| | " " " Round Trip Tkts. Nos. to inc. | \$100 each |
| | Express Receipts—Rockford, " " " Belvidere, | |
| | Miscellaneous, Boat Tickets. | |
| | TOTAL EARNINGS | 1934 05 |
| Pleasant | Woodman Picnic. | |

DAILY REPORT OF EARNINGS. SIZE OF ORIGINAL, 8 X 9 1/2 IN.

cars of considerably larger size are being built as rapidly as possible to take care of this constantly increasing branch of the company's business. One of the methods employed to favor customers and to increase the express business of the company is, we believe, entirely novel and has been found very effective. For example, if a dealer

Rockford and Belvidere Electric Railway Co.

DEAR SIR:

Please deliver to M

all express and freight consigned to me at station.

Date 190

EXPRESSMEN'S ORDER FOR RECEIVING GOODS.

in Belvidere finds that he is short of any line of goods for which he has a demand instead of looking for the goods himself he telephones an order for what he wants to the company's express agent in his town. This order is telephoned by the local agent to the general agent in Rockford who purchases the goods and ships them to Belvidere by the next electric express. In this way the dealer in Belvidere receives his goods in the shortest possible space of time, often not even knowing where they have been purchased.

166,002; fruit, including apples in barrels, 71,403 lb.; sugar, 14,000 lb.; groceries, 100,744 lb.; meat, 30,800 lb.; meat, 68,744 lb.; beer, 122,547 lb.; lumber, 51,540 lb.; sewing machine furniture, 66,748 lb.

TRANSPORTATION DEPARTMENT.

The transportation department takes charge of the rolling stock and the car barns and repair shops. The operating force, repair men and barn men are also hired, instructed and disciplined by the

| AGENT'S STUB | | | | | | Form 1 |
|---|-------------------------|-----|-----|-----|-----|---------|
| Station, | | | | | 190 | |
| Delivered to the ROCKFORD AND INTERURBAN RAILWAY COMPANY | | | | | | |
| by | | | | | | |
| as described below Express to be forwarded subject to rules and conditions contained in the Bills of Lading, Classifications and Tariffs of the Company, and upon the express condition that it will not carry and is not liable for loss or damage occurring beyond its own lines. | | | | | | |
| Consignee | | | | | | |
| Destination | | | | | | |
| Via | | | | | | |
| CLASSES | 1st | 2nd | 3rd | 4th | 5th | 6th |
| WEIGHTS SUBJECT CORRECTION | A | B | C | D | E | |
| No PRGS | DESCRIPTION OF ARTICLES | | | | | WEIGHTS |
| | | | | | | |
| SHIPPER | | | | | | |
| BILL OF LADING. | | | | | | |
| Size of original, 5 1/2 x 8 1/2 in. | | | | | | |

superintendent of transportation, Mr. Charles C. Lines. The company's rolling stock includes 18 open motor cars 30 ft. long, three of which are 10-bench and 15 are 9-bench cars; 18 closed motor cars, part of which measure 16 ft. and the rest 18 ft. over floor posts; these cars are mounted on Bemis, Brill No. 21 and duPont trucks; eight double truck cars four of which are 38 ft. long, built by Jackson & Sharp and mounted on Lorain trucks, and four of which are 45 ft. long, built by Barney & Smith and mounted on "Diamond" trucks. The four latter cars are those used on the interurban division. There are also 15 open 10-bench trailers which are used in emergencies for handling heavy crowds. The company also has one nose snow plow built by the Taunton Locomotive Manufacturing Co. which is equipped with two 50-h. p. motors, one sweeper made by the McGuire Mfg. Co., equipped with two 50-h. p. Lorain motors, one sprinkler of 1200 gallons capacity by the Miller-Knoblock Co. and one express car 23 ft. in length. Two new express cars are soon to be added to the service, one of which is now nearly completed. These will measure 42 ft. over all. The motor equipments of the cars are of various kinds; Westinghouse No. 3 and No. 9; G. E. 52 and G. E. 800 and also some Steel motors are used. The city cars are generally equipped with Sterling brakes and incandescent headlights made by the Crouse-Hinds company. The suburban cars, in addition to the hand brakes, have Christensen air brakes, and are fitted with arc headlights.

The main barns are situated at the corner of Kishwaukee St. and First Ave. on a site 120 ft. wide by 250 ft. deep. There are two buildings called the north and south barns between which are the general repair shops. The barns and shops are all connected forming practically one large building. The company also has another barn in what is known as the West End Division of the city which is used exclusively for storage purposes. At the front of the repair shop on Kishwaukee St. is located the storeroom in which all kinds of shop supplies are kept. Beyond the storeroom is a winding room in which armatures are wound and fields repaired. The company does not form its own armature coils but these are bought ready made and are put on the armatures in the company's shops. Behind the armature room is a machine shop which contains the usual equipment of lathes, drills, scrapers and a hydraulic wheel press. The company has tried turning down flat wheels but has abandoned it as being unsatisfactory. At present when flat spots are worn on wheels or the flanges wear too thin the old wheels are simply pressed off and disposed of as scrap and new wheels pressed on the axle. Next to the machine shop comes the overhauling department which is located alongside of the track pits in the north barn. These pits are provided with a narrow gage track on which is mounted a car carrying a jack and a cradle upon which armatures and motors are lowered from the trucks. The pit car is then run out from under the car and the armature or motor is picked up by a swinging crane which deposits it on the floor of the overhauling department. Here the machines may be readily taken apart and cleaned, the various parts carried to the different shops for such repairs as may be found necessary.

DAILY REPORT OF EXPRESS.
ROCKFORD & INTERURBAN RAILWAY COMPANY.

| STATION | | DATE | |
|--|---------|---------|-------|
| UNCOLLECTED BILLS AS PER LAST REPORT \$ | | | |
| | COLLECT | PREPAID | TOTAL |
| EXPRESS | | | |
| FORWARDED | | | |
| EXPRESS | | | |
| RECEIVED | | | |
| TOTAL AMOUNT OF BUSINESS. | | | |
| BILLS FOR COLLECTION AT THIS OFFICE. | - | - | \$ |
| TOTAL BILLS. | - | - | \$ |
| COLLECTIONS | | | |
| CASH | - | - | \$ |
| MILK TICKETS AT | | \$ | |
| BUTTER | AT | \$ | |
| TOTAL COLLECTIONS. | - | - | \$ |
| UNCOLLECTED BILLS AT CLOSE OF BUSINESS. | - | | \$ |
| TICKET SALES | | | |
| TICKETS-COMMUTATION No. | | To | \$ |
| TICKETS. | No | To | \$ |
| AGENT | | | |
| NOTICE TO AGENTS THIS REPORT MUST BE FILLED OUT EVERY DAY AND SENT TO AUDITOR'S OFFICE BY 10 A. M. THE FOLLOWING DAY | | | |
| AGENTS DAILY REPORT OF EXPRESS. | | | |
| (Size of original 4" x 8 in.) | | | |

Beyond the overhauling department is a small paint room in which paints are mixed and sash and other small parts are painted or varnished. The car painting is done on two tracks in the barn adjacent to the paint shop which are reserved for this purpose. All the company's rolling stock is varnished every year and it is also repainted each year if found necessary. At the rear of the paint room is the woodworking shop where all repairs on car bodies

are made. This shop is now turning out two new express cars previously mentioned, one of which is already nearing completion. The blacksmith shop is located alongside of the carpenter shop and contains 1 forge. The north barn is largely devoted to painting, general repair work and storage while the south barn is used for the night storage of the cars in service.

The company is preparing to adopt the "Detroit" style illuminated signs on all of its cars, and a large number of these signs are

list of questions which he is required to answer over his own signature. The questions upon this application blank are as follows:

What is your full name?

Are you married?

Residence?

How long have you resided at the above address?

Previous residence?

Trade or occupation?

| DELIVERY TICKET. | | | | Form 3 |
|--|----------|--|---------|----------|
| <p><i>Received from</i> Rockford and Belvidere Electric Railway Co.</p> | | <p style="text-align: right;"><i>Pro No.</i></p> | | |
| <p><i>Consignor, Orig. Point Shipment, Con. Line Ref.</i></p> | | <p style="text-align: center;"><i>The following shipment in good order</i></p> | | |
| BILLING STATION | WAY-BILL | | CAR | |
| | DATE | NUMBER | NUMBER | TIME |
| | | | | |
| ARTICLES AND MARKS | WEIGHT | RATE | EXPRESS | ADVANCES |
| | | | | |
| <p style="text-align: right;"><i>Total Express and Advances</i></p> | | | | |
| <p style="text-align: right;"><i>Dragage</i></p> | | | | |
| <p><i>Drag No.</i></p> | | <p style="text-align: right;"><i>Total Charges</i></p> | | |

SECTION OF TRIPPLICATE FORM. (SIZE OF ORIGINAL 7x8½ IN.)

being made at these shops. These signs are mounted on the sides and front of the decks and are illuminated by means of the interior car lighting through the deck sash. The signs are made of wood painted black, the lettering being sawed entirely through the wood and the narrow outline around the letters painted white. On the back of each open letter is fastened a strip of white celluloid which permits sufficient passage of light to thoroughly illuminate the sign when the interior lights of the car are burning. The combination

| | | | | |
|-----------------------|----|-----|----|-----|
| FORM NO. 1 | NO | 401 | NO | 401 |
| FROM | | | | |
| TO | | | | |
| IF FILLED, FORWARD TO | | | | |
| IF EMPTY, RETURN TO | | | | |

ICE CREAM TICKET.

of white letters upon a black background also make a very legible sign during the daytime.

As previously stated all application for employment are made to the superintendent of transportation and every applicant for the position as motorman or conductor is given a blank containing a

Have you a good watch?
Do you drink or frequent saloons?
How long have you been out of employment?
By whom were you last employed?
How long were you in their employ?
Their address?
Why did you leave?
Who was your previous employer?
How long were you in their employ?
Their address?
Who recommended you to this company?
Their address?
Other references.
Have you read the rules and regulations of the company?
Were you ever employed on any horse or electric railroad in this
or in any other city as motorman or conductor, if so state which.
State where so employed.
State how long employed.
State why you left.

If the answers to these questions are found satisfactory and the applicant appears upon personal examination to be sufficiently intelligent and otherwise qualified for the position which he is seeking he is, if a motorman, put to work in the pit for seven days in order to familiarize himself with the essential parts of the car equipment. After working a week in the pit he is put on a run with an old motorman who instructs him as to his duties up to such time as he considers him capable of operating a car. The new applicant is then put on with another man and continues to operate under instruction until passed by both motormen. During

his period of instruction the superintendent of transportation occasionally rides with the new man in order to personally observe his capabilities. The regular runs on the company's lines are divided into three classes called day runs, late runs and swing runs. The uniformed force includes about 65 men and 15 men are employed in the shops and barns.

Whenever an employe leaves or is discharged from the service of the company he is given a certificate stating that he has been employed by the company for a certain time and also giving the cause of his leaving the service. His conduct while in the employ of the company is mentioned and in case he is discharged the cause and particulars for his discharge are given. This certificate is signed by the superintendent of transportation and is approved by the general manager. A copy of such certificate is kept in the superintendent's office in a book used for that purpose.

The description of the Rockford & Freeport Division as well as the park system of the Rockford & Interurban Ry. and the financial statistics of the company will be given in the July issue of the "Review."

CONVENTION ANNOUNCEMENTS.

The accompanying diagram shows the arrangement of exhibit space for the 22nd annual convention of the American Street Railway Association to be held at Saratoga September 2d to 4th next. The list of exhibitors to whom space has been assigned is also given herewith. The exhibits will be located on the verandas and in the court yard of the headquarters hotel.

Mr. Frank M. Cozzens, chairman of the exhibit committee, No. 4 Thomas St., Saratoga, N. Y., has made the following announcement:

The allotment of space shown is final and cannot be revised. The committee reserves the right to cancel applications for space not paid for by Sept. 1, 1903. Payment should be made to T. C. Pennington, treasurer American Street Railway Association, 2020 State St., Chicago.

Exhibits can be placed four days before the first day of the convention, and shall be in place on the morning of September 2. All articles for exhibition shall be delivered on the exhibition grounds by the agent or owner and at his expense, but the local committee has made arrangements with Tooley Brothers, Saratoga Springs, to deliver all shipments to and from the grounds at low rates. Mark your goods to yourself, care of Tooley Brothers, Saratoga Springs, New York, sending them bill of lading or advice and prepay charges. Under no circumstances will exhibits be received on which there are charges of any kind. Mark the number of your space on all boxes and cases. Ship all goods early to avoid delay in transit.

The grounds will be planked and exhibitors desiring platform or railing should apply to the chairman of exhibits at once who will quote prices per square foot. Signs should not exceed 2 ft. in height, and cannot be placed so as to obstruct any other exhibit. Cars and sweepers will be exhibited on side track within one-half block of grounds. No nails, tacks, or screws shall be placed or driven into the floor, wall or trees and all decorations must be put up without defacing walls or trees. Exhibitors will be held responsible for any damage to floor, walls or trees caused by the act or negligence of the exhibitor or his agents. The grounds will be well lighted, special lighting or power will be furnished at lowest market rates.

Exhibitors are requested to send the following information to the chairman of exhibits not later than July 15, 1903:

1. Will your exhibit be of light or heavy material?
2. What amount of current will you require for power?
3. State whether you want direct or alternating current and what kind.
4. What machinery will you have in operation? Give full description of same and power required.
5. Will you require extra lighting? If so, what amount?
6. Will you have electric signs for display? Give full particulars as to number of lights, etc.

Exhibitors must provide and ship all lamps needed for electric signs.

Secretary Pennington has issued a circular giving the rules regarding tickets at reduced rates as follows:

The passenger associations have granted excursion fares from all points, except in the district of the South Western Passenger Association. Fare and one-third for the round trip.

One hundred or more persons must purchase tickets and get properly executed certificates from the agent when purchasing ticket.

Tickets for the return journey will be sold by ticket agent at Saratoga for one-third the first-class limited fare to those holding certificates signed by the ticket agent at point where ticket is purchased, countersigned by the secretary of the association, signed and stamped by a special agent of the passenger association, and upon payment of 25 cents for vising by passenger agent.

Tickets for return journey must be purchased within three days after adjournment of meeting. Sunday not being reckoned as one of the three days.

No certificates will be honored if issued in connection with any ticket unless full fare shall have been paid to Saratoga.

The certificates are not transferable.

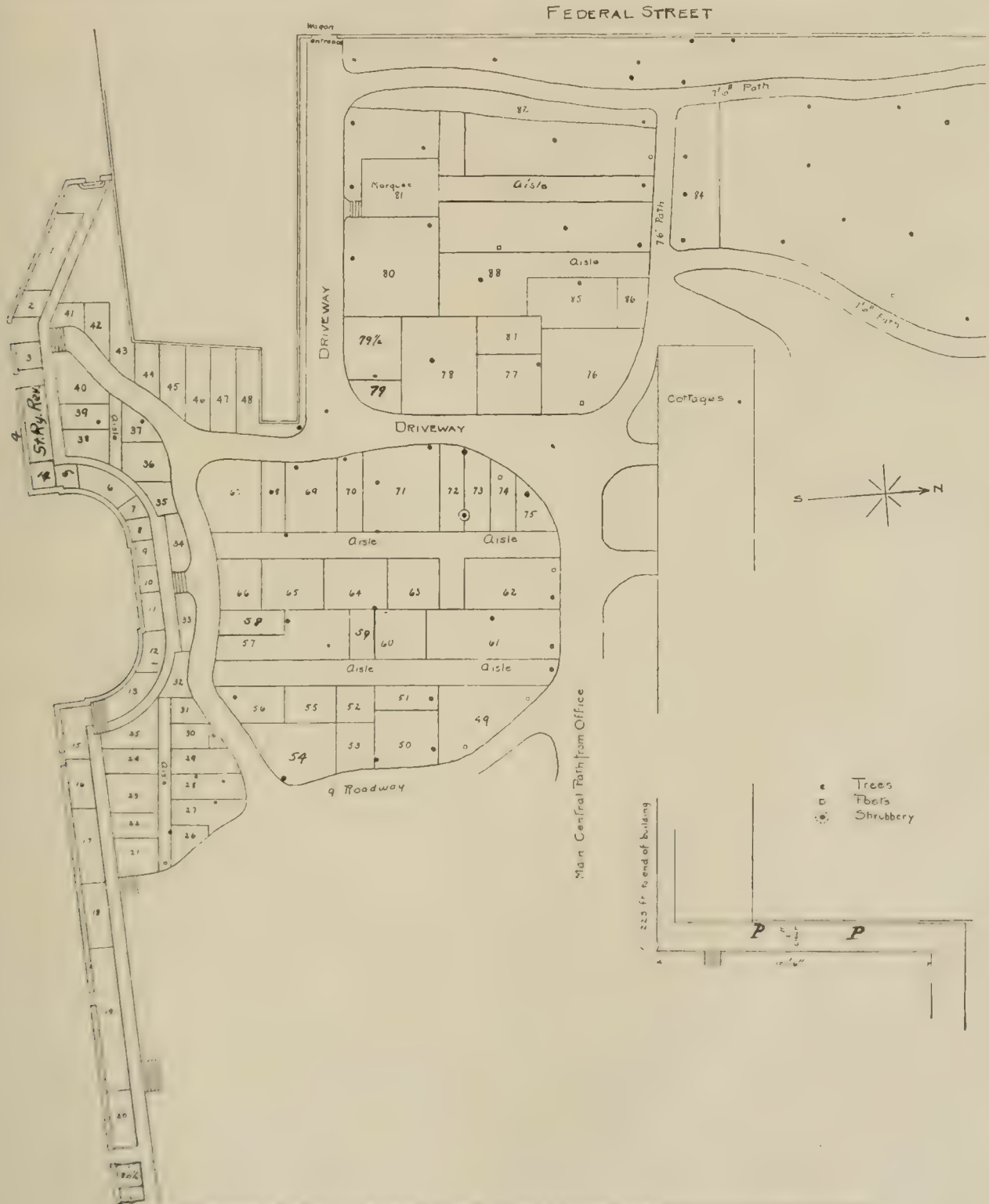
No refund of fare can be expected if you do not get certificate when ticket is purchased.

Leave your certificate with clerk when you register.

LIST OF EXHIBITORS.

| Space No. | Sq. ft. |
|-----------|---|
| 16 | Adams & Westlake Co., Chicago..... 200 |
| 30 | American Automatic Switch Co., New York..... 100 |
| 36 | American Brake Shoe & Foundry Co., Mahwah, N. J.... 200 |
| 68 | American Car Seat Co., Brooklyn..... 250 |
| 33 | American Railway Supply Co., New York..... 100 |
| 52 | American Steel & Wire Co., Chicago..... 225 |
| 40 | Atlas Railway Supply Co., Chicago..... 200 |
| 60 | Baldwin Locomotive Works, Philadelphia..... 250 |
| 84 | Bemis Car Truck Co., New York..... 850 |
| 70 | Berry Brothers, Detroit..... 200 |
| 11 | Bliss, E. W. & Co., Brooklyn..... 150 |
| 77 | Brill, J. G. & Co., Philadelphia..... 300 |
| 60 | Brown, Harold P., New York..... 600 |
| 44 | Bruck Solidified Oil Co., Boston..... 100 |
| 27 | Brady Brass Works, New York..... 100 |
| 74 | Chase, L. C. & Co., Boston..... 200 |
| 69 | Christensen Engineering Co., New York..... 400 |
| 32 | Cook, Adams & Sons, New York..... 100 |
| 3 | Conant, R. W., Cambridge..... 100 |
| 61 | Consolidated Car Fender Co., New York..... 1000 |
| 66 | Consolidated Car Heating Co., Albany..... 300 |
| 73 | Continuous Rail Joint Co., Chicago..... 200 |
| 17 | Curtain Supply Co., Chicago..... 300 |
| 6 | Dearborn Drug & Chemical Works, Chicago..... 200 |
| 39 | Detroit Trolley & Manufacturing Co., Detroit..... 200 |
| 41 | Duff Manufacturing Co., Allegheny..... 100 |
| 63 | Electric Storage Battery Co., Philadelphia..... 400 |
| 82 | Electric Railway Equipment Co. (E. P. Morris), Cincinnati..... 1000 |
| 9 | Field, C. J., New York..... 100 |
| 50 | General Electric Co., Schenectady..... 500 |
| 14 | Globe Ticket Co., Philadelphia..... 100 |
| 57 | Gold Car Heating & Lighting Co., New York..... 500 |
| 18 | Hale & Kilburn Manufacturing Co., New York..... 250 |
| 12 | Harrington, C. J., New York..... 200 |
| 42 | Heywood Bros. & Wakefield Co., Philadelphia..... 100 |
| 79 | Howe Manufacturing Co., Scranton..... 100 |
| 20 | International Register Co., Chicago..... 200 |
| 67 | Johns, H. W.—Manville Co., New York..... 600 |
| 47 | Kinnear Manufacturing Co., Columbus..... 100 |
| 58 | Knowles, C. S., Boston..... 225 |
| 25 | LeValley Vitae Carbon Brush Co., New York..... 200 |
| 64 | Lorain Steel Co., Lorain..... 500 |
| 59 | Ludlow Supply Co., Cleveland..... 200 |
| 31 | Lumen Bearing Co., Buffalo..... 100 |
| 76 | Magann, G. P., Air Brake Co., Detroit..... 1000 |
| 55 | National Carbon Co., Cleveland..... 300 |
| 7 | National Ticket Co., Cleveland..... 100 |
| 56 | National Lock Washer Co., Newark..... 250 |
| 5 | Newcomb, F. H., Brooklyn..... 100 |
| 53 | Nuttall, R. D. Co., Pittsburg..... 300 |
| 49 | Ohio Brass Co., Mansfield..... 875 |
| 19 | Ohmer Fare Register Co., Dayton..... 500 |
| 15 | Pantasote Co., New York..... 150 |

| | | | | | |
|-----|---|------|----|---------------------------------------|------|
| 78 | Peekham Manufacturing Co., New York..... | 1000 | 10 | Star Brass Works, Kalamazoo..... | 100 |
| 71 | Pennsylvania Steel Co., Philadelphia..... | 1000 | 1 | Stephenson, John, Co., Elizabeth..... | 600 |
| 21 | Pierce, E. Raymond, Boston..... | 200 | 13 | Sterling Meaker Co., Newark..... | 250 |
| 54 | Pittsburg Reduction Co., Chicago..... | 600 | 38 | Sterling Varnish Co., Pittsburg..... | 150 |
| 35 | Pittsburg Switch & Signal Co., Pittsburg..... | 100 | 48 | St. Louis Car Co., St. Louis..... | 200 |
| 20 | Railway Appliance Co., Albany..... | 100 | 45 | Stuart Howland Co., Boston..... | 100 |
| 28 | Railway Appliances Co., Chicago..... | 200 | 1 | Street Railway Journal, New York..... | 300 |
| 51 | Root Track Scraper Co., Kalamazoo..... | 200 | 4 | STREET RAILWAY REVIEW, Chicago..... | 300 |
| 85 | Rossiter, McGovern & Co., New York..... | 700 | 80 | Taylor Electric Truck Co., Troy..... | 1500 |
| 20 | Railway Sander Co., Toronto, Can..... | 100 | 46 | Traction Equipment Co., Brooklyn..... | 150 |
| 20½ | Sherwin Williams & Co., Cleveland..... | 200 | 43 | Union Signal Co., Cambridge..... | 100 |
| 62 | Standard Paint Co., New York..... | 400 | 8 | U. S. Curtain Co., Newark..... | 100 |
| 24 | Standard Vitrified Conduit Co., New York..... | 200 | 22 | Van Dorn & Dutton Co., Cleveland..... | 200 |



OFFICIAL DIAGRAM OF EXHIBIT SPACE, A. S. R. A. CONVENTION, SARATOGA, N. Y., SEPT. 24, 1903.

| | | |
|----|---|-----|
| 37 | Van Dorn, W. T., Co., Chicago..... | 100 |
| 25 | Watson Wm T., Newark..... | 180 |
| 72 | Weber Railway Joint Manufacturing Co., New York..... | 200 |
| 2 | Western Electrican, Chicago..... | 100 |
| P | Westinghouse Electric & Manufacturing Co., Pittsburg..... | 600 |
| 65 | Wharton, Wm. Jr. & Co., Philadelphia..... | 500 |
| 34 | Wheel Truing Brake Shoe Co., Detroit..... | 100 |

LABOR SITUATION AT RICHMOND, VA.

During the past month the relations between the Virginia Passenger & Power Co., of Richmond, Va., and its employees have been growing somewhat strained and as we go to press it is not improbable that a strike may result. Early in May the union asked the management to enter into a contract for a 9-hour day and grant an increase in wages. Some other minor points were included but the wage question was the important point. May 23d, the general manager, S. W. Huff, replied to the demands of the men calling attention to the fact that the existing wage schedule was adopted August, 1902, after arbitration between the parties in interest and that inasmuch as this was practically the only question at issue the company must decline to consider the proposal made. May 25th a committee of the union proposed that the matter of agreeing to proposal previously made be submitted to arbitration. On the 30th the company again replied that as the question of wages was the only real issue, and the scale now paid had been fixed by arbitration only ten months ago it declined to rearbitrate the matter.

Mr. Huff's letter of the 23d was in part as follows:

"Shortly after the properties controlled by the Virginia Passenger & Power Co. were acquired, and before there had been an opportunity to know what the earning capacity and the expenses of the properties operated together would be, a demand for increased wages and a nine-hour day was presented.

"After some discussion the company offered a nine-hour day, provided a majority of the men on the various lines desired it, and agreed to arbitrate the rate of wages. This offer to arbitrate wages was first declined by the committee representing the motormen and conductors, but, after a strike of about twelve hours' duration, the same committee offered to accept arbitration.

"This arbitration resulted in an increase of wages, fixing upon the company an additional expense of about \$50,000 per year; the scale of wages fixed by this Arbitration Committee taking effect Aug. 1, 1902.

"When the company had been gotten into such shape as to be able to determine the result of the combined operation of the companies, it was found that, although the combined operation of the properties had effected a substantial saving, still the ratio of operating expenses to receipts was abnormally high, and that the amount which stood out most prominently in proportion to other expenses, and which was most out of proportion to the same expense in the report of other properties was the amount paid our motormen and conductors, it being 31 per cent of the total receipts from railway operation and 44 per cent of the total operating expenses. If the officers of the company had gone at the readjusting of expenses in the most natural way, this item of motorman and conductor wages would have been the first one that would have come in for reduction, but, as this rate of wages had been fixed by a Board of Arbitration, the company did not feel that it could make a reduction in these wages and keep good faith with its employees.

"Under these circumstances, you can understand why, when a demand for an additional increase of 24.6 per cent over the present high wages is asked, resulting in an added increase in expense of about \$80,000 per year, and this request or demand is made just nine months from the date upon which the arbitration went into effect, we are forced to decline to make any further increase, it already being a very serious question as to how the company will be able to live up to the rate fixed by the Board of Arbitration and at the same time meet its obligations. In fact, if the award of the Board of Arbitration, which took effect the first of last August, is to be thrown over, it becomes a question whether the company should not reduce these wages rather than increase them.

"It is appreciated that the expense of living is greater than it has been in periods past, but this was fully considered by the Board of Arbitration last summer, as the present high rate of wages (high as compared with other cities of the same size in the South)

was the result of the consideration of the Arbitration Committee of this increased cost of living.

"By your own choice, you are now working nine hours per day on the Richmond and Manchester lines, rather than twelve hours, as heretofore, and it is unreasonable to expect that the company will be able to pay you such increase in wages per hour as would enable you to earn as much per day working only nine hours as you formerly earned working twelve hours.

"In the matter of the Petersburg Road. With the present rate of wages paid, the Petersburg Road during the past winter was barely able to pay operating expenses and must trust to the summer travel to pay the interest on its bonds. To increase the wages 25 per cent, as provided in your proposed contract, would mean to bankrupt the property.

"With regard to submitting to a Board of Arbitration the dismissal and suspension of our employes, this would be to virtually place the discipline of the roads in the hands of a Board of Arbitration. As railroad men, familiar with the difficulties with which a superintendent has to contend, you must recognize that it will be impossible for a superintendent or any operating man to control and maintain the respect of his men if his actions in matters of discipline are to be continually reviewed and passed on by a Board of Arbitration; it would simply mean to take matters out of his hands, and his usefulness would be at an end. * * * The foregoing reasons why we could not accede to your request or demand were explained to you more in detail when you called to see me at my invitation on May 11, when you were shown the company's balance sheets, that you might see for yourselves the company's inability to grant any increase in wages. Should there be any doubt in your minds as to my statements to you, or as to the genuineness of the balance sheets shown, I will be willing for you to have any accountant that might not be objectionable to us examine our books and satisfy you on this point."

The men went out on strike at 3 a. m., June 17th, tying up all the lines in Richmond and vicinity.

DOG TICKETS AT HARTFORD, CONN.

The Hartford Street Railway Co. derives considerable revenue from the sale of tickets permitting the transportation on its cars of dogs when accompanied by passengers. The tickets are sold at the company's office in strips at 5 cents each. Each ticket bears on



HARTFORD DOG TICKET.

the reverse side the following conditions under which the ticket will be accepted:

"This dog permit will be accepted for the transportation of one dog on the cars of this company as indicated on the face of this permit, on condition that if dog cannot be carried in owner's arms it shall ride in front vestibule with motorman."

The Boston (Mass.) Aldermen recently revised the ordinance regulating the speed of electric cars within the city limits from 7, 10 and 12 miles an hour to 10, 12 and 15 miles, according to locality. In turning corners speed must not exceed 4 miles an hour.

A contract has been closed between the city of Columbus, Ga., and the Columbus Street Railroad Co., part of the Stone-Webster electrical management of Boston, by which the company gains permission to run its cars across the new 14th St. steel bridge into the adjoining city of Girard, Ala. The former wooden bridge was not large enough nor strong enough to admit of a car line and it was this fact that practically made separate systems of the Phoenix-Girard and the Columbus car lines which prevented the original system in the Alabama suburbs from being successful. Now, however, the situation is entirely different, for the three cities are under a unified management. Extensions are being made in Phoenix City and Girard wherever they are deemed necessary.

ACCIDENTS.

By the derailing of a Berkshire Street Railway Co.'s car as it was passing through Housatonic, Mass., May 29th, the motorman was almost instantly killed, his child probably fatally injured and his wife and five other passengers, together with the conductor, severely hurt. It happened at a curve and it is thought a stone was in the track. The car struck a tree, breaking it off short, and the front end of the car was demolished.

Charles Babbitt, a conductor of the South Chicago City Railway Co., stood on the fender of his car as it was crossing the railroad tracks at 100th and Union Sts., Chicago May 22d, and was struck and instantly killed by a Pennsylvania railroad passenger train, which also injured the motorman and damaged the front portion of the electric car. The conductor had just crossed the network of tracks to see that the coast was clear and, two Baltimore & Ohio trains having gone by, he told the motorman to go ahead, at the same time stepping on the fender to watch out for trains.

One man was killed outright, two persons fatally and several others badly injured in a runaway trailer car accident at San Jose, Cal., June 6th, on the Alum Rock Electric Ry., owned by the San Jose & Santa Clara Railroad Co. The car was standing on a siding at the top of a hill and was being loaded with returning picnickers.

May 23d a Kedzie Ave. electric car and a Chicago & Grand Trunk freight train collided at the grade crossing at 49th St. and Kedzie Ave., Chicago, and five persons were hurt. The motorman started to cross the tracks after a passenger train passed, failing to see the freight.

A north bound Halsted St. car collided with an east bound 35th St. car, in Chicago, May 21st, at the intersection of the two thoroughfares, and 12 persons were injured, five seriously. The motorman of the Halsted St. car could not stop his car on account of slippery rails.

One man was fatally injured by a collision in Chicago June 5th, between an 18th St. electric car and a Halsted St. cable train. The windows of both cars were broken and several passengers were cut by flying glass.

Nine persons were badly injured by the overturning of a trolley car that ran wild down Eagle Rock on its way to Orange, N. J., June 6th. A passenger boarding the car by the front platform accidentally unset the brake and the car gained great momentum before the motorman could reach the brake. At the foot of the hill it struck a curve.

Eight persons were hurt in a collision at Jonesboro, Ind., June 4th. A Gas City motor car running between Jonesboro and Marion and a gravel car on the Union Traction Co.'s line, both running at high speed, collided on a curve.

In New York City, June 2d, a Columbus Ave. electric car, going through 53d St., struck the rear of a north bound Eighth Ave. car and forced it almost to the sidewalk. Both were open cars and both were considerably damaged. Nine persons were injured.

Two Brooklyn trolley cars collided on the New York end of the Brooklyn Bridge May 30th and both cars were badly damaged. One passenger was injured.

Ten persons were injured May 25th in a collision at New Baltimore, Mich., between a Rapid Railway electric passenger car and a steam freight train that runs on the company's tracks hauling freight during the night and early morning. The tender of the freight engine was driven half way through the passenger car. A mistake in orders is said to have caused the accident.

A collision occurred June 7th 10 miles west of St. Louis between two street cars running between St. Louis and Crève Cœur Lake. One passenger was seriously injured. The cap of a motorman blew off and he backed his car to get it. Another car came around a curve from behind.

June 1d there was a collision in St. Louis between Bellefontaine and Cherokee cars, in which eight persons were hurt.

A trolley car of the New Jersey line and a freight car of the Jersey Central railroad were in collision at Elizabeth, N. J., May 24th. The freight car was being shunted up the track just as the trolley crossed and struck the rear of the latter, completely wrecking it. The conductor and a passenger were severely injured.

The rear end of a Union Traction Co. car was struck by an excursion train on the Lake Erie & Western railroad at Muncie, Ind., May 24th, and demolished. It was a stormy evening and just as the interurban was crossing the track the power failed, owing to

the motor being burned out by lightning. The steam train was flagged and its speed reduced.

A car of the East Pittsburg and Homestead line, while descending a steep grade on Library St., Braddock, Pa., May 23d, jumped the track, ran across the street and crashed into a building. Fourteen passengers were injured and the car wrecked. A broken brake beam was alleged to be the cause.

A rear-end collision occurred on the Detroit, Ypsilanti, Ann Arbor & Jackson Ry., May 30th, a short distance from the power house at Dearborn, Mich. Three persons were injured and all the windows in the forward car were smashed. The cars were running closely together and when one stopped to let off a passenger the other ran into it.

An accident which completely demolished one of the cars of the Omaha Street Railway Co., occurred on the Park Ave. line, Omaha, Neb., May 29th. Seven people were badly injured, including a conductor. It happened on a stretch of single track near a turnout, one car starting from the switch too soon.

A Robinson Park trolley car at Fort Wayne, Ind., and an electric construction train consisting of a box car and two gondolas loaded with stone collided head on at "Horseshoe Bend" May 20th and six people were hurt. The collision took place on a curve, and high bushes obstructed the view from both approaches.

In San Francisco May 30th a Fillmore St. electric car of the United Railroads ran full upon a Haight St. cable car at the junction of Fillmore and Haight Sts. The cable car was completely wrecked and 14 persons were injured, none fatally. It is a rule of the company that cars of both lines stop before crossing each other's tracks. It is said that the motorman of the Fillmore St. car was unable to stop it.

A South Omaha (Neb.) car was struck by a whirlwind May 22d with such force the glass in the vestibule and windows was blown in and the motorman was badly cut about the head and face. An Omaha car was struck by the squall and the front truck lifted from the track, causing a blockade.

The South Chicago City Railway Co. has offered a reward of \$1,000 for the arrest of persons who are believed to have caused one wreck on the company's lines and to have attempted others. June 1st a car was derailed at Stony Island Ave. and 67th St., by spikes driven against the rails. A woman passenger was severely injured. A similar attempt was made the same night at Hammond, Ind.

Early in the evening of June 5th a car on the Wilmerding branch of the Pittsburg Railways Co., on a level piece of track, jumped the track and plunged 14 ft. downward over a steep embankment toward the Monongahela River. The 14 passengers were thrown first against the roof and then against the floor as the car rolled three-quarters over and lay within six feet of the river bank. Everybody was injured, including the motorman and conductor, but none fatally. It happened between Brown's Station and Glenwood Bridge. The motorman thought a stone, or "clinker" may have caused the derailment.

In Alliance, O., June 7th, a defect in the track caused a car to leave the rails on the South Arch Ave. grade. The body of the car left the truck. A woman 60 years old was thrown through the car floor and rendered unconscious.

Two cars of the East St. Louis & Suburban Railway Co. met in head-on collision on a short curve at the western city limits of Collinsville June 5th and three persons were hurt. The cars telescoped part way and both were damaged.

Two Rapid Railway System cars collided near Mt. Clemens, Mich., in a heavy rain June 6th and several passengers were more or less injured. One of the cars was a mail car.

A Montreal Terminal Railway Co.'s car jumped the track on the incline on City Hall Ave., Montreal, June 6th, and plunged into a shed in the rear of the No. 6 Fire Station. The shed was wrecked, the car somewhat damaged and several passengers slightly hurt. The motorman jumped before the crash came. A loose rail was blamed.

Two double truck Park & Island Ry. cars collided near the St. Laurent Bridge, Montreal, June 7th, on a curve which prevented the motormen seeing each other until it was too late. They stuck to their posts with the result that nobody was seriously hurt, although the front ends of the cars and the platforms were damaged.

On the grade crossing at Niles, O., June 7th, a Mahoning Valley electric car was run down and demolished by a Baltimore & Ohio freight train. Fortunately there were no passengers.



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CONVENTION EXHIBITS.

The circular announcement of the chairman of the committee having in charge the arrangement and care of exhibits at the meeting of the American Street Railway Association to be held at Saratoga in September shows that spaces aggregating about 27,000 sq. ft. have been assigned to 80 different concerns.

PENSION SYSTEM IN DENVER.

It gives us pleasure to note the adoption by the Denver City Tramway Co. of comprehensive plans for pensioning superannuated employees and for guaranteeing the solvency of an employees' mutual benefit association. We are satisfied that such provision for faithful employees who by reason of age or accident cannot continue in the service is equitable and sure to promote better relations between the men and the company. In establishing a pension system the Denver company has followed the example set by some of the largest steam railroad corporations and also by three of the leading street railways of the country—the Rhode Island Co., of Providence; the Metropolitan Street Ry. of New York, and the Boston Elevated Ry. The Denver Tramway company has not followed exactly any of the plans adopted by other companies, its scheme involving points of both the Providence and the Boston pension regulations. The company has also arranged to give substantial aid to an employees' benefit association and has gone further in this direction than any other street railway of which we know.

As will be seen from the synopsis published on another page the pension system is entirely distinct from and independent of the mutual aid association, the company being the sole contributor to the pension fund, while the employees are the chief contributors to the mutual aid association fund, the company contributing twenty-five dollars for every one hundred dollars paid in by the employees. The company, however, guarantees the payment of insurance and sick benefits, thus making it better than any form of fraternal insurance.

Should all of the 786 present employees of the company avail themselves of the opportunity to join this association, it would entail upon the company a total liability of \$626,625 on account of life insurance. The average expectation in life, based on the American Experience tables of mortality, of all present employees is 30.28 years. The total payments made by the employees during their average life period would amount to \$253,785, the difference between the amount paid in by employees and the total amount of insurance liability being \$372,000, which would be partially made up by the interest on premium payments, the balance being paid by the company.

Doubtless one reason why more street railway companies have not instituted pensions, is the fear that so large an annual expenditure as would eventually be entailed would not be justified. It is our belief, however, that the knowledge of the employees that their future is provided for would make them more loyal to the company and more careful in the performance of their duties, with the result of savings in accident and maintenance accounts that would go far towards paying the pension charge.

ON STRIKES.

Whether the labor situation with which street railway companies are now confronted is better or worse than it has been in times past may be open to argument, and the opinion of an individual would probably be determined by his own experience, but the existing condition is sufficiently bad. To briefly summarize the reports of the past month there have been strikes at Dubuque, Ia., at Bridgeport, Conn., at Montreal, and at Richmond, Va.; strikes have been threatened at St. Louis, at New Orleans, at Pottsville, Pa., at Shamokin, Pa., at St. Joseph, Mo., at Toronto, Ont., at Derby, Conn.; arbitration has been invoked to settle controversies at San Francisco, Chicago, Scranton, Pa., and almost every day we learn of demands for shorter hours and higher wages. At Montreal, Dubuque and Bridgeport the strikes were followed by exhibitions of mob violence.

The question at issue when a strike is called is almost invariably "recognition of the union," although the matter of wages is often one of the nominal causes, especially in the early stages of the negotiation. There is no dispute as to the legal right of an employer to refuse an increase in wages or to refuse to employ union labor, but strikes are seldom settled with any regard to legal rights. The trial is before the bar of public opinion, and fortunate indeed is an em-

ployer if the press will present his case to the public fairly. The employees generally ask that the questions in dispute be submitted to arbitration, and a refusal to accede by the employer is at once denounced as a high-handed disregard of the rights of the public, which is perhaps the greatest sufferer in event of a street railway strike.

If the scale of wages is the real issue it may be deemed expedient to arbitrate and avoid a conflict, but the results of recent arbitrations with street railway labor unions cannot be regarded as promising much for the future. Thus in Chicago a board of arbitration is about to meet in order to decide whether the work of former arbitrators has left anything effective in the contract made between the street railway company and its men; and the street railway at Richmond, Va., has been asked to arbitrate the question of whether the demand that an existing contract (made as the result of arbitration some ten months ago) is a fair one. The practical failure of arbitration over wages is apparently due to two causes, first, the union of the men is not financially responsible for any breach of contract, and second, the tendency which has been observed in boards of arbitration to "split the difference" constitutes a great temptation for the men to make new demands at frequent intervals, in the practical certainty of being given part of what they ask.

The most promising suggestions for remedying these practical defects of arbitration are that financial responsibility be attached to labor unions, and that arbitration boards adopt the rule of granting the whole of any increase in wages asked for or none at all. Such a rule as this has been incorporated in some agreements between employers and employees in England and is reported to have worked admirably, as the men are conservative in their demands, asking for no more than they are sure they should rightfully have; in this country demands for 25 per cent are often followed by an award of 5 per cent which is thankfully received. While the most obvious method of securing equality between capital and labor as regards financial responsibility would be to require the incorporation of labor unions, suits have been begun as the result of recent strikes that when decided may show that such responsibility already exists. As examples may be cited the attempt by the Connecticut Railway & Lighting Co. to hold the unions of Waterbury, Conn., to account for damages to railway property during the strike there, and the suits brought by several Chicago publishers against the officers of the International Bookbinders Brotherhood for violation of contract in permitting a strike.

"Recognition of the union" is a very pretty phrase which generally means much more than appears on its face; just what the meaning is in any particular case depends upon circumstances. In the case of the controversy at Dubuque, Ia., one of the most recent labor troubles, recognition of the union means: "That in the operation of the lines of the party of the first part (the railway company), both parties hereto (the company and the union) agree that all business shall be transacted between the properly accredited officers of each party hereto." Besides this the form of agreement submitted by the men provided that all suspensions and discharges of employees be reported to the union within 48 hours, that the company suspend employees at the request of the union, that all employees be required to join the union, and that all difficulties arising between the parties to the agreement be settled by "the respective committees of the parties thereto."

It needs no argument to demonstrate that such a recognition is equivalent to a surrender by the executive officers of the company of a substantial part of their authority, such as would badly impair the discipline of the road. Moreover it would be a surrender of authority into irresponsible hands, while the company remained itself liable for the results flowing from poor discipline. Aside from the matter of impaired discipline there is in the agreement quoted an attempt to coerce men into joining the union under penalty of discharge for failure to do so. The reply of the company quoted the finding of the anthracite strike commission: "That no person shall be refused employment, or in any way discriminated against, on account of membership or non-membership in any labor organization, and that there shall be no discrimination against, or interference with, any employee who is not a member of any labor organization by members of such organization."

Responsibility for such unreasonable and illogical demands does not belong to the rank and file of the union, but to the reckless leaders to whom the conduct of affairs has been delegated.

When so vital a question as who shall administer discipline on a

railway is at issue duty to the public requires that there should be no compromise, and in fact the serious strikes of the last few years have been over this very point. The unfortunate thing in connection with the most of them was that they were in effect compromised after the road had won, and the moral effect of the victory over mob violence and demagogism thus to a great extent lost. The blame for thus sacrificing a principle worth fighting for as a rule should not attach to the general manager or other nominal head who has represented the company in the fight, but to his board of directors. The manager seldom gets the sympathy he deserves because few on the outside have any appreciation of the pressure brought to bear upon him to compromise a matter of principle, by the very men who should support him in his fight.

The safety of the public which patronizes a transportation company depends upon the discipline maintained among the employees, and no company can permit the men for whose actions it is legally responsible to attempt to serve two masters, the union and the company.

If conditions are to be bettered there must be a recognition of right principles, and rigid conformation to them in dealing with employees, instead of attempts at good bargaining.

CHICAGO TRACTION AFFAIRS.

Notwithstanding that the much discussed Mueller act enabling Illinois municipalities to own and operate street railways was approved by the governor on May 18th, there has been but little progress made towards agreement as to the terms on which franchise extensions are to be granted. The city maintains its position that the companies must waive their rights under the 99-year act. Attorneys representing the Chicago City Railway Co. and the council sub-committee on transportation have submitted a form of waiver that it is believed the railway would accept. The conditions of the waiver are that if at the expiration of the grant, the city does not purchase the property, or cause its licensee to do so, a new grant of twenty years shall be made on terms to be fixed at that time. On receiving this report the council committee adjourned until June 19th.

The Chicago United Traction Co. is in charge of receivers appointed by the federal court, and the action taken by them will be governed by the view which the court takes of the contentions as to the date of expiration of existing grants. The receivers on May 14th asked for instructions as to their attitude in negotiations with the city, in answer to which the court directed that a petition be prepared bringing before the court all the facts, and that the receivers invite the bondholders, the railway companies and the city to supply any facts deemed material and to be represented at a hearing to be given June 18th. Judge Grosscup in his letter of instructions to the receivers expressed a willingness to intervene in such a manner that the questions involved could be carried up to the Supreme Court of the United States for a hearing this coming autumn; this offer was upon the condition, however, that all parties in interest should freely consent to such action, which the city does not appear willing to do. June 17th the receivers filed the petition as directed and as we go to press arguments are in progress.

A PROSPEROUS INTERURBAN ROAD.

The system of the Rockford & Interurban Railway Co., which is described at length in this issue, constitutes one of the many interurban electric lines constructed in the middle west during the last five years, and the prosperity of this company is indicative of similar success for other conservatively managed enterprises in the interurban field. The company is a consolidation of the Rockford & Belvidere interurban with the local Rockford street railway company, and the present plans contemplate a merger with the Rockford-Freeport road, now building, after the latter shall have been in operation long enough to determine its earning power. The interurban line will be 43 miles long when the western portion is completed.

An important part of the company's revenue is derived from passenger excursions and the transport of freight and express on the 15-mile interurban section between Rockford and Belvidere, and the methods by which this business has been built up are well worthy of study. The general passenger and express agent of the company is continually on the alert to interest lodges, church societies, etc., of one town in the entertainments given by similar organizations in the other, and arrange for mutual visits, joint picnics, etc., each excursion providing business for the railway. In the express department

this company has gone further than any other we know in the endeavor to save patrons trouble; the company's agents receive orders by telephone, see to the purchase of the goods and ship them by the next express car, or if the consignment is a small one by the regular passenger car. The convenience of such a service is much appreciated by patrons.

CONSOLIDATIONS AND RE-ORGANIZATIONS.

The consolidation of the Union Traction Co. of Indiana and the Indianapolis Northern Traction Co., referred to in the "Review" for April, 1903, was completed at Anderson, Ind., May 27th. The consolidated company will be known as the "Union Traction Co. of Indiana," the same as the present company. The capital of the company will be \$8,500,000, representing the \$5,000,000 capital of the Union Traction Co. and the \$3,500,000 capital of the Indianapolis Northern. Under the resolution adopted the \$3,500,000 of stock of the Indianapolis Northern will be issued to the present stockholders, common and preferred, of the Union Traction Co., making a dividend of 70 per cent on the present Union Traction Co. stock; \$100 of present Union Traction stock will receive \$170 of stock in the consolidated company. The present preferred stockholders of the Union Traction Co. will receive preferred stock in the consolidated company at par for their present preferred stock in the Union company and will receive the 70 per cent dividend in common stock.

In addition to this consolidation, another company known as the Indiana Union Traction Co. filed articles of incorporation June 9th, it being stated that this is another step toward combining all the traction interests in Indiana and the extending of interurban lines to Chicago, Cincinnati, Louisville, Columbus and southern Illinois. The company is capitalized at \$5,000,000 and 80 counties of Indiana are mentioned in the articles as those which its lines will traverse. The incorporators and first board of directors are Horace Stillwell (president), Ellis C. Carpenter, Charles W. McGuire, Harry F. Guthrie, Edgar A. Turpin, Charles R. Leas and Arthur W. Brady.

At a meeting of the Union Traction Co. of Indiana directors June 9th, Mr. Stillwell submitted a proposition for a lease of that system to the Indiana Union Traction Co. It will be accepted, it was announced, but the final transaction will not take place until another meeting, to be held at Anderson June 30th. The general offices of the Indiana Union Traction Co. will also be at Anderson.

The stockholders of the Union Traction Co. of Indiana met June 9th, also, and re-elected for the consolidated company the following directors: George F. McCulloch, Indianapolis; Randall Morgan and J. Levering Jones, Philadelphia; J. A. Van Osdol, Anderson; W. C. Sampson, Muncie; W. H. Schoepf, Cincinnati. The board re-elected Mr. McCulloch president, Mr. Matter vice-president, Mr. Van Osdol secretary and Mr. Sampson treasurer.

A holding company is to be organized under New Jersey laws, with a total capitalization of \$14,500,000, to take over the stock of the Louisville (Ky.) Railway Co., according to the reorganization plan adopted June 6th. As announced, two shares of the new common stock will be given for one share of old stock, the holder to have the additional privilege of paying \$55 a share for as many more new shares as he already possesses. A share of the new preferred stock, bearing 5 per cent cumulative dividends, but non-voting, is to be given for one share of the old preferred stock, with 20 per cent bonus of common stock. The plan adopted was suggested by Maj. Alexander H. Davis. The meeting was attended by the full directorate, who represented such a large majority of the stock that the plan will not have to be submitted to the other stockholders. It was stated that the amount needed for improvements in the next two years is estimated at \$3,000,000, and in order to raise the money it is proposed to offer to the common stockholders in the new company shares of the common stock sufficient, from time to time, for present and future needs. The present bonded indebtedness of the company is \$7,000,000, which is practically already out, which will make the total securities of the new company about \$22,000,000. The capital of the present company is \$3,500,000 and there is now outstanding of the preferred stock \$2,500,000.

It is announced that Hodenpyl, Walbridge & Co., of New York, and E. W. Clark & Co., of Philadelphia, have formed a syndicate to organize a holding company under the laws of New Jersey to take over the Saginaw Valley Traction Co., of Saginaw, Mich., and the Bay Cities Consolidated Railway Co., of Bay City, Mich., to-

gether with the Bartlett Illuminating Co., of Saginaw, and the Bay City Gas Co. The capital of the new company, which will probably be known as the Saginaw-Bay City Railway & Light Co., will be \$3,000,000, with an authorized bond issue of \$7,000,000.

The Saginaw Valley Traction Co. controls all the electric lines in Saginaw and the interurban line to Bay City, 12 miles, a total of 33 miles on a single track basis. The Bay Cities Consolidated Railway Co. controls all the electric lines in Bay City and West Bay City and the line to Wenona Beach, a total of 21 miles. The Bay City road is in the hands of a receiver.

The Metropolitan Street Railway Co., the Central Electric Railway Co., which is controlled by the Metropolitan, and the Kansas City Electric Light Co., all of Kansas City, each filed a mortgage May 19th in favor of the Continental Trust Co., of New York, and Henry C. Flower, of Kansas City, as trustees for the Kansas City Railway & Light Co. The Metropolitan mortgage is for \$8,000,000, the Central Electric for \$500,000 and the lighting company for \$2,000,000. The filing of the mortgages is the first step toward the reorganization of the interests named. The Kansas City Railway & Light Co. is a holding company recently incorporated in New Jersey. The capital stock consists of \$12,500,000 preferred and \$12,500,000 common and a small bond issue will be authorized. The securities have been underwritten by Blair & Co. and Kuhn, Loeb & Co., of New York. It is said that considerable stock was taken by the Armour, of Chicago.

The Cincinnati, Dayton & Toledo Traction Co., of Hamilton, O., will acquire the Dayton and Piqua electric line, paying \$800,000 therefor. The company will issue \$1,100,000 of bonds, making a total issue of \$4,600,000. Traffic arrangements have been made, it is stated, between the Toledo, Bowling Green & Southern Traction Co. and the Toledo & Maumee Valley Railway Co., whereby the former will enter Toledo over the latter's tracks and the Cincinnati, Dayton & Toledo combining with these, will form a trunk line from the Ohio River to Lake Erie, when the necessary connecting links have been acquired.

The Sheffield Co., a holding company, has been incorporated under New Jersey laws, with a capital of \$500,000, to take over all the stock of the Sheffield (Ala.) Railway Co., to run between Sheffield, Tusculumbia and Florence, the lighting company that supplies the three cities and the water works company that supplies Sheffield and Tusculumbia. There will be a total of 11 miles of track operated, of which 10 miles is double track, when the railway is thrown open to traffic next September. A large power house is being erected on the Tennessee River. The officers of the new company are: President, Henry Parsons, New York; secretary and treasurer, W. U. Parsons, New York; general manager, chief and electrical engineer, L. H. McIntire, Sheffield.

The Marinette (Wis.) Gas, Electric Light & Street Railway Co., and the Menominee (Mich.) Electric Light, Railway & Power Co. will be consolidated. At a meeting June 2d it was voted that the capital be \$560,000 and that \$200,000 of bonds be issued for improvements. The power house will be entirely rebuilt, a brick car barn will be erected and the Menominee street railway will be extended to Poplar Point. An extension to Peshtigo will be built next year and ultimately the road will be extended to Escanaba and Green Bay.

The consolidation, which will be formally completed June 25th, was made possible by a recent act of the Legislature.

The entire stock of the Indianapolis, Shelbyville & Southeastern Traction Co. recently passed into the hands of R. C. Light and Fletcher S. Hines, of Indianapolis, and a new board of directors has been elected. The present officers are: President, R. C. Light; secretary, Fletcher S. Hines; treasurer, Howard Cale; chief engineer, Thomas F. Buchanan. It is the intention to extend the road this season to Greensburg, Ind., or further, and ultimately to Cincinnati. The road was opened for traffic last September and has 27 miles of track in operation.

The stockholders of the Boston Elevated Railway Co. have ratified the lease of the property of the Old Colony Street Railway Co. within the city of Boston. Seventeen miles of track will be taken under the lease, which provides that on November 1st and May 1st of each year the Boston Elevated shall pay to the Old Colony 6½ per cent upon the adjustment replacement value of the property to date of Feb. 6, 1903, and 4 per cent upon the adjustment value of betterments made from time to time.

The Los Angeles and the Pacific Electric Railway System, Los Angeles, Cal.—II.

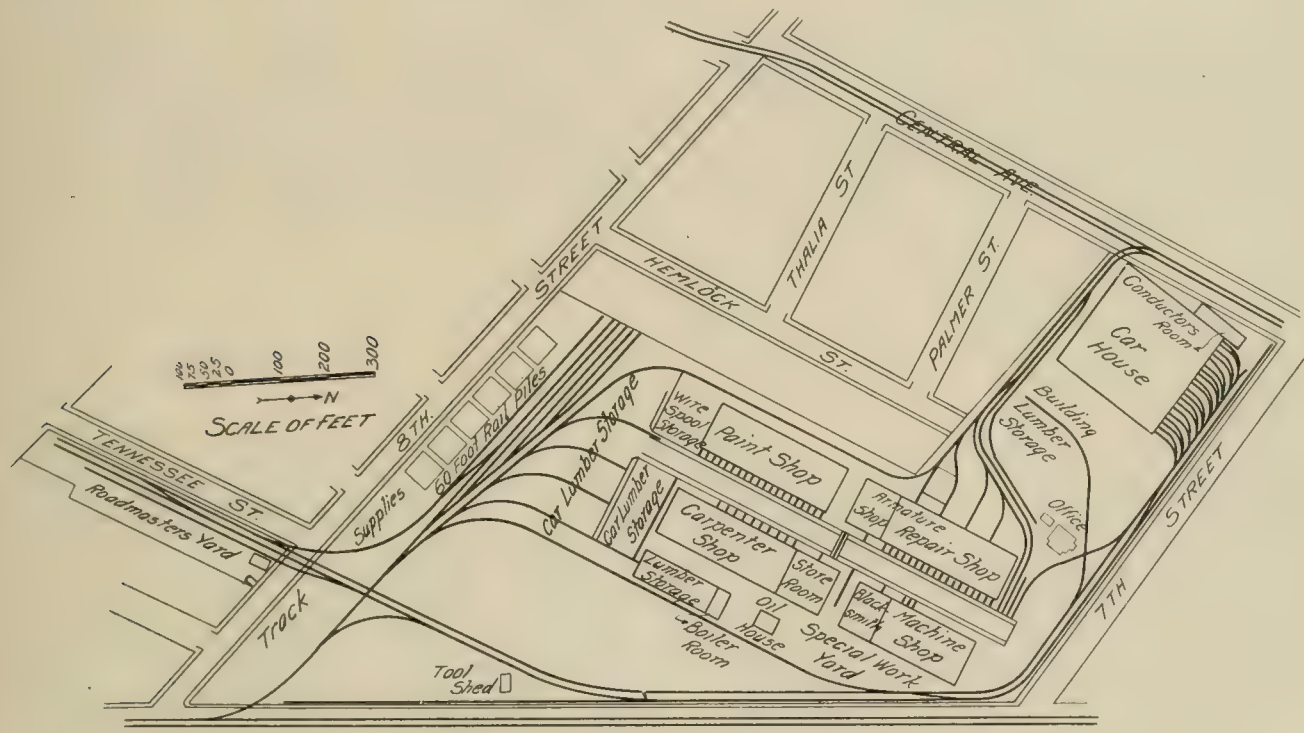
Car and Machine Shops—Complete List of Machine Shop Equipment—Store Room Accounts—Car Houses—Union Depot—Table of Organization of Departments—Personnel.

Car Shops.

The Pacific Electric Railway Co. has built extensive car shops in Los Angeles on Seventh St., where it has 30 acres of land. These shops were opened for operation in July, 1902, and were described and illustrated in the "Review" for Aug. 20, 1902. The buildings com-

The location of these buildings, as well as the company's new car house is shown in one of the accompanying illustrations. These buildings are located on a tract of land 30 acres in extent.

The repair and armature shop is 360 ft. long, 100 ft. wide and 22 ft. high; of this length 80 ft. is partitioned off for the armature



SHOWING LOCATION OF SHOPS AND YARDS.

prise a repair and armature shop, a paint shop, a machine and blacksmith shop, pattern shop (over lumber room), a carpenter shop and storeroom, a boiler room and lumber storage and an oil house. The machine and blacksmith shops and the carpenter shop and storeroom stand in a line with one another and together are over 700 ft. in length. Opposite this line of buildings are the paint shop and the repair and armature shop forming a parallel line of buildings of about the same length.

The transfer table shown diagrammatically in the accompanying illustration is situated between the two rows of shops and is used for taking cars from one shop to another as well as for transferring material between the shops. The platform is 60 ft. long, 13 ft. wide, and is provided with both standard and narrow-gage tracks. The load is supported by box girders made up of two 15-in. I beams and $\frac{1}{2}$ -in. plate which run the entire length of the table. The girders are carried on two 15-in. I beams near each end to which the bearings for the wheels of the transfer table are secured. The table is carried on four wheels 4 ft. in diameter with steel tires, and the tracks on which the table runs are 40 ft. apart.

The table is propelled by a Westinghouse 12 A motor which is located under the platform at the center. The usual reduction gearing is retained and a still further reduction in speed is made. The shaft carrying the larger gear is extended on both sides of the motor nearly to the track wheel. Here are large gears mounted on the axle which engage with pinions on the extended shaft, the ratio of the gear and pinion being 84 to 17. The table was built by the Llewellyn Iron Works of Los Angeles and was designed to carry a load of 80 tons. It is controlled from a small house at one end by a regular street car controller, the current being taken from an overhead line in the usual manner.

shop. The paint shop is 300 ft. long, 100 ft. wide and 22 ft. high; the machine and blacksmith shop is 276 ft. long, 100 ft. wide and 22 ft. high, of which length the machine shop occupies 200 ft. The carpenter shop is 280 ft. long, 100 ft. wide and 22 ft. high, of which 100 ft. of its length is devoted to storage purposes. All of these shops are provided with both standard and 3 ft. 6 in. gage tracks

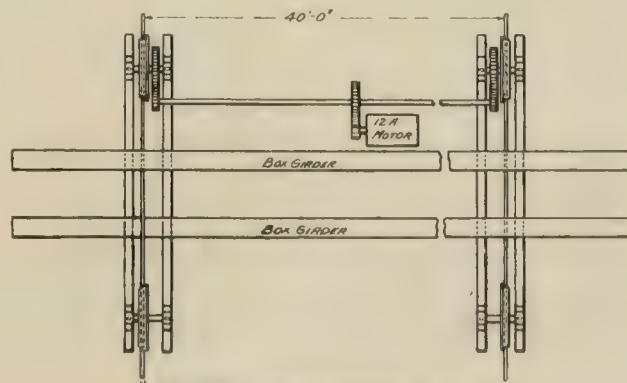


DIAGRAM OF TRANSFER TABLE.

both of which gages are in use by the company. The boiler house and lumber storage for hard wood lumber occupies a building 200 ft. long by 60 ft. wide and two stories in height. The oil house is 34 ft. wide, 40 ft. long, with a basement 10 ft. in height.

These shops have a very large and complete equipment enabling

all kinds of work to be carried out on short notice. The company is constantly rebuilding old cars and building new ones, and most of its work is done in these shops. Patterns for almost all of the parts in general use are made at the company's pattern shop, its castings being made outside. In the machine shop the brass and iron castings

and all setups are saved to be worked out into car axles. A setup furnace is provided for this purpose. All of the blacksmith work on the cars and in the power houses is done here.

In the pattern shop patterns are made not only for car parts but for special steam fittings used at the power house and also parts for



INTERIOR OF MACHINE SHOP.



SPECIAL WORK YARD.

are finished, car wheels turned and bored, axles made and wheels pressed on. All of the car repair work involving machine work is done here. The company builds its own trucks and is at present making 20 of the new trolley bases described elsewhere. Nearly all of the bolts used by the company are made in these shops and

engines, pumps, etc. In the carpenter shop, in addition to the woodwork for car bodies, many articles are made for use about the works, such as filing cases, desks, bookcases, tables, etc. The cross-arms used on line construction are also made here. The armature and winding room takes care of the electrical repairs of all motors,



STOCK ROOM IN PAINT SHOP.
CORNER IN PAINT SHOP.



INTERIOR OF BLACKSMITH SHOP.
VIEW IN STORE ROOM



the machine work on special track work is done here. In addition to the equipment in the following list this shop contains an air compressor which furnishes air for cleaning, operating portable drills in yards, chipping machines, etc.

The blacksmith shop contains machines for roughing out bolts,

dynamos and arc lamps. This department is equipped for repairing any of the types of motors in use and it has also repaired several generators which have burned out. The arc lamps used on all cars for headlights and interior illumination are also repaired here.

In the repair shop the cars are overhauled and taken apart for

MOTOR AND MACHINE TOOL EQUIPMENT OF THE SHOPS OF THE PACIFIC ELECTRIC CO.

| MACHINE SHOP. | | | |
|-----------------|--------------------------------------|-------|--|
| H. P. | Type. | Amps. | Speed. Driving Made by. |
| 7.5 | West. 13954 A. C. | 9.6 | 1120 36 in. Lathe. Fitchburg Machine Wks |
| | | | 24 in. Lathe. C. W. Fifield. |
| | | | 14 in. Lathe. G. A. Gray. |
| | | | 13 in. Lathe. Putman. |
| | | | 16 in. Lathe (Turret). Springfield Mach. Tool Co |
| | | | 13 in. Lathe (Turret). American Tool Wks. |
| | | | Double Emery Grinder. |
| 3.5 | West. 16053 D. C. | 6.8 | 1050 24 in. Lathe. H. K. LeBlond Mach. Tool Co. |
| 3.5 | West. 13953 D. C. | 6.8 | 1050 22 in. Lathe. New Haven Mfg. Co. |
| 3.5 | West. 16052 D. C. | 6.8 | 1050 16 in. Lathe. F. E. Reed. |
| 5. | G. E. 71627 A. C. | 12. | 1200 16 in. Shaper. Hendey Mach. Co. |
| 5. | West. 16247 A. C. | 12. | 1120 No. 3 Milling Mach. Cincinnati Milling Mach. Co. |
| 1.5 | Northern 7618 D. C. | 13. | 950 6 ft. Radial Drill. Bleckford Drill & Tool Co. |
| 1.5 | Northern 7610 D. C. | 13. | 950 5 ft. Radial Drill. Universal Radial Drill Co. |
| | G. E. 68162 A. C. | 9. | 1800 24 in. Drill Press. W. F. & J. Barnes. |
| | Northern 767 D. C. | 3.5 | 1660 22 in. Drill Press. W. F. & J. Barnes. |
| 1. | West. 68388 A. C. | 2.5 | 1700 22 in. Drill Press. H. & A. Effer. |
| 1. | West. 75173 A. C. | 2.5 | 1700 16 in. Drill Press. H. & A. Effer. |
| | West. 68324 A. C. | 33. | 1120 36 in. Planer, 18 ft. Platen. Putman Mach. Co. |
| | West. 18501 A. C. | 25. | 1120 60 in. Planer, 18 ft. Platen. Wm. Sellers & Co. |
| | West. 17287 A. C. | 6.5 | 1120 24 in. Planer, 6 ft. Platen. Pond Mach. Tool Co. |
| | West. 17263 A. C. | 6.5 | 1120 24 in. Planer, 5 ft. Platen. New Haven Mfg. Co. |
| | West. 17236 A. C. | 6.5 | 1120 24 in. Planer, 7 ft. Platen. New Haven Mfg. Co. |
| 5. | West. 185109 A. C. | 25. | 1120 Cold Circular Saw. Newton Mach. Wks. |
| 7.5 | West. 29412 A. C. | 19. | 1120 Wheel Grinder. Springfield Mach. Tool Co. |
| 15. | West. 684688. Street Car Motor D. C. | 24. | 600 12 in. Wheel Boring Machine. Niles Tool Wks. |
| | | | Hydraulic Press. Niles Tool Wks. |
| | | | Axle Lathe. Putman Mach. Wks. |
| | West. 13247 D. C. | 4.5 | 1200 Axle Centering and Turning Machine. Pond Mach. Tool Co. |
| 15. | West. 26517 A. C. | 35. | 1120 Axle Lathe. Putman Mach. Tool Co. |
| | | | Grind Stone. |
| | | | 18 in. Shaper. Springfield Mach. Tool Co. |
| | | | Double Bolt Tapping Machine. Acme Machine Co. |
| | | | Threading Machine. Wiley & Russell. |
| | | | 6-Spindle Tapping Machine. Detrick & Harvey. |
| | | | Single Tapping Machine. Acme Machinery Co. |
| | G. E. 68152 A. C. | 12. | 1200 6 in. Pipe Cutting Machine. Wiley & Russell. |
| | G. E. 71405 A. C. | 5. | 1800 18 in. Emery Grinder. |
| | West. 172961 A. C. | 6.5 | 1120 16 in. Lathe. Graves, Klusman & Co. |
| | | | 13 in. Lathe. F. E. Reed. |
| | | | Tool Grinder. Cincinnati Milling Mach. Co. |
| | | | Drill Grinder. |
| | | | No. 8 Shear and Punch. Long & Alstatter. |
| | | | 4 Emery Wheels. |
| | | | Hoist on Crane. Northern Engineering Wks. |
| | | | Carriage on Crane. Northern Engineering Wks. |
| | | | Crane. Northern Engineering Wks. |
| | | | No. 2 Punch. Hilles & Jones. |
| | | | No. 3 Shear. Hilles & Jones. |
| | | | 1800 Eye Bolt Machine. Williams, White & Co. |
| | | | 1120 Bolt Machine. Ajax Mfg. Co. |
| | | | 1200 Nut Machine. Ajax Mfg. Co. |
| | | | 1120 Bulldozer. Ajax Mfg. Co. |
| | | | 1120 No. 8 Blower. Sturtevant Co. |
| | | | American Engine Wks. |
| | | | Niles Tool Wks. |
| | | | 1 old motor for running air pump. |
| | | | 1 steam hammer 3000 lb. blow, double frame. |
| | | | 1 steam hammer 800 lb. blow, single frame. |
| | | | 11 fires with draft furnished by No. 8 Sturtevant Blower. |
| | | | 1 scrap furnace. |
| | | | 1 heating furnace for springs. |
| WINDING SHOP | | | |
| 3.5 | West. 17552 D. C. | 6.8 | 1050 Line Shafting. |
| | | | 2 Lathes. |
| | | | 1 Drill Press. |
| | | | Grindstone. |
| | | | Feld Winder. |
| CARPENTER SHOP. | | | |
| 5. | G. E. 71625 A. C. | 12. | 1200 1 Tennon Machine. J. A. Fay. |
| 5. | West. 26522 A. C. | 13. | 1120 1 Door Mortiser and Relisher. J. A. Fay. |
| 5. | West. 19654 A. C. | 13. | 1120 1 Four-Sided Molder. J. A. Fay. |
| 5. | West. 126781 A. C. | 4. | 1700 1 Sand-Papering Machine. J. A. Fay. |
| 19. | G. E. 63419 A. C. | 23. | 1200 1 Boring Machine. J. A. Fay. |
| 15. | G. E. 68319 A. C. | 35. | 1200 1 Mortiser. J. A. Fay. |
| 1.5 | G. E. 69252 A. C. | 18. | 1200 1 Four-Sided Molder. J. A. Fay. |
| 10. | West. 185110 A. C. | 25. | 1120 1 Double Surfer. J. A. Fay. |
| 5. | West. 186400 A. C. | 13. | 1120 1 Joister. J. A. Fay. |
| | G. E. 69475 A. C. | 35. | 1200 1 Rip Saw. J. A. Fay. |
| | G. E. 68407 A. C. | 23. | 1200 1 Cut-Off Saw. J. A. Fay. |
| | West. 11476 A. C. | 15. | 850 1 Planer. J. A. Fay. |
| 3. | G. E. 67917 A. C. | 7.5 | 1800 1 Band Saw. J. A. Fay. |
| 3. | G. E. 69667 A. C. | 18. | 1200 1 Rip Saw. J. A. Fay. |
| 3. | G. E. 67916 A. C. | 7.5 | 1800 1 Cut-Off Saw. J. A. Fay. |
| 10. | Springer Motor D. C. | 18. | 1900 1 Line Shafting. |
| | | | 2 Grindstones. |
| | | | 1 Band Saw. |
| | | | 1 Emery Wheel. |
| | | | 2 Saw Grinders. |
| | | | 1 Knife Grinder. |
| | | | 1 Lathe. |
| | G. E. 3326 D. C. | 5.4 | 1200 1 Shaper. J. A. Fay. |
| PATTERN SHOP | | | |
| | West. 17557 A. C. | 14. | 1120 Line Shafting. |
| | | | 1 Rip Saw. |
| | | | 1 Lathe. |
| | | | 1 Grindstone. |
| | | | 1 Emery Wheel. |
| | West. 16654 A. C. | 14. | 1120 Line Shafting. |
| | | | 1 Lathe. |
| | | | 1 Band Saw. |
| | | | 1 Planer. |
| | | | 1 Jig Saw. |
| | | | 1 Boring Machine. |
| BOLLER ROOM | | | |
| 2 | Northern 2914 D. C. | 2.5 | 250 1 Buffer Wheel. |

general repairs, the different parts being sent to the respective departments in which they belong. The motors are sent to the winding room, other parts to the machine and blacksmith shop, the trucks are taken out and if necessary, sent to the machine shop or perhaps to the blacksmith shop. If the woodwork of the car is injured the carpenter is called in and all the needed parts gotten out by him in the carpenter shop. When the car is reassembled, it is then taken to the paint shop where it is finally completed. For every job in the shops a shop order number is issued and all supplies drawn from the store room as well as all labor is charged to it.

These shops present an excellent example of a large plant using principally individual motor driving, and we give in the following table a complete list of all of the machinery used in each of the shops. This table includes the make and the type of each motor, its ampere capacity, etc. The motor equipment of the shop comprises both alternating current and direct-current motors and while individual motor driving is the rule there are a few places where group driving is used. All of the alternating motors are supplied with a 210-volt current at 6,000 alternations and all of the direct current motors are 500-volt machines.

Store Accounts.

The company handles its storehouses in the following manner: Requisitions for general stock are issued on the purchasing agent once a month, calling for approximately the month's supply of usual stock material. In addition to this emergency requisitions are issued daily calling for such materials as are needed at once. After the purchasing agent has obtained prices and other particulars and has placed an order with some firm a copy of such order is sent to the store department to be entered against the requisition, thus showing what order has been placed.

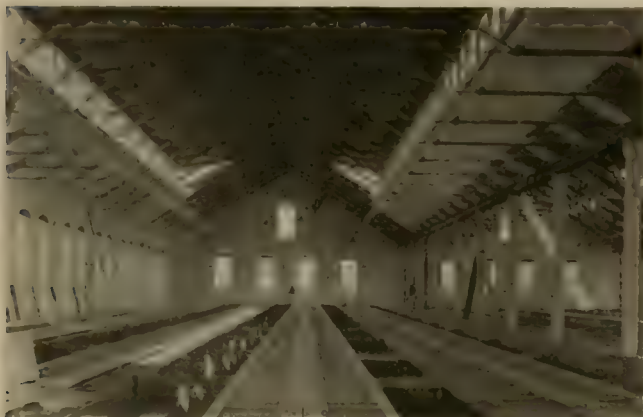
When goods are received the receiving clerk makes out receipts in numerical order keeping separate the goods received from one and the same firm. These receipts are again checked up against the requisitions, the orders thus showing when delivery has been made or how much, if any part of the goods have been delivered. When invoices are received they are first passed upon by the purchasing agent as to correctness of price, discount, days of shipment, etc. They are then checked up at the storeroom against the receipts and if found correct are approved, taken into account and passed to the accounting department for auditing.

In drawing out supplies and materials from the storeroom the company uses a small requisition blank stating the nature of the material required and the account to which it is chargeable. This is turned into the office where the proper charges are made. In connection with issuing material the company uses a card system, one side of the card having a ledger ruling and the other side showing the requisition orders and receipts. This gives all the information required in a small compass. On the ledger side of the card are entered the invoice and disbursements.

| D. C. MOTORS | | | | RECAPITULATION OF MOTORS | | | | A. C. MOTORS | | | |
|--------------|------------|-------------|----------|--------------------------|------------|-------------|----------|--------------|------------|-------------|----------|
| H. P. | No. Motors | Total H. P. | Amperes. | H. P. | No. Motors | Total H. P. | Amperes. | H. P. | No. Motors | Total H. P. | Amperes. |
| 2 | 1 | 2 | 18 | 1 | 2 | 2 | 15 | 5 | 2 | 2 | 5 |
| 3 | 1 | 3 | 54 | 2 | 3 | 6 | 42 | 15 | 3 | 3 | 15 |
| 3.5 | 4 | 14 | 27.2 | 3 | 4 | 12 | 86 | 19 | 4 | 4 | 19 |
| 5 | 2 | 10 | 24 | 5 | 5 | 25 | 126.5 | 6.5 | 5 | 5 | 6.5 |
| 7.5 | 2 | 15 | 26 | 6 | 1 | 6 | 37.5 | 83.6 | 6 | 6 | 83.6 |
| 10 | 1 | 10 | 18 | 7.5 | 1 | 7.5 | 167 | 208 | 7 | 7 | 208 |
| 15 | 1 | 15 | 23 | 10 | 1 | 10 | 45 | 65 | 10 | 10 | 65 |
| | | | | 15 | | 15 | | | | | |
| | | | | 20 | | 20 | | | | | |
| | | | | 30 | | 30 | | | | | |
| Total | 15 | 75 | 139.6 | | 41 | 320.5 | 740.6 | | | | |

Car Houses.

The companies have a number of car houses situated in different parts of the system. One of the car houses of the Los Angeles Ry. is situated just north of the company's power house with a capacity for 32 cars, another is situated just behind the power house and has



INTERIOR OF CAR HOUSE, LOS ANGELES.

a capacity for 40 cars while a third is just south of the Pacific Electric Railway Co's. power house, its capacity being 140 cars. The Los Angeles Railway Co. also has a shed at Agricultural Park with four tracks with a capacity for 20 cars.

The Pacific Electric Railway Co. has a car house located on a 30 acre tract on 7th St. This barn has a capacity for 100 of the company's largest cars. It also has a car house, previously mentioned, adjoining the power house in Pasadena. This is a brick building containing 9 tracks and has a capacity for 35 cars. A new car house with a capacity for 40 cars is being built at Pasadena and this will be used as a terminus for all the local lines and the interurban lines entering the city. At this barn will be located the starters' office and trainmen's room, and club rooms for the employees will



VIEW ON LONG BEACH.

also be established in this building. The company also has a small car house at Long Beach with a capacity for 20 cars.

The Pacific Electric Railway Co. has just built a baggage and express depot in Pasadena. It is a brick building with a track running through the center, platforms being located on each side of

the tracks. In the rear are stables where the horses and express wagons are kept.

There are numerous points of interest and pleasure resorts reached by the various branches of this system including seaside resorts, mountain scenery and places of historical note. One of the principal points of interest is Long Beach, situated on the Pacific Ocean, 20 miles southeast of Los Angeles. In addition to the surf bathing and fishing, which this beach affords, there is a large open-air pavilion in which concerts are given every day in the year and where dances are held tri-weekly. A new bath house has recently been erected at the beach at a cost of \$90,000, which is elegantly equipped and appointed in every respect. Its bathing pool of warm water is



VIEW OF TRETTLE ON LONG BEACH LINE.

60 x 120 ft. in area and is graded to varying depth. The line to Long Beach is a double track road on which a fare of 50 cents for a round trip from Los Angeles is charged. Commuters' tickets are issued in 10 and 60 ride tickets, the former costing \$2 and the latter \$7.50. The commutation tickets are good for 30 days only. This line commenced operation in July, 1902, over a private right of way which is well ballasted. The running time is 35 minutes and 18 cars are in service on week days, giving a 15 minute headway. A seven minute service is given on Sundays.

The Monrovia line is 17 miles in length and commenced operation on March 1, 1903. This is a double track line passing through Baldwin's ranch of 30,000 acres. The fare for the round trip is 50 cents and the running time is 53 minutes. Half-hourly service is given on week days and 15 minute service on Sundays. The Alhambra

line is a double track line 11 miles long running to San Gabriel Mission. This Mission, which is a well-known historical land mark was founded by Franciscan Fathers in 1771, for the purpose of converting the Indians to Christianity. The Mission structure is sub-



TROLLEY LINE WINDING UP MT. LOWE.

stantially built of brick, the walls being from four to six feet thick. Four of the original Mission bells, which were cast in Spain, sent to Mexico and brought from there by the Fathers, are still in use. The Alhambra line commenced operation in June, 1902. The fare



SAN GABRIEL MISSION BELLS.

for the round trip is 25 cents, and to San Gabriel 30 cents. The run is made in 28 minutes, with a 30 minute service on week days, and a 15 minute service on Sunday.

The Mt. Lowe line from Los Angeles to Alpine Tavern passes

through the most picturesque mountain scenery on the road. In making this trip the passenger ascends from a valley of tropical climate with its characteristic fruits and flowers and enters a higher zone where all traces of these are lost. Starting from Los Angeles the cars of the Mt. Lowe line pass through the San Gabriel Valley before reaching Altadena. Here the passengers transfer to the Mt. Lowe car which ascends the foot hills of the mountain to Rubio Canyon. Here they are taken by the incline cars, which climb grades varying from 48 to 60 per cent, and in a distance of 3,000 ft. make a rise of 1,300 ft. One of the bridges on this line is 200 ft. in length, the upper end being 120 ft. higher than the lower end. At the end of this line is Echo Mountain, 3,500 ft. above the sea. From Echo Mountain to Alpine Tavern the line is a winding mountain railway rising to an ultimate height of 5,000 ft. above the sea level. The rate of fare for the round trip from Los Angeles to Alpine Tavern on Mt. Lowe is \$2.50, and excursion tickets are sold Sat-



CABLE INCLINE RAILWAY, MT. LOWE.

urdays and Sundays for \$2. From Los Angeles to Pasadena the distance is 11.37 miles and the fare is 25 cents. Ten ride commutation tickets are sold for \$1. Between Los Angeles and Pasadena a five minute service is given during the rush hours at morning and night and 10 minute service during the day.

The Whittier line, 17 miles in length, is to be built this summer. This line will eventually run to Santa Ana, 35 miles distant, where a steam motor line is now operated by the same interests.

Union Depot.

The Pacific Electric Railway Co. is building a new terminal station in Los Angeles which will be used as a Union depot for all the interurban lines of the companies, including the Pasadena, Long Beach, Santa Ana, Monrovia, Alhambra and Whittier lines. This building will be nine stories high, the ground floor being used for cars, waiting rooms, ticket offices, etc. The second to the sixth stories inclusive will be rented for general office purposes and the seventh floor will be devoted to the offices of both the railway companies and the other light and power interests with which Mr. Huntington is connected. The eighth and ninth floors will be de-

voted to club rooms and a roof garden to be used by the Jonathan Club and the Los Angeles Business Men's Club. It is claimed that this building will have the largest floor area of any west of Chicago.

in 1884, by uncle the late Colles P. Huntington, appointed him superintendent of the Kentucky Central R. R., which was then operated by the Chesapeake & Ohio. In the early part of 1885 Mr. Huntington was appointed receiver of the Ken-



L. P. S. RADOLPH.



H. E. HUNTINGTON.



J. A. MUIR.

Personal

Mr. Henry Edwards Huntington was born Feb. 27, 1850, at Oneonta, N. Y. He was educated in public and private schools and at an early age engaged in the hardware business in his native town. When he was 20 years old he went to New York City, where he remained several years with one of the large hardware firms. He

tucky Central and a year later, when the road was reorganized, he was made vice-president and general manager. In 1890 the road was sold to the Louisville & Nashville Railroad Co., and Mr. Huntington became vice-president and general manager of the Elizabethtown, Lexington & Big Sandy and Ohio Valley railways. He was in charge of these interests until they were sold in 1892. During his connection with the Kentucky Central R. R. he was also superintendent of construction of the Maysville & Big Sandy R. R., and had charge of the construction company which built the lines through Covington, Ky., and Cincinnati, O., including the Ohio River Bridge.

In April, 1892, Mr. Huntington went to California as first assistant to the president of the Southern Pacific Co., whom he represented in San Francisco until March, 1900, when he was elected second vice-president; in June of that year he was elected first vice-president of the company. He is also president of the Southern Pacific Railroads of Arizona and New Mexico, the Carson & Colorado Ry., the Los Angeles Railway Co., and the Market Street Railway Co., and the Geary Street Railway Co., of San Francisco. He is vice-president of the Southern Pacific Railroad of California, the South Pacific Coast Ry., and the Oakland Street Railway Co. In March, 1901, he retired from the active management of the Southern Pacific and disposed of his financial interest in the company.

In 1893 Mr. Huntington effected the consolidation of the various street railways now a part of the Market Street Railway Co. system, of San Francisco. In 1898 he purchased the Los Angeles railway lines that form the Los Angeles Railway Co. He also consolidated the interurban lines of that city and Pasadena into the Pacific Electric Railway Co. of Arizona. Then followed the consolidation resulting in the Pacific Electric Railway Co. The Market Street railway system in San Francisco comprises about 200 miles.

Beside being president of the Market Street Railway Co., the Los Angeles Railway Co., and the Pacific Electric Railway Co., Mr. Huntington is vice-president and a director of the Southern Pacific Co. He is also a director of the Central Pacific Railroad Co., Wells, Fargo & Co., the San Francisco National Bank, the California Wine Association, the Southern Pacific Railroad Co. of Arizona, the Southern Pacific Railroad Co. of New Mexico, the Gila Valley, Globe & Northern R. R., and the National Surety Co., of New York.



YE ALPINE TAVERN, MT. LOWE.

next went to St. Albans, W. Va., and engaged in lumbering and lumber manufacture for six years.

In 1880 he was appointed superintendent of construction of the Huntington lines then being built between New Orleans and Louisville, giving his especial attention to the construction of the Chesapeake, Ohio & Southwestern Ry. Upon the completion of the roads

Mr. Epes Randolph, previous to Mar. 1, 1891, was superintendent and chief engineer of the Elizabethtown, Lexington & Big Sandy, the Kentucky & South Atlantic and the Ohio & Big Sandy railroads. Then he became superintendent and chief engineer of the Newport News & Mississippi Valley Co., and the Ohio Valley Ry., where he remained two years. From January, 1893, to May, 1894, he was general superintendent and chief engineer of the Chesapeake, Ohio & Southwestern road, formerly operated by the Newport News & Mississippi Valley Co. On May 1, 1895, Mr. Randolph was appointed superintendent of the Yuma and Tucson divisions of the Southern Pacific Co., which position he resigned to accept that of vice-president and manager of the Pacific Electric Railway Co.

Mr. John Allan Muir was born at Truro, Nova Scotia, Sept. 25, 1850. He was educated in the Truro public schools and in March, 1866, entered the employ of the Pictou Extension Nova Scotia R. R., as a telegraph operator. In November, 1870, having removed to California, he became night operator at Rocklin for the Central Pacific R. R. In September, 1871, he was made agent of the road at

Rocklin and in 1875 became trainmaster. In July, 1881, he was appointed division trainmaster at Sacramento; May, 1882, he was promoted to assistant division superintendent of the Sacramento and Oregon divisions of the California Pacific & Northern R. R.; February, 1884, he was made assistant superintendent of the Southern Pacific Railroads of Arizona and New Mexico; April, 1886, he was transferred to a similar position on the Los Angeles division of the Southern Pacific Co., and in January, 1893, succeeded to the position of superintendent of that division. February, 1902, he resigned to accept his present position.

Beside being general manager of the Los Angeles Railway Co., Mr. Muir is a director of the company and is also a director of the Gila Valley, Globe & Northern R. R., and has interests in a number of mining companies.

The following table shows the organization of the Los Angeles Railway Co. and the Pacific Electric Railway Co. and the distribution authority among the different departments.

ORGANIZATION OF THE HUNTINGTON SYSTEM OF LOS ANGELES.

| | | | | |
|--|--|--|---|---|
| | | Secretary, E. E. Bacon. | | |
| | | Treasurer, I. W. Hellman. | | |
| | | Auditor, S. C. Baxter. | | |
| | | Purchasing Agent, C. E. Brady. | | Superintendent Pasadena, Monrovia and Alhambra Divisions, F. H. Jones. |
| | | Manager Lines East of Los Angeles, W. H. Smith. | | Superintendent Los Angeles Div., J. B. Rowray. |
| | Vice President and General Manager Pacific Electric Railway Co., Epes Randolph. | Assistant to General Manager, Howard E. Huntington. | | Superintendent Mt. Lowe Division and Hotels, J. F. Turner. |
| | | Supt. Long Beach Division, F. Van Vranken. | | Roadmaster, S. Maclure. |
| | | Chief Engineer, G. E. Pillsbury. | | |
| | | Passenger Agent, H. F. Gentry. | | |
| | | Claim Department, W. H. Faust. | | |
| President, Los Angeles Railway Co. and Pacific Electric Railway Co., H. E. Huntington. | Vice-President Los Angeles Railway Co., Ch. de Guigne. | Land Agent, Geo. S. Patton. | Superintendent Mechanical Department, C. E. Donnat. | Master Car Builder, A. H. Lindemuth. |
| | Second Vice-President, Los Angeles Railway Co., C. W. Smith. | Mechanical Superintendent, William Jennings. | Superintendent Power, J. R. Atchison. | Master Mechanic, A. E. Hathaway. |
| | | Superintendent of Buildings, E. S. Cobb. | Chief Electrician, S. H. Anderson. | Master Painter, F. H. Jones. |
| | | Consulting Engineer, R. S. Masson. | | Electricians, Linemen. |
| | | Consulting Engineer, Secretary, E. B. Holliday. | | |
| | | Treasurer, I. W. Hellman. | | |
| | | Auditor and Purchasing Agent, C. A. Henderson. | | |
| | General Manager Los Angeles Railway Co., J. A. Muir. | Superintendent, J. J. Atkin. | Assistant Superintendent, Claim Department, Dispatchers, Inspectors. | |
| | | Chief Engineer, George J. Kurtz. | Roadmaster, C. Setzepland. | |
| | | Chief Electrician, J. L. Clarke. | | |
| | | Master Car Builder, E. L. Stephens. | | |

TROLLEY TRIPS IN NEW ENGLAND.

"Trolley Trips Through Southern New England," published by White & Warner, of Hartford, Conn., has just appeared in the 1903 edition, this being No. 5 of the series. This little guide has now come to be the accepted authority on information concerning electric railway routes, fares, schedules, connections and descriptive data in general throughout southern New England. The New York to Boston trolley trip is given in complete form this year and a feature of the book is the gathering together of data concerning the trolley trips which may be taken from the principal points on the line between the two termini.

For instance, all the suburban lines of Bridgeport, New Haven, Hartford, Springfield and Worcester are given, and in every instance the fare from point to point is stated, and the running time of the cars, in condensed form. It is interesting to know that the trolley run from New York to Boston can now be made with but one short break of six miles and a half between Chelsea and Southington. From Worcester there is a choice of routes, the most direct route being through Southboro, Framingham and Woburn, while a longer and very interesting route is through Marlboro, Concord and Lexington, connected with many stirring events.

From Concord, and through Bedford County, and, in fact,

all about the picturesque regions of the southern part of New England, are described and illustrated.

The book this year contains 112 pages with about 60 half tone engravings and ten maps of trolley routes. It is sold for 10 cents per copy.

FORMULA FOR BABBITT METAL.

The manager of a prominent interurban road is using the following formula for making babbitt metal for motor bearings and states this has given better results on heavy high speed service than any other he has ever tried.

The composition consists of 48 lb. of tin, 4 lb. of copper and 1 lb. of antimony. The copper and tin are melted first, then the antimony is added.

The Supreme Court of Illinois has decided, in the case of the owners of the Monadnock Building, Chicago, against the Union Elevated Railroad Co., that the trial court erred in sustaining the defendant's demurrer and the case has been remanded for trial. This is a suit for alleged damages on account of noise and restriction of light, and will now be heard on its merits. A number of other suits have been brought since the decision became public.

A TEST OF PAINT AND VARNISH REMOVERS.

Under the general name of paint and varnish removers there is a large assortment of compounds of greater or less value which are being recommended for the use of car painters. Many of the paint and varnish makers are offering compounds or solvents for old paint and varnish under various names which, however, bear no relation to the compounds they represent. The similarity in the directions for the use of each, attached to the various goods, however, leads one to believe that the ingredients in every case are practically the same. But whether this is true or not it is certain that their action on old paint and varnish varies considerably. These are conventionally prepared, some in the form of a paste and some in liquid form, so that they may be easily applied to all kinds of surfaces, and they offer to the car painter what seems to be a certain time-saver.

In testing about a dozen different named paste removers on the outside surfaces of cars some very unsatisfactory results followed. These cars, which had been in service from 10 to 12 years, were covered with a thick coating of paint and varnish. They were seldom used, however, more than 12 months without receiving a coat of high grade varnish, so that the old varnish still retained a considerable amount of elasticity which would necessarily have a strong neutralizing effect on any alkali or acid used to remove it. In consequence, the removers used in these tests were subjected to severe trial, as the results proved, for none of them was able to penetrate the varnish and paint with one application, although in some cases they were allowed more time to effect the removal than the directions demanded. The actions of some of the best removers seemed to gradually diminish as the remover penetrated through the varnish to the paint below, upon which they had no effect whatever. Not until the application was repeated would the paint yield to the knife.

Subsequent tests were made with some of the best of these removers on a car obtained from another company whose varnish had nearly perished so that it offered but little resistance to the penetrating quality of the solvents. In this case the paint and varnish were successfully removed with one application.

In testing the liquid removers on work finished in natural wood such as the sash interiors of cars, they all failed to penetrate to the wood, and the attempt to use them was a failure until the directions, which plainly stated to apply the liquid with a brush, were ignored. The glass of the sash was taken out and the sash completely immersed in a bath of what proved to be the best liquid remover. In about 20 minutes it was taken out of the bath, when it was found that the old varnish and shellac were nearly dissolved and what remained could easily be removed by wiping with waste. After the sash was completely dry it appeared to be in as good condition as when it was originally made with the exception of a slight discoloration, and no bad results followed the varnishing presumably because the liquid was absolutely, or very nearly volatile, and no neutralizing agent was necessary to be employed in this case before the shellac was applied. Subsequent tests of some of the other liquids when dried in the bath disclosed the fact that a perceptible residue remained which was deposited in the pores of the wood. This proved to be a non-drying oil which prevented the drying of the varnish after it was applied so that the latter had to be removed and the liquid remover remaining in the pores of the wood neutralized before the sash could be successfully varnished.

During the tests of these removers, which proved very interesting and instructive, some fortunate ideas were conceived which were afterward worked out in a practical way and which proved to be improvements over methods previously used. For example, it frequently happens that cars are required for use in routes other than those on which they are usually used and this requires, in some cases, the changing of the glass in the ventilator sash either on account of its color or lettering. For economical reasons it is evident that the glass should be removed without breaking, as it can be put back into stock and used for repairs. The operation of removing this glass, owing to the hardness of the putty used for bedding it in the rabbet of the sash, is usually attended with more or less breakage. The putty on the outside of the sash can be taken out with a chisel, but no instrument can be safely applied in the small space occupied by the putty between the glass and the rabbet, as this putty generally refuses to yield to any force that the glass will stand. These lights of glass vary in price from 50 cents to \$2

according to their color and decoration, so that it is very desirable to remove them in perfect condition. A successful method for accomplishing this was discovered with the use of one of the liquid removers. A sash having the outside putty removed was laid perfectly level on a bench and the depression in which the glass was situated was half filled with the liquid remover, which was allowed to stand for 20 minutes. The result was highly satisfactory. On account of the large supply of the remover coming into contact with the putty the oil failed to neutralize it before it had penetrated to the deepest recesses of the rabbet and the solvent acting upon the putty quickly released the glass which, when reversed upon the bench, fell out of the sash by its own weight. While some of the liquid removers act more rapidly in this operation I should not hesitate to state that they all, at least all that have been submitted to me for examination, will, in time, accomplish this purpose.

Again, these tests brought out the idea of erasing the numbers on the interiors of the cars by means of the paste, which is an operation often desirable when changes in the routing of cars are made. Previously this operation had been a source of considerable trouble, as the numbers are often located in the center of a large panel, and to remove the finish on the whole panel and to subsequently refinish it involves a great loss of time. Sometimes the varnish is taken off directly over the number with a steel scraper which invariably leaves imperfect edges around the perceptible depression caused by this removal. Another method is to letter the new numbers directly over the old ones, covering that part of the old number which then shows with paint to match the grain of the wood. The paste in the case of this operation was deposited accurately on a line with the top and bottom of the figures which constituted the whole number and after the ends were squared on each side of the number the square thus formed was covered with the paste. This was allowed to act 15 minutes, when all of the material down to the wood was removed, leaving the edge of the depression in a very smoothly beveled condition, which, after being stained, re-numbered and varnished, left no trace of the change which had been effected.

To sum up the results of this investigation it was plainly shown that it is possible to use these removers to advantage on cars which are allowed to remain in the service until the paint and varnish are thoroughly decomposed, but to come into competition with such a valuable instrument as the blow-pipe they have not, in their present condition, the slightest chance. They may be advantageously utilized for some minor purposes such as have been proved beyond a doubt by the tests of the baths, but a remover should be used which will not interfere with the subsequent varnishing. This is important as the effect of non-drying matter left in the pores of the wood may not be realized until some months afterward.

It would obviously be premature to consider a comparison of the cost while investigating any new method of painting before it had proved itself superior or at least able to practically compete with methods already in use and the consideration of expenses in this instance were not taken into account. It might be added, however, that if any of these removers could effectually meet all of the requirements necessary for the removal of paint or varnish on the cars a most liberal discount would be necessary on the prevailing prices listed in the catalogs of the makers to make them compare favorably with the cost of methods in general use. F. II

CONDUCTOR KILLED BY CAR ROBBERS.

Three masked men boarded an East St. Louis & Suburban Railway Co. car running east from East St. Louis on the morning of June 3d, robbed the motorman and killed the conductor, John N. Keith, by shooting him when he went to the motorman's assistance. There were a few passengers.

Two men held up a car on the Chicago Union Traction Co.'s Evanston line on the night of May 25th and robbed the conductor of \$24 and a watch valued at \$35, and secured the motorman's watch also. There were no passengers.

Three men boarded an electric car on the Portland (Ore.) Railway Co.'s line near Woodlawn at 11 p. m., May 20th, and robbed the conductor and passengers of \$175 and several watches.

May 26th a car on the Oregon City (Ore.) line was stopped at Midway Station and the robbers secured \$110.

A UNIVERSAL TECHNICAL DICTIONARY.

The Society of German Engineers, of Berlin, is to publish a technical dictionary in three languages, English, German and French. It is entitled the "Technolexicon," and its editor-in-chief, Dr. Hubert Jansen, has forwarded to us a short report upon the progress of compilation. The report states that the work was begun in 1901, and in response to invitations to contribute there are 341 societies co-operating, 42 in English, 272 in German and 27 in French-speaking countries. Among American associations participating are the American Society of Mechanical Engineers and American Society of Civil Engineers, New York; American Railway Engineering and Maintenance-of-Way Association and Western Society of Engineers, Chicago, and American Chemical Society, Brooklyn. Assistance has been promised, and partly rendered, by 2,185 industrial establishments and individual collaborators. Among the industrial companies are the Westinghouse Brake Co., Trenton Iron Co., B. F. Sturtevant Co., Manning, Maxwell & Moore, the Fairbanks Co., and the Thomas D. West Co., of Sharpsville, Pa.

Excerpts from standard technical dictionaries and thousands of catalogs, price lists, handbooks, store lists, piece lists, customs tariffs, etc., have yielded 1,200,000 filled-cut word blanks, to which will be added within the next two years hundreds of thousands of words contributed by the collaborators. The contributions will be called in in 1904. In the meantime the invitation to contribute is extended to all technical branches including the handicrafts. It is further announced that delayed contributions, if received before the end of 1906, when printing will begin, can still be made use of. For information address Dr. Hubert Jansen, care of Technolexicon, 49 Dorotheenstr., Berlin.

BRIDGE COLLAPSES AT BINGHAMTON, N. Y.

On May 20th the span of what is known as the Rockbottom Bridge over the Susquehanna River at Binghamton, N. Y., collapsed, carrying with it an electric car of the Binghamton Railway Co. and eight people. No one was killed, and only two or three persons were seriously injured. The car was running slowly at the time and had just passed a little beyond the middle of the north span of the bridge when the span gave way, the south end slipped from the pier, and the bridge and car lurched toward the west and settled into the river. The bridge went down behind the car, the north end remaining on the north abutment, the fallen part forming an incline that reached nearly to the middle of the span. As the bridge went down behind it the car slipped back a few feet, tipped

where their bruises and injuries were given prompt medical attention.

The Rockbottom Bridge was erected in 1874 at a cost of \$35,194. When it was built it was the finest bridge in that part of the country, but in its design probably did not anticipate the heavier loads that have gradually been imposed upon it by the increase in street



VIEW FROM OPPOSITE SIDE.

traffic and the addition of electric railway tracks. It was a double span steel bridge, resting upon masonry and concrete piers. The car that fell with the bridge was a short single truck car, weighing not over six tons, and was one of the lightest owned by the company.

The full responsibility for the collapse of the bridge has not yet been fixed, but it is believed the Binghamton Railway Co. will be relieved of all blame or responsibility for the accident.

PRIZES FOR SUGGESTIONS FROM EMPLOYEES.

In line with an editorial in the "Review" for Apr. 20, 1903, p. 201, on "Co-operation of Employees," comes the announcement from Lynchburg, Va., that Mr. R. D. Apperson, president of the Lynchburg Traction & Light Co., recently issued a circular in which he proposes to award prizes to employees for suggestions for the betterment of the service. The awards are to be made Sept. 15, 1903, as follows: To the employee who makes the most valuable suggestion, \$25; for the second most valuable suggestion, \$20; for the third, \$15; fourth, \$10; fifth, \$5.

The term "valuable suggestion," the circular states, means such suggestions as the company or a committee appointed for the purpose shall recommend. Boxes have been placed in the several departments, wherein the suggestions may be deposited. Every employee is urged to feel that he is invited to make any suggestion that may occur to him, and as many as he chooses.

FIRST PACKAGE FREIGHT LINE IN CHICAGO.

Saturday, May 23d, the Chicago, Riverside & La Grange Street Railway Co.'s system was formally opened. This road is only six blocks long, between W. 40th and W. 46th Sts., Chicago. It is a connecting link between the lines of the Suburban Railroad Co., which serves Riverside, La Grange, Oak Park and Austin, and the Chicago General Railway Co. Light merchandise and passengers are carried. As the Chicago General Railway Co. reaches the stock yards district, it is proposed to deliver light package freight from the stock yards to the various suburban towns in Cicero. The new road will also serve to give the Suburban Railroad Co. a downtown connection. The carrying of package freight was begun June 1st, for the first time in the city's history.

It is announced that the excavating for the New York Subway will be completed the latter part of July.



COLLAPSE OF ROCKBOTTOM BRIDGE.

north end to the west and remained on the fallen roadway, the north end nearly out of the water and the south end settling into the water so that it came nearly to the window. By the prompt action of the conductor and motorman, assisted by spectators, officers of the street railway company and city officers, the imprisoned passengers were quickly rescued and assisted to places of safety,

ADVERTISING ELECTRIC RAILWAYS.

A comparison of the publicity carried up to date by electric railways in the advertising department, whence emanates well-merited credit, is especially where the picture picture feature is concerned, in favor of the trolley excursion fad. So popular has this fad become that managers everywhere have planned to cater to it more extensively this season than ever. Particularly noticeable is the East St. Louis & Suburban Railway Co., which maintains a well-equipped press bureau in charge of Mr. Frank H. Thomas, passenger and excursion agent, who is continually evolving attractive advertising literature calling attention to the facilities which the system's appropriately termed "Scenic Route" affords to excursionists. Recently Mr. Thomas issued a circular intended for fraternal societies, or clubs, including women's clubs, which exist in and around East St. Louis to a large extent, apropos of an illustrated vest pocket booklet, which gives full information of the various points of interest along the route of "the great electric railway system of the East Side, with especial reference to its particular attractiveness for excursions and the various summer outings which the out-of-door season will suggest." The circular is printed on the company's letter-head to resemble a typewritten letter and emphasizes the fact that trolley excursions have become the fad in many eastern cities and, the craze having drifted westward, seems to have settled in the vicinity of East St. Louis; also that trolley outings not only appeal to societies in general, but women's clubs are beginning to realize the facilities the company possesses for giving them exceptional service, and the freedom which they may enjoy upon its parlor cars commends the "Scenic Route" to their attention.

The booklet referred to is entitled, "Vest Pocket Guide to East Side Trolley Outings." It is 3 x 4 in. in size and contains 24 pages of information, illustrated with views taken along the route. The contents are classified under the following heads: Rates of Fare, Private Car Parties, Reduced Excursion Party Rates, Stop-over Privileges, The Scenic Circuit, Fishing Resorts, Belleville, Priester's Park, Monk's Mound, Edwardsville, Collinsville, Belleville Fair Grounds, Caseyville, French Village and The Great World's Fair.

Another publication by the company is a 32-page illustrated descriptive pamphlet, 5½ x 8½ in., entitled, "Charles Dickens' Trip to Belleville in 1842, and How the Trip May Be Made Today." Excerpts from Dickens' "American Notes," in which he tells of his experience in making a trip to Belleville under conditions prevailing in those times, when they traveled in coaches and the mud "had no variety but in depth," and when "Belleville was a small collection of wooden houses huddled together in the very heart of the bush and swamp," are vividly contrasted with the interurban service of today. Then it was an all-day jaunt from St. Louis; now, the pamphlet states, if Dickens were here he could cross the Mississippi in electric cars on the magnificent bridge of steel, board a swift and easy riding car at the east end of the bridge and be put down at the court house in Belleville in 50 minutes without disturbing the regular running schedule of the line. If he were in a hurry the trip could be made in 30 minutes, as was actually done recently. The scenic beauties of the various divisions operated by the East St. Louis & Suburban are enticingly described in the publication, enhanced by full-page half-tone views of many of the more attractive portions. Time tables and special car rates are also given.

Still another advertisement employed is a 4-page folder and time table of the Edwardsville-East St. Louis division. Three pages of the folder are devoted to advertising the vest pocket guide and private and excursion car parties, and calling attention to the increased facilities for interurban service along the Edwardsville-Collinsville division. The East St. Louis & Suburban Railway Co. operates the following electric railways: St. Louis & East St. Louis Bridge, East St. Louis city lines, East St. Louis & Belleville, East St. Louis, Collinsville & Edwardsville, Collinsville, Caseyville & Edgemoor, and East St. Louis, O'Fallon & La Grange.

STREET RAILWAY TRAFFIC IN NEW YORK.

It is estimated that the number of passengers to be carried by the New York City street railways during the current fiscal year will exceed 1,000,000,000, and that during the next five years, with the rapid increase in population in and around New York, service for 1,897,300,000 passengers will be called for. Taking the annual state-

ments of the Manhattan Elevated alone, it will be seen that the 9,291,319 passengers carried in 1878 increased to 171,529,789 in 1888, and to 183,360,846 in 1898. According to the last annual report the number of passengers carried had increased to 223,427,283.

The preliminary report on street railways of the country for the year ending June 30, issued at Washington, and mentioned in the "Review" for April, 1903, indicates that the surface and elevated lines of Greater New York provide one-fifth of the total street and electric transportation demands of the United States. The population of Greater New York is about 3,500,000, so that at present each inhabitant averages 400 trips on one of the city lines during 12 months.

CONVENTION OF AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS.

Following is the program for the 1903 convention of the American Institute of Electrical Engineers, to be held at Niagara Falls, June 29th to July 3d:

Monday; Institute and President's Day. Morning: 9:30 to 1:00, President's address; "Institute Branch Meetings: Their Organization, Development and Influence," by Calvin W. Rice; "The Energy Transformations in the Synchronous Converter," by W. S. Franklin; "Commercial Alternator Design," by W. L. Walters. Afternoon: 1:00 to 2:00, Lunch; visits to local points of interest, no pre-arranged program. Evening: An exhibition of the Hewitt Converter and the Mercury Vapor Lamp, by F. H. Thomas.

Tuesday; Electrical Day. Morning: 9:30 to 1:00, Railroad papers—"High Speed Electric Railway Problems," by A. H. Armstrong; "Storage Battery Industrial Locomotives," by Frank L. Sessions; "Predetermination in Railway Work," F. W. Carter; "Car Run Tests," by W. E. Goldsborough and P. E. Fansler; "Some Recommendations Concerning Electrical and Mechanical Specifications for Trolley Line Insulators," by Samuel Sheldon and J. D. Keiley; "The Storage Battery in Substations," by W. E. Goldsborough and P. E. Fansler. Afternoon: 1:00 to 2:00, Lunch; 2:15, technical tour of inspection of electro-chemical and other electrical installations operated by Niagara Falls power, and the power houses of the Niagara Falls Power Co.; reception by Niagara Falls Power Co. on terrace of power house No. 2. Evening: Dance under auspices of local committee at Cataract House.

Wednesday; Niagara Day. Morning: 9:30 to 1:00, Power Transmission papers—"On the Testing of Electrical Apparatus for Dielectric Strength," by P. H. Thomas; "Choice Frequency for Very Long Lines," by P. M. Lincoln; "Method of Entering Buildings with High Tension Wires," by C. E. Skinner; "Y or Delta Connection of Transformers," by F. C. Blackwell. Afternoon: 1:00 to 2:00, lunch; trolley trips to Niagara Gorge, Fort Niagara, Brock's Monument, Chipewaga; technical visits to following plants: Niagara Falls Hydraulic Power and Manufacturing Co., Canadian Niagara Power Co., Natural Food Co. Evening: Entertainment at Cataract House, under auspices of local and general committees.

Thursday; Excursion Day. Morning: 9:30 to 1:00, Miscellaneous papers—"The Factors which Affect the Energy Losses in Armature Cores," by J. Walter Esterline and Clarence E. Reid; "Central Station Economies," by W. E. Goldsborough and P. E. Fansler; "The Electrical Equipment of a Gold Dredge," by Ralph L. Montagu; "The International Electrical Congress of 1904," by Elihu Thomson; "The Legalized Standard of Electromotive Force," by H. S. Carhart; "Symbols and Nomenclature," by Carl Hering; "A Universal Telegraphic Code," by G. O. Squier; "The Magnetic Units," by A. E. Kennelly. Afternoon: 1:00 to 2:00, lunch; technical excursions to Olcott Beach, St. Catherine's, Lockport, Tonawanda Substation. Evening: Illumination of Gorge Route.

Friday; Buffalo Day. Morning: 9:30 to 1:00, joint meeting with the Society for the Promotion of Engineering Education; papers will be presented by the following members of the Institute: W. S. Franklin, J. G. White, E. H. Mullin, B. Gherardi, Jr., L. A. Osborne and T. J. Johnston. Afternoon: 1:30 to 2:00, lunch; technical trips to Buffalo, Buffalo General Electric Co., Buffalo terminal house. Adjourning.

The offices of the Springfield (Ill.) Consolidated Railway Co. have been removed to the building of the People's Hot Water Heating & Power Co., corner of Fourth and Adams Sts.

Recent Improvements in the Street Railway Plant of Niagara Falls Power House.

BY ARTHUR E. WEEKS.

Since its first installation the street railway plant of the Niagara Falls power house has been entirely reconstructed. The original switchboard panels and starting devices have all been done away with, making way for a most modern apparatus superior in every way to the former methods.

Fig. 1 shows a panel for the purpose of operating a 500-h. p. G.



FIG. 1.

E. rotary converter. The round pattern Thomson ammeters, one for each phase, are located in the upper left hand side of the panel. Immediately below them is a new Lincoln synchronizer, which is universally liked, being positive in action and denoting slow or fast as the needle is to the right or left of the upper vertical line. When on this line the needle indicates synchronism.

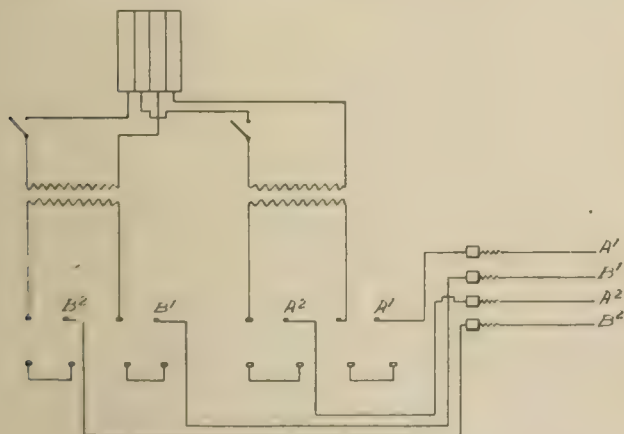


FIG. 2.

Below the synchronizer is an automatic oil switch on the primary circuit, the lever controlling both phases. One valuable feature of the switch is that should the lever be thrown in and anything wrong on the line, the breaker would immediately open independent of the lever which is grasped by the hand. The rotary can

be synchronized either on the low or high tension side. Should the switch on the high tension side be closed out of step the automatic circuit-breaker just mentioned would open and rupture the arc in the oil.

The diagram, Fig. 2, shows the wiring of the a. c. side of this panel. The two main switches on the lower panel are the secondary

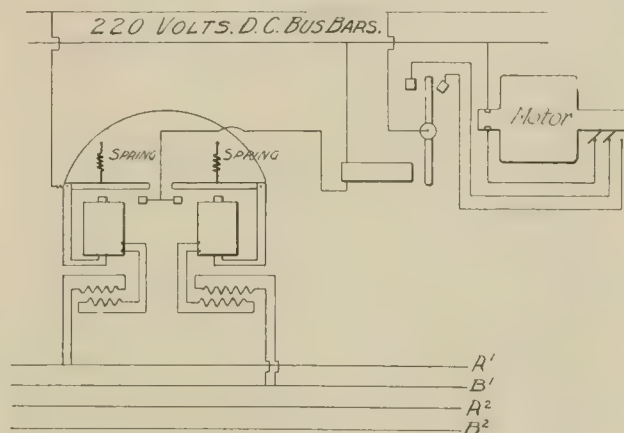


FIG. 3.

switches. There was no provision made for these switches, and they were fitted by the master mechanic of the power house. As shown in the diagram, one leg of each phase is broken by these switches. The original panel had high tension switches (2200 volts) upon its face, and all synchronizing was done by means of them. It was an exceedingly dangerous performance as several employees learned to their cost. The automatic oil switch is therefore most valuable here.

The secondary switches were below the a. c. collector rings on the rotary, and there was always more or less arcing at the collector rings close to one's face when closing these switches, hence the new arrangement is greatly appreciated.

Between the secondary switches is the starting switch of the

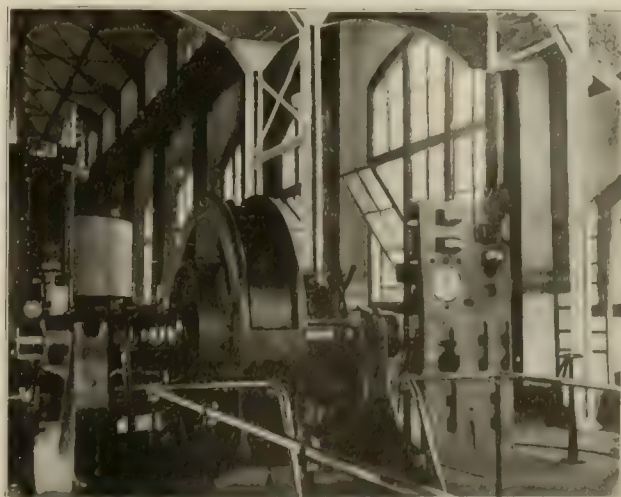


FIG. 4.

rotary, for it is started only by direct current. The rheostat pedestal stands to the right of the panel with the rheostat in a subway below the floor. Here also are the transformers for the rotary, one of which is a General Electric, and two Westinghouse machines. The G. E. air blast transformer is used in connection

with the G. E. rotary, and the oil insulated and water-cooled transformer for the Westinghouse machines. An induction motor

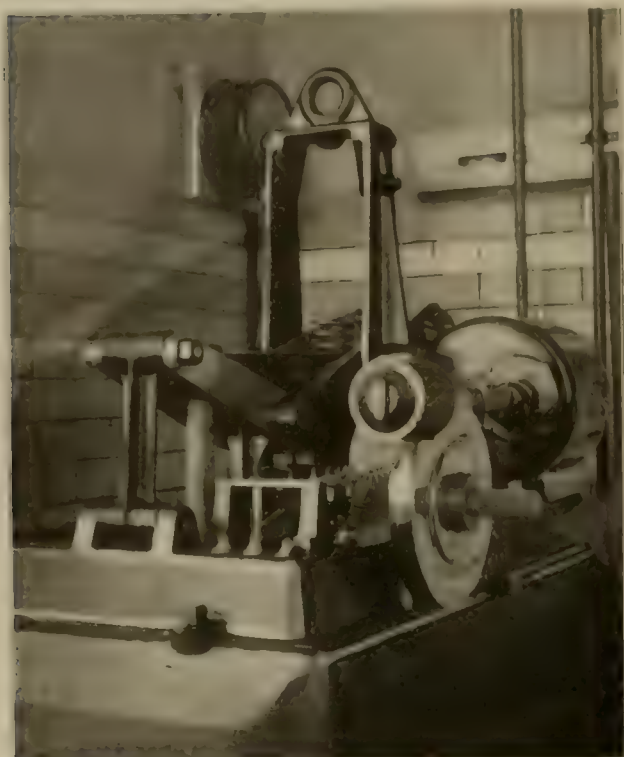


FIG. 5.

drives the blower for the air blast for the G. E. transformer. Formerly it received air from the subway, but as the temperature in summer was exceedingly high there an opening was made instead in the power house floor. All the wiring has been gone over thoroughly, and arranged in up-to-date style.



FIG. 6.

The rotaries formerly received their current directly from the railway feeder on the local service, and however severe the trouble

on this railway apparatus, there was no way to cut it off from the main feeder, unless by opening the feeder switch itself. This was never deemed advisable; hence there were times in the past when considerable damage resulted. Transformers of 500-h. p. capacity burning out with 2300 volts back of them make no little disturbance, as can be readily imagined.

Alternating current 100-ampere fuses on the 2300-volt circuit is another practice abolished by the present system, which puts these three 500-volt rotaries on a circuit controlled by a motor-actuated oil switch whose relay is placed upon the wall back of the switch. The relay that operates the d. c. General Electric motor is placed upon a panel of No. 1 switchboard.

The diagram, Fig. 3, shows the circuit in part. A short circuit on either phase closes a circuit from the d. c. bus-bars through the switchboard relay and starts the motor, upsetting the toggle and causing the switch to open. The motor is automatically cut out of circuit as soon as this is accomplished. When all circuits to the rotaries are opened the automatic switch is closed by the electrician on No. 1 board when all is in readiness, by throwing the relay switch to the opposite side. This closes the circuit to the motor and the oil switch is immediately closed.

Fig. 4 shows the G. E. rotary and new panel, and Fig. 5 shows the motor operating the oil switch. As shown in this illustration the oil switch is closed.

The d. c. motor relay has the same feature described in connection with the a. c. automatic circuit-breaker and oil switch, viz.: that should the switch be closed on short circuit the relay will open independently of the operator. This is an improvement over some of the G. E. relay switches and is especially valuable.

Fig. 6 shows the only night view of switchboard No. 1 ever taken.

TRANSPORTATION EXHIBITS AT THE WORLD'S FAIR.

Recognizing that transportation plays a most important part in social economy the Department of Social Economy of the Louisiana Purchase Exposition is intending to secure for that department special exhibits on the development of transportation. This will be designated Class 750 and in a recent announcement is thus described:

"Class 750—Development of Means of Transportation. In addition to the general exhibits in class 749 (Physical Resources and Characteristics), special exhibits are desired from state railway commissions, railway and navigation companies, and others engaged or concerned in transportation. These exhibits should be in the form of maps, charts, diagrams, statistical tables, models or photographs, showing the development, nature, and extent of the transportation facilities, the business done, the organization of the transportation enterprises, number of employees, etc. Pamphlets briefly describing the exhibits and containing reproductions of the charts, tables, etc., are also desired from each exhibitor."

Correspondence on this matter should be addressed to Carrol D. Wright, Washington, D. C.

CONSOLIDATION IN CLEVELAND.

Under date of May 28, 1903, a notice was issued for a meeting of the stockholders of the Cleveland Electric Railway Co. on June 29, 1903, for the purpose of assenting to the purchase by the Cleveland Electric Railway Co. of the railroads of the Cleveland City Railway Co. in and adjacent to the city of Cleveland, together with all its property, franchises, rights and privileges respecting the use and operation of such railroads; and for the purpose of increasing the capital stock of the company from \$13,000,000, its present capital stock, to \$23,400,000, divided into 234,000 shares of \$100 each; for the purpose of amending the articles of incorporation of the company so as to change the name thereof, if the stockholders at said meeting deem it best so to do; for the purpose of increasing the board of directors to fifteen; and for the purpose of transacting such other business as may come before said meeting.

Books for the transfer of stock of the company will be closed on June 10th and be reopened July 1st.

The Buffalo (N. Y.) Bellevue & Lancaster Electric Railway Co. has equipped its line with telephones.

RECENT STREET RAILWAY DECISIONS.

EDITED BY J. L. ROSENBERGER, ATTORNEY AT LAW, CHICAGO.

ADVERSE REPORT OF COMMITTEE NO IMPAIRMENT OF FRANCHISE RIGHTS GIVING FEDERAL COURT JURISDICTION.

Hanks v. City of Chicago (U. S. C. C., Ill.), 110 Fed. Rep. 957.

The mere appointment by the common council of a city of a committee to investigate when the franchises of certain companies would expire; the reporting by the committee that they would expire at a certain time contrary to the contention of the companies, with a recommendation that measures be adopted to dispossess the companies at the expiration of such time if renewal was not arranged meantime; and the further fact that the report was "received, approved, and printed" by the common council, the United States circuit court, in Illinois, holds, assuming that the franchises did not expire until the time claimed by the companies, was not such an impairment of contract as to give a federal court jurisdiction to interfere, no other action having been taken by the common council.

BOY THROWN OR KICKED OFF CAR BY MOTORMAN KILLED GOING ON OTHER TRACK—DUTY OF LOOKING AND LISTENING.

Pinder vs. Brooklyn Heights Railroad Co. (N. Y.), 66 N. E. Rep. 405. Feb. 17, 1903.

This action was brought to recover for the death of a concededly bright lad of 14 years of age, with no physical defect, save that of being slightly tongue-tied. Adopting the most favorable view of the facts which the plaintiff could claim, the court of appeals of New York says that the boy, while riding upon the front platform of a car, propelled by electric power, upon a part of an avenue which was unimproved by buildings, was thrown or kicked from the car by the motorman. He picked himself up, and, walking slowly, crossed the track, upon which his car had been running, and, while in the act of crossing the second, or further, track, was struck and run over by a car on it, and, from the injuries received, subsequently died. Under these circumstances, the court holds that a nonsuit was proper. It says that it thinks the evidence pointed as much in the direction of the negligence of the deceased as to his freedom from negligence. If he had looked and listened, as he was bound to do, there was nothing to show that he could not have seen the approaching car, and that he was unable to take those usual and necessary precautions was a matter of pure guesswork, and not of a reasonable inference from proven facts.

[This is a reversal of the decision in the lower court reported in 72 N. Y. Supp. 1082, St. Ry. Rev. Mar., 1902.]

NO REVERSAL FOR ERROR IN SUBMISSION OF CASE WHERE PASSENGER WAS THROWN FROM CAR RUNNING AT HIGH SPEED BREAKING WIRES AND BEING WRAPPED IN THEM.

Houston Electric Street Railway Co. v. Elvis (Tex. Civ. App.), 72 S. W. Rep. 216. Jan. 22, 1903. Rehearing denied.

The evidence showed that an open car was being run at a high and dangerous rate of speed, when the trolley wire broke and fell upon and became wrapped around and involved with the car, the momentum of which gave such force as to break the guy wires and break and throw down five of the poles, which fell toward and threatened to strike the car, which jumped and pitched along the track. The plaintiff testified that he was sitting in the car, holding on with both hands to the seat in front of him, and the wires were dropping down on the left-hand side and also in front and in the rear, and he pushed over to the right-hand side to escape the wires, and the last recollection he had he was sitting there holding on with both hands looking straight ahead. When he picked himself up after the accident, he was about three car lengths in the rear of the car, which stopped very soon after he got pulled off, or thrown off, which was a fact. The court of civil appeals of Texas held that since the undisputed facts showed that he was entitled to recover, and that no other verdict could have been rendered, a judgment in his favor could not be reversed for error in the submission of the case.

POWER OF COURT TO ORDER REDUCTION OF SPEED NEAR COURT HOUSES.

Ex parte Mayor, etc., of Birmingham (Ala.), 33 So. Rep. 13. Nov. 18, 1902.

If during court hours the unobstructed travel on a street which had been paved with vitrified brick where it ran by a long-established court house obstructed, interrupted or hindered proceedings in court by the noises from the street filling the court room, drowning all other sounds therein, and these could not be shut out even with the doors and windows closed, the supreme court of Alabama holds that the court had the power to abate such obstruction, hindrance or interruption to the administration of justice, the order approved requiring, among other things, that while the court was in session the speed of street cars for a block on that street should not exceed the rate of two miles an hour.

EJECTION NOT WARRANTED BY MERE HONEST BELIEF OF CONDUCTOR THAT COIN IS NOT GOOD.

Ruth v. St. Louis Transit Co. (Mo. App.), 71 S. W. Rep. 1055. Jan. 20, 1903. Rehearing denied Feb. 3, 1903.

It is not the law, the court of appeals at St. Louis, Mo., holds, that, where a passenger on a street car tenders the exact amount of his fare in a legal-tender coin, the conductor has a right to refuse to accept the same because he honestly believes it not to be a good coin, and demand payment in other coin, and, if the passenger refuses to pay it in any other money, then to eject him from the car. On the contrary, the passenger, in such circumstances, has a right to remain on the car, and, if he is forcibly ejected, has his recourse on the company for damages. In this case there was evidence offered tending to show that the nickel offered to the conductor in payment of fare, and which it seems should have been accepted, was worn smooth on one side, but on the other side the stamped device was plain to be seen, and that it was a good and current nickel.

RISK FROM PROXIMITY OF TREES TO TRACK ASSUMED BY CONDUCTOR.

Drake v. Auburn City Railway Co. (N. Y.), 66 N. E. Rep. 121. Feb. 10, 1903.

A street railway was required by the permit issued for it by the commissioner of highways to be constructed upon the westerly side of the street or highway so that the easterly rail of the track should be within eight feet from a line of large trees on the west side thereof. By this mode of construction the nearest point of the car to the trees was about 21 inches. A conductor who as such had been over the road about 160 times, and about 40 or 50 times as a motorman, was killed by coming in contact with a tree while he was on the running board of an open car adjusting a curtain at the request of a passenger. The court of appeals of New York says that the conductor, when passing over this road frequently, was fully advised as to the proximity of the trees, and if, in his opinion, there was peril in operating an open car, it was his duty to have retired from the employment. As he failed to do this, it must be held that he assumed whatever risk there was in the situation.

RISK ASSUMED BY ONE EMERGING RAPIDLY FROM SIDE STREET AND ATTEMPTING TO CROSS DOUBLE TRACKS BEHIND PASSING CAR.

Schutt vs. Shreveport Belt Railway Co. (La.), 33 So. Rep. 577. May 12, 1902. Rehearing Feb. 2, 1903.

The danger resulting from emerging rapidly from a cross-street and attempting to traverse a double-track railway immediately behind a passing car, without pausing to consider that it may mask a car moving in the opposite direction upon the further track, the supreme court of Louisiana says, is understood by those who are at all accustomed to street car travel, and is a danger from which, in the main, the individual wayfarer must be his own protector, since in

and the car was running smoothly. It could not be said that, if there was any negligence on the part of the motorman, it was such as would come under any reasonable definition of "gross negligence." And the same might be said of the failure of the conductor to tell the man to sit down, or to warn him of the danger of standing so near to the edge of a moving car. So far as respected the obvious danger to one standing in that position, the conductor might reasonably have supposed that the man needed no warning, but would look out for himself during the brief time required to get from his pocket the money for the fare.

DUTY OF CONDUCTOR AT PLACES WHERE IT IS CUSTOMARY FOR PASSENGERS TO GET ON AND OFF CARS WITHOUT ANY SIGNAL.

Atlanta Railway Co. vs. Randall (Ga.), 43 S. E. Rep. 412. Feb. 10, 1903.

It is the duty of a street railway company, the supreme court of Georgia holds, to exercise extraordinary care for the safety of its passengers. As an incident to this obligation, where, in compliance with a city ordinance, street cars are brought to a full stop just before reaching a crossing of tracks, and it is customary on such occasions to stop long enough for passengers to get on and off without giving any signal therefor, it is the duty of the proper servant of the company to exercise extraordinary diligence, before signaling the car ahead, to ascertain if any passengers desire to alight from the car, and, if so to give such passengers a reasonable opportunity to alight in safety. It is true, the court says, that the conductor cannot be expected to wait indefinitely when he does not know whether or not there is any one desirous of getting on or off the car; but it is also undeniably true that the duty rests upon him to take what means are in his power to acquire that information for himself; and where the ascertaining of that fact involves the safety of the passengers on his car extraordinary care is required of him under the law to find out the wishes of his passengers. Especially is this so at places where passengers customarily get on and off cars without any signal, either from themselves to the conductor or from the conductor to the motorman.

DUTY TO KEEP ADOPTED PLATFORM IN SAFE CONDITION—CONTACT WITH CAR NOT NECESSARY TO CONSTITUTE PASSENGER.

Haselton vs. Portsmouth, Kittery & York Street Railway (N. H.), 53 Atl. Rep. 1016. Dec. 18, 1902.

Where a platform was used by a street railway company, which regularly stopped its cars there to take on and discharge passengers, the supreme court of New Hampshire holds that the jury were warranted in finding, upon the evidence, that the company had adopted the platform and invited the public to use it in getting on and off its cars. Having adopted the platform, and invited the public to use it, the company was bound to maintain it in a reasonably safe condition, having reference to the purposes for which it had adopted it, and the uses it had invited the public to make of it. Whether it was in a reasonably safe condition for such purposes and uses, and, if not, whether the plaintiff was injured in consequence, or as a result of his own negligence, he having stepped off the end of the platform in looking for a seat in a car, were, upon the facts disclosed, questions for the jury.

Physical contact with the car was not necessary to constitute the plaintiff a passenger, and entitle him to the care due to that relation. Nor, having adopted and used, and invited the public to use, the platform, as shown, was it important whether the company actually built it or not. No more was it material whether the platform was within or without the limits of the highway.

DUTY TO PREVENT COLLISION OF REAR END OF CAR WITH TRUCK.

Suse vs. Metropolitan Street Railway Co. (N. Y. Sup.), 80 N. Y. Supp. 513. Feb. 20, 1903.

In turning from one street into another, the rear end of a car collided with a truck, knocking off a trunk, which, in falling, struck a window in the car, some of the pieces of glass injuring a passenger. Just before that, the car had stopped for passengers, and Mr. Justice Ingraham, of the first appellate division of the supreme court of New

FALL OF CAR ELEVATOR DEFECT IN GEAR WHEEL INADEQUATE INSPECTION.

Swenson vs. Metropolitan Street Railway Co. (N. Y. Sup.), 80 N. Y. Supp. 281. Jan. 23, 1903.

An elevator used for hoisting street cars to the upper floors of a building used for their storage fell and injured an employe assisting in pushing a car from the track on the elevator to the track on the second floor of the building. There was evidence that the cause of the accident was the breaking of a gear wheel, and the first appellate division of the supreme court of New York holds that if such breakage was the result of there being a "blowhole" in the wheel, a hidden defect in the metal of which the wheel was composed, which could not possibly be discovered by any known process of inspection or examination, the company would not be liable. And it says that it must be conceded, as a general proposition, that where an appliance or machine obviously safe has been in daily use for a long time, and has uniformly proven adequate and safe, its use may be continued without the imputation of imprudence or carelessness. However, it was also brought out in the case that there was an old crack in the gear wheel, and the court holds that if the crack was a defect which could have been detected by inspection, and was the proximate cause of the accident, then the elevator, with its appurtenances, was not an obviously safe apparatus; and in that case the duty of inspection was cast upon the company. Furthermore, it appeared that the elevator had been in use for some 11 years, required repairs from time to time, and had fallen before. Indeed, the company undertook, through its servants, the work of inspection. One of its witnesses testified that he was in the habit every week of going around the elevator, and looking at it, and going up a ladder and observing the wheels and the drums and oiling the machinery; but he did use the hammer test on this wheel more than a year before the accident. The existence of the crack could readily have been detected by the use of a hammer, and the court holds that the above was inadequate inspection.

FALLING OUT OF OPEN CAR OF PASSENGER STANDING UP TO GET FARE FROM POCKET NO WARNING REQUIRED SPEED OF 16 MILES AN HOUR NOT GROSS NEGLIGENCE.

Witherington vs. Lynn & Boston Railroad Co. (Mass.), 66 N. E. Rep. 206. Feb. 25, 1903.

A passenger sitting at the extreme left end of the first seat in front of the rear partition of a not crowded, long, open car running at the rate of perhaps sixteen miles an hour, on being asked by the conductor for his fare rose, and, standing near the edge of the side of the car, put his hand in his right-hand trousers pocket, as if to get the money, and while doing this he leaned a little "to the left and backwards," and his body left the car, striking the ground with such force as to cause fatal injury. It was conceded that no action could be maintained for damages unless there was a gross negligence on the part of the motorman or conductor, but it was contended that the gross negligence consisted in allowing the car to go at an unusual and dangerous rate of speed, or in not warning the man of the danger. The supreme judicial court of Massachusetts, however, is of opinion that the evidence was not sufficient to warrant a finding of gross negligence in either respect, and that a verdict for the company was properly ordered. It says that this was not a case where the speed was so great as to result in any unusual motion or jar of the car. The track, although slightly curved, was very nearly straight,

York, says that, when the signal was given to the motorman to proceed with the car, he, being upon the front of it, and observing that there was room for the car to pass the truck in safety, had a right to assume that the driver of the truck, in proceeding would keep away from the car, and thus prevent a collision, there being room for him to do so. It could not be said that the motorman was negligent, after the front of the car had passed the truck in safety, because he did not observe how near the rear of the car, by reason of the overhang, was being brought to the truck. The motorman was stationed on the front of the car. He was obliged to observe what was taking place in front of him, and control the car accordingly, to the end that it might not injure persons in the streets, or collide with vehicles passing thereon. But the company was just as much obligated to prevent a collision with the rear end of the car as it was with the front end, and, if it was true that the motorman's duties were such that he was required at all times to look in front of the car, then it should have required the conductor, or some one on the rear, to observe that, and, if a collision were about to occur, signal the motorman to stop; and whether the company performed this duty, so far as the passenger injured was concerned, was a question for the jury to pass upon.

DUTY TO LOOK BOTH WAYS BEFORE STARTING TO
CROSS STREET—WHAT MOTORMAN MAY ASSUME
OF PERSON WHO HAS CROSSED HIS TRACK
AND IS CONFRONTED BY CAR ON
FURTHER ONE.

Trauber vs. Third Avenue Railroad Co. (N. Y. Sup.), 80 N. Y. Supp. 231. Feb. 6, 1903.

According to the plaintiff's testimony, when he left the west curb to cross the street he saw a south-bound car approaching between a half and a block away. He crossed the south-bound tracks, and either had or was about to step upon the north-bound tracks, when he discovered a car only a few feet from him, approaching from the south, and in order to avoid a collision with that car he stepped back onto the south-bound tracks, and was immediately struck by the car going south. The first appellate division of the supreme court of New York holds that his failure to look for the north-bound car and to ascertain the relative position of both of the cars before starting to cross the tracks, and thus placing himself in a position of danger between the two cars approaching from opposite directions was a negligent act upon his part, inasmuch as it was his duty to look both ways before starting to cross the street. Nor, the court holds, could it be said that the motorman on the south-bound car was negligent because he did not anticipate that the plaintiff, after he had passed over the south-bound tracks, would retrace his steps in order to avoid a collision with the north-bound car. On the contrary, the motorman had the right to assume that after the plaintiff had passed over the south-bound tracks he would continue in the same direction in which he was going, instead of stepping back upon those tracks, and, if there were any danger of his colliding with the north-bound car, he would remain in the space between the two tracks, which, according to the uncontradicted evidence, was about six feet.

LIABILITY FOR ATTORNEY'S FEES AFTER SETTLEMENT
OF CLAIM WITH CLIENT—HOW LIEN FOR
SAME MAY BE ENFORCED.

Brooklyn Heights Railroad Co. vs. The Mayor (N. Y.), 66 N. E. Rep. 997. Feb. 17, 1903.

Section 66 of the New York Code of Civil Procedure provides that "From the commencement of an action or special proceeding, or the service of an answer containing a counterclaim, the attorney who appears for a party has a lien upon his client's cause of action, claim or counterclaim, which attaches to a verdict, report, decision, judgment or final order in his client's favor, and the proceeds thereof as soon as they may come, and the lien cannot be defeated by any settlement between the parties before or after judgment or final order. The court upon the petition of the client or of the attorney may determine and enforce the lien."

In construing the above, the court of appeals of New York has held that it created a lien in favor of the attorney on his client's cause of action, claim or counterclaim, or judgment or final order in the court of the litigation, and enabled him to follow the proceeds into the hands of the parties, without regard to any settlement before or after judgment,

that all the world must take notice of the lien, and that it was unnecessary for the attorney to give notice of his claim to the other party. But it thinks the lien is subject to the right of the client to settle in good faith, without regard to the wish of the attorney. Of course, it says, it does not refer to dishonest settlements made to cheat attorneys, which the courts will brush aside with a strong hand, but to honest settlements, made in good faith because the client preferred something certain in hand to the uncertainty of protracted litigation. In this case the plaintiff (attorney), by standing on the settlement, admitted that it was made in good faith, and thus confirmed his lien upon the proceeds, which was not defeated by payment to his client, for the defendant (company) paid at its peril. A lien upon a claim or a cause of action follows the fund created by a settlement of the claim, which thereupon ceases to exist. It attaches to the amount agreed upon in settlement the instant that the agreement is made, and, if the defendant pays over to the client without providing for the lien of the attorney, he violates the rights of the latter, and must stand the consequences.

The remedy provided by the Code by means of a petition is not exclusive, but cumulative, for a court of equity has always had power to ascertain and enforce liens.

APPLICATION OF DOCTRINE OF RES IPSA LOQUITUR
TO DERAILMENT OF CARS OPERATED BY MODERN
POWER—PARAMOUNT RIGHT BETWEEN CROSSINGS
—DUTY IN FURNISHING AND MAINTAINING TRACK,
CARS AND APPLIANCES—BURDEN OF PROOF.

Adams v. Union Railway Company of New York City (N. Y. Sup.), 80 N. Y. Supp. 264. Feb. 6, 1903.

Where the doctrine of *res ipsa loquitur* (the matter speaks for itself) applies, the first appellate division of the supreme court of New York says that the happening of the accident and the attending circumstances raise a presumption of negligence sufficient to warrant a finding of negligence, in the absence of any explanation on the part of the defendant. And whatever the rule may be in horse car cases, the court is of the opinion that the doctrine of *res ipsa loquitur* should be applied to cases of injuries to passengers caused by the derailment of street railway cars operated by mechanical or by mechanical and electric power, or, in other words, that under such conditions the cases are to be assimilated to those in which the vehicles are operated by steam power.

Originally horse cars for the transportation of passengers, the court says, were small and comparatively light. They were easily derailed. It is common knowledge that they could be, and were, readily derailed and pulled along the street to pass an obstruction, and then driven back upon the track. The tracks themselves were not originally of heavy construction, and the rails were thin and light. Now the construction of the tracks is substantial, and the rails are as heavy as those employed in the construction of steam railroads. The modern electric, cable, and compressed air power cars are large and heavy, and not readily derailed. Although the power and speed of these cars are greater than of horse cars, yet, if properly equipped with modern appliances, they are more readily controlled, in proportion to their speed, at least. It is true that the street railway companies have not the exclusive use of their tracks, but between crossings they have the paramount right to such use. Steam railways have not the right to the exclusive use of their tracks at highway crossings, or where the tracks are constructed longitudinally along the surface of the street, as is the case in many instances. If the derailment of a passenger car on a steam railroad operated along the surface of a street gives rise to the presumption of negligence on the part of the company, on principle the court sees no reason why the rule should not be applied to street railway cars operated by modern power.

It is the duty of a street railway company to its passengers, the court says, to furnish a reasonably safe and efficient track, car, and equipments, including the appliances used for utilizing the power, and to so maintain them, as far as this may be done by the exercise of the highest degree of skill, diligence, and foresight. Ordinarily, if this duty is performed, and the motorman is vigilant in the performance of his duties, a car will not be derailed. On principle, therefore, the rule is applicable. It is but just to the passengers that this rule should obtain, for ordinarily they have no means of knowing the cause of the accident; and, if properly guarded by the trial court, there is little danger that it will work injustice to the street railway

operator. The burden will still rest upon the plaintiff of showing negligence on the part of the carrier. A prima facie case will be made by showing the derailment of the car, resulting in injuries to the passenger, and the defendant then may show that the derailment was not occasioned through its negligence. If this evidence is clear and satisfactory, it will overcome the presumption, and on the whole case the plaintiff will fail to bear the burden resting upon him of proving negligence by a preponderance of the evidence.

REAL OWNER IN POSSESSION OF LAND WITHOUT LEGAL TITLE MAY GIVE CONSENT SUFFICIENT FOR PUBLIC HEARING. ADJOURNMENT OF ADVERTISED MEETING. VALID RESERVATION AND PROVISION IN ORDINANCE—LESSOR COMPANY MAY APPLY FOR PERMISSION TO CONSTRUCT EXTENSION.

State (Shepard et al., Prosecutors) v. Mayor, Etc., of East Orange (N. J. Sup.), 53 Atl. Rep. 1047. Jan. 16, 1903.

A New Jersey act of 1896 provides that no street railway shall be constructed except upon consent of the governing body of the municipality; that permission to construct, maintain and operate a street railway shall in no case be granted until there shall be filed with the clerk of such governing body or other equivalent officer the consent in writing of the owner or owners of at least one-half in amount of lineal feet of abutting property; that notice of application for such permission shall be published, and that the governing body may grant permission by ordinance, etc.

Under this act, the supreme court of New Jersey holds, the real owner of land, in possession, may effectually consent to the construction, maintenance, and operation of a street railway, although the mere legal title may be vested in another person. The public hearing by said act directed to be given by the governing body of a municipality applied to for a grant of permission to construct, maintain, and operate a street railway may be given before the introduction of the granting ordinance. Adjournment of the advertised meeting is adjournment of the hearing. If ample opportunity to be heard has been afforded, such governing body may, at a time and place to which it has adjourned the advertised meeting, proceed, without further hearing of objections, to its consideration of the application, and action thereon.

A reservation, in an ordinance granting permission to construct, maintain, and operate a street railway, of power to change by resolution the location of tracks and poles on application of the railway company, will not avoid the ordinance. A provision in such an ordinance to fix by arbitration the compensation to be paid for the permission granted, after the expiration of a time during which such compensation has been fixed therein, will not avoid the ordinance.

A street railway company that has leased its property and franchises to another company on terms that after-acquired railroads shall come under the lease without increase of rent may lawfully be the applicant to a municipality for permission to construct, maintain, and operate an extension of a street railway embraced in the lease.

VALIDITY OF AGREEMENT TO PAVE STREET FOR FRONTAGE CONSENTS—STIPULATION OF LIQUIDATED DAMAGES FOR FAILURE.

Farson v. Fogg (Ill. App.), 105 Ill. App. 572. Jan. 30, 1903.

To secure the consents of two abutters which were indispensable to obtaining a franchise to lay tracks in a certain street, a firm interested in the street railway company which wanted them and in securing the franchise agreed with such abutters that they would be damaged by the railway in such street; that in consideration for and payment of such damages the company or this firm would pave the street; that if they failed to do so they would pay \$1,000 as liquidated damages caused by such failure, a certified check for that amount being put up to guarantee the performance of the agreement. Following the signatures to this agreement was a statement, signed by the company, per general manager, that the company for value received acknowledged that it had agreed to do such work according to the specifications stated, and upon the conditions recited. The branch appellate court of the first district of Illinois holds that, notwithstanding the purchase of a frontage consent from the abutters would be illegal, this contract was valid. It says that the contract did not purport to be and evidently was not for the exclusive benefit of the two abutters, if carried out according to its terms. It was for

the public benefit that the street should be paved, and other property owners as well as these would be compensated by such paving to that extent for such damages as the construction and operation of the railway might involve. The court is not aware of any considerations of public policy which forbade the railway company from making good to the public and the property owners damages which were occasioned by its appropriation of a part of the street for its tracks and cars. Such provisions are frequently inserted in ordinances by which franchises are granted, with a requirement that as a condition the company shall pave the street upon which it is permitted to place its tracks. This is ordinarily a just and equitable provision. The fact that a street railway imposes no additional servitude upon a public street does not by any means compel the conclusion that it may not in fact inflict damages upon the public as well as upon the private owners of abutting property, which it is equitable to require the railway company to lessen as much as possible by improvement of the street in a compensatory way. The agreement settled the amount of damages, which might otherwise be uncertain, for failure to perform at the time set, and there was no reason for treating it otherwise than as one for liquidated damages.

POWER TO BUY EXISTING LINES TO EXTEND SYSTEM—VALIDITY OF MORTGAGE—NEGOTIABILITY OF BONDS—PRIORITY OF LIEN—WHEN LIEN FOR PAVING TAXES SUPERIOR—ASSESSMENT FOR PAVING ONE FOOT OUTSIDE OF RAILS.

City of Lincoln v. Lincoln Street Railway Co. (Neb.), 93 N. W. Rep. 766. Feb. 4, 1903.

A street railway company authorized to construct, equip, and operate lines of electric street railway, the supreme court of Nebraska holds, may purchase lines already constructed, and fit and suitable for the extension and completion of its system, as well as construct the same; and a recital contained in a mortgage executed by such company that it has power to borrow any sum or sums of money which may be necessary for the purchase, construction, and equipment of its electric street railway will not render the mortgage void upon its face.

The charters of all street railway companies in Nebraska are created by general law. Cities have no power to grant such charters or impose limitations thereon; and the act of 1889, authorizing street railway companies to borrow money for certain purposes, and secure the payment of the same by mortgaging their property and franchises, applies to all street railway companies in Nebraska, whether chartered before or after the passage of that act.

Where it is claimed that a mortgage executed by a street railway company is for an amount in excess of that permitted by law and its charter, such alleged fact must be proven, so that an examination of the record will disclose it. Otherwise it will be presumed that the mortgage was not for an excessive amount. Where a street railway company mortgaged its property and franchises to secure the sum of \$600,000 for the purpose of purchasing, constructing, and equipping its lines of electric street railway, and it is shown that it expended for that purpose about \$900,000, it cannot be said that the mortgage was given to create a fictitious indebtedness.

A series of bonds secured by a mortgage or trust deed on the property of a street railway company are negotiable, and, as between bona fide purchasers thereof for value, are equal in priority; the lien of each bond dating from the recording of the mortgage that secured it, and not from the time it was issued. Such a mortgage is a first lien upon the property of the street railway described therein, as against all special assessments for paving taxes, except such as were assessed for paving already done, or as were in contemplation at the time it was recorded.

Section 77 of chapter 11 of the Nebraska Laws of 1887, which creates a lien for paving taxes against the lines of street railway companies, does not make such special taxes a lien on their personal property. Where the trial court finds, on sufficient evidence, that certain assessments for paving taxes were in contemplation at the time of the execution of a mortgage by the street railway upon its property, it follows, as a matter of law, that the lien of such taxes is superior to the lien of the mortgage. Assessments for paving one foot outside of the rails of street car lines will not be held void where such paving was done while the statutes were in force providing that street railway companies should be required to pave between their tracks and one foot outside of the rails thereof.

NASHVILLE RY. IMPROVEMENTS AND REORGANIZATION PLAN.

The Nashville Ry., of Nashville, Tenn., recently changed the gage of its entire system from 4 ft. 11 $\frac{3}{4}$ in. to standard gage, and the greatest obstacle met in the performance of the work was the removal of the required portion of the new bithulitic composition with which the city paved the Public Square last summer as an experiment. This pavement is a bituminous, waterproof macadam, composed of broken rock and sand, heated to expel the moisture, and bitumen. The mixture is placed upon a bed of macadam already rendered waterproof by a specially prepared bitumen liquid and rolled. With all the moisture expelled from the materials, a paving waterproof above and below is thus obtained. In changing the gage of the track on the Public Square the railway company found it necessary to tear up a portion of this paving. A gang of laborers was put to work at the Cedar St. corner at 10 a. m., and at 5 p. m., when they stopped work for the day, it was found that they had

paving, and that when the railway company's permanent improvements are made, and the cross-ties imbedded in this waterproof material, the life of the ties will be more than doubled. The new paving is made by the Warren Brothers Co., of Boston, Mass.

One of the accompanying illustrations shows the new paving in the Public Square and two gangs at work prying it up. The other view shows work of reconstruction in East Nashville, on Bridge Ave., where there is a double track. One track has been entirely removed and is being reconstructed with 70-lb. rail, where formerly 45-lb. rail was used.

Messrs. Ford, Bacon & Davis, the engineers in charge of the Nashville railway improvements, began the work of laying 80-lb. 60-ft. rails in Broad Street about May 1st. There are two miles of double track to be laid and as the company is required to put down at its own expense the new bituminous macadam between rails and two feet each side, while the city paves the rest of the street, it was estimated that it would require two months to complete the work. At the time the Broad St. work was begun permanent improvements



REMOVING BITHULITIC PAVEMENT IN PUBLIC SQUARE, NASHVILLE, TENN.

barely been able to make an incision in the elastic bithulitic. The foreman of the gang had had experience with all paving except this and at the outset instructed the crew that it was only necessary to take up a strip one foot wide. The distance to be torn up was about 70 ft., and the men scattered and began to swing their picks. Under each stroke the paving gave perceptibly, but at the end of an hour an incision sufficiently large to admit a crowbar had not been made. Picks were then discarded and chisels and sledge hammers brought into use. This proved to be almost as ineffectual as picks, so the foreman decided that it would be best to tear up all the paving between the tracks, and late in the afternoon, by means of chisels, hammers and steel saws, holes were made in which extra strong and heavy crowbars were inserted. Instead of raising the bituminous macadam the crowbars bent under the stress. Next, 40-lb. rails were sharpened and used as crowbars, with four or five negroes to each lever. It took 25 men more than an entire day to complete the 70 ft. The engineers in charge of the work afterward obtained asphalt chisels, by means of which they were enabled to remove a 4-in. strip of the paving fairly rapidly. It is thought that the new composition which resembles asphalt, will make an ideal

were started on N. First St., East Nashville, but owing to a strike of 100 laborers on the Broad St. line the force was temporarily transferred from N. First St., it being important that the improvement on Broad St. keep pace with the work done by the city. The laborers were receiving \$1.00 per day for 10 hours' work, that being the usual rate paid in Nashville and vicinity for work of that character. Thinking that the importance of hastening the work on Broad St. gave them an advantage, they struck for \$1.25 per day. Their action inconvenienced the engineers for a few days only, after which they obtained all the men needed at the old rate and the work has since progressed satisfactorily. Twelve miles of 70-lb. rails, 60-ft. lengths, were ordered recently and with the eight miles already ordered and delivered will make 20 miles of heavy rail soon to be relaid in Nashville.

The Nashville Ry., in an effort to reduce the number of accidents, has inaugurated a "Roll of Honor," and each month lists of motor-men and conductors who have not had an accident during the previous month, for which they were adjudged responsible, are posted, while those who have had accidents for which the management considers them blamable are bulletined in another list. The men take

great interest in the matter and carefully strive to keep their name on the "honor roll" bulletin from month to month. In posting the bulletin covering the first four months of this year, Mr. Percy Warner, one of the receivers of the road, addressed a letter to the men, in which he pointed out that of the 300 accidents reported during the four months conductors were to blame for 20 and motormen for 36. The letter stated that the company realized that some of the names on the "roll of honor" are those of men who have been with the company a short time, and that a number work as extras and so are less liable to have accidents, consequently each man is to be judged according to the time made each month. Several of the motormen have been with the company from 10 to 15 years, with not a single accident charged to them, and they have had only two or three slight accidents of any kind.

The foreclosure sale of the Nashville Ry., which has been in the hands of Messrs. Percy Warner and E. C. Lewis, receivers, since June 22, 1901, was advertised to take place June 15th under the direction of Charles C. Trabue, special master, the sale to include all the property, rights, franchises and easements. The

stock issued, \$5,470,000; bonded indebtedness outstanding, \$2,384,000; underlying bonds, issued and outstanding, \$2,000,000; bonded indebtedness of the Cumberland Electric Light & Power Co., \$517,000. The bonds of the Nashville Ry. bear interest at the rate of 5 per cent. They were secured by mortgage or deed of trust to the Baltimore Trust & Guarantee Co. The capital stock of the Cumberland Electric Light & Power Co., with the exception of 10 shares, was deposited under an agreement dated Jan. 29, 1900, with the Baltimore Trust & Guarantee Co., trustee, as security for the bonds issued by the Nashville Ry.

It is proposed to further secure the bonds of the corporation acquiring the Nashville Ry. properties by either a pledge of the stock of the electric light company, or by a mortgage of the property of such company, subject to the prior lien of the underlying bonds, amounting to \$517,000. The reorganization plan provides for the issuance of \$6,000,000 5 per cent 50-year gold bonds redeemable at the company's option after five years at 107½. Of this amount \$2,423,000 will be applied to purposes of the corporation and \$3,577,000 to provide for underlying bonds. Preferred stock to the amount



LAYING DOUBLE TRACK ON BRIDGE AVE., EAST NASHVILLE, TENN.

sale was ordered upon the petition of the Baltimore Trust & Guarantee Co., trustee. According to the terms of sale each bidder must deposit \$100,000 cash, a certified check for that amount, or \$300,000 par value of the bonds secured by the mortgage of Jan. 29, 1900. Also, it was stated that no bid would be accepted under \$500,000. "In addition to the obligations imposed upon the purchaser . . . to pay and discharge the costs and compensations; to pay the receivers' certificates of the Nashville Ry., amounting to the sum of \$512,000; and the obligation to furnish the additional sum of \$346,000 to provide for the acquisition by the receivers of the joint certificates of the Cumberland Electric Light & Power Co., and the receivers of the Nashville Ry." It will thus be seen that the upset price is \$1,358,000.

It is understood that Mr. Percy Warner will be president of the new company and that the Nashville Ry. and the Cumberland Electric Light & Power Co. will be consolidated and operated as one concern. Heretofore, although the Nashville Ry. owned or controlled all the stock of the lighting company, they have been managed separately.

The authorized capital stock of the Nashville Ry. is \$6,500,000;

of \$2,500,000 and \$4,000,000 common stock will be issued, the preferred to pay 5 per cent per annum, if earned, dividends to commence to accrue Jan. 1, 1904. Of the preferred stock \$1,995,500 will be issued now, and of the common \$3,500,000; the rest will be reserved in the treasury for future needs. Holders of stock of the Nashville Ry., upon payment of the assessment, will be entitled to \$820,500 of the preferred stock and \$656,400 of the common. The rest will be sold, each subscriber receiving for every \$1,450 cash the following securities: \$1,000 bonds; 500 preferred stock; 900 common stock. The securities to be sold now, including the assessment on present stock, will aggregate \$3,941,800. Deducting August, 1901, coupons and interest of Nashville Ry. bonds, expenses of receivers and settlement with the city, and an approximate floating debt of \$350,000, it is estimated that \$1,290,400 will be available for improvements. Of this amount \$1,000,000 will be available for improvements for which no contracts have as yet been made. It is proposed to allow any subscriber to any of the new securities depositing bonds with August, 1901, and subsequent coupons attached, a credit equal to 85 per cent of the par value, together with interest. It is also proposed to assess stockholders of the Nashville Ry.

desiring to participate in the new plan \$8.50 per share and to deliver for each share deposited with assessment paid \$15 par value of new preferred stock and \$12 par value of new common stock.

The expected construction of the Nashville, Gallatin & Columbia Interurban Ry. has been delayed on account of differences arising between the capitalists backing the enterprise, namely, Messrs. Ruth and Haskell, of Pittsburg, and Mr. J. H. Connor, who has been manager at Nashville. Nearly \$12,000 has been expended in preliminary work and the Pittsburg people hope to be able to complete the road, but it is stated that the difficulties that have arisen are quite serious. It was expected that the greater part of the system would be put in operation by August, 1903, and to that end negotiations were making with the Nashville Ry. and the Cumberland Electric Light & Power Co. for necessary power until other and permanent arrangements could be made.

While no actual work of construction has begun on any of the proposed interurban lines centering at Nashville, the Nashville & Lewisburg Electric Ry. people are making surveys and estimates and are negotiating for entrance into Nashville over the tracks of the Nashville Ry.

PENSION SYSTEM FOR DENVER CITY TRAMWAY.

The directors of the Denver City Tramway Co. recently decided, after careful investigation of the subject, to establish a pension system for the benefit of the employes of the Tramway company and all companies operated by it or in connection with it, and also to organize a mutual benefit association among employes.

The general provisions of the two plans, which are, however, independent and quite distinct, are as follows:

PENSION DEPARTMENT.

Retirement from the service of the company upon pension has been divided into two classes, the first compulsory and the second in the discretion of the Pension Board, as follows: Employes attaining the age of 70 years, who shall have been 25 years or more in the company's service, shall be retired; employes 65 years of age to 69 years of age, who shall have been 25 years or more in the service may be retired, if, in the opinion of the Board, they shall have become physically disqualified. An exception, so far as length of service is concerned, is made in favor of all present employes of the company who shall be members in regular standing of the Tramway Mutual Aid Association. The length of service of such employes is reduced to 15 years, as a qualification for retirement and pension.

The service defined as "continuous" is that service which has continued from any given date upon or in connection with any works of the company, whether prior or subsequent to their control or acquisition by the Denver City Tramway Co., and in computing the length of service it shall be reckoned from the date of entry in the service to the date when relieved, deduction of the actual time out of the service being then made and eliminating any fractional part of a month.

The following classification has been made of the employes, in determining the amount of pensions to be paid:

To all uniformed employes in the regular train service the sum of \$25 per month pension.

To all employes who shall have received average monthly wages of \$80 or more, during the 10 years immediately preceding retirement, the sum of \$25 per month pension.

To all employes whose average monthly wages during the period of time last mentioned shall have been \$60 to \$79, the sum of \$20 per month pension.

To all employes whose average monthly wages during the period above mentioned shall have been less than \$60, the sum of \$15 per month pension.

The acceptance of a pension allowance shall not debar any former employe from engaging in other business, but such person cannot re-enter the service of the company.

It has been estimated that pensions upon the basis outlined may be paid the employes of the company and will not exceed in the aggregate the sum of \$18,000 per year, but the company reserves the right to establish a new basis, ratably reducing the pension allowances, whenever it shall be found that the present basis creates demands in excess of \$18,000 per year.

THE MUTUAL AID ASSOCIATION.

The association shall have a Board of Trustees of nine members, four of whom shall be elected by members of the association and five by the directors of the company. This association shall enter into a contract with the Denver City Tramway Co., whereby the latter shall guarantee to the members of the association the payment of all benefits and indemnities provided for.

Any officer or employe of the company may become a member of the association upon complying with the requirements thereof. In the case of present employes, the requirement with reference to a physical examination shall be waived for the period of thirty days from the organization of the association.

Members of the association are divided into three classes, as follows:

1. All members whose monthly earnings are \$80 or over.

2. All members whose monthly earnings are at least \$60 and less than \$80.

3. All members whose monthly earnings are less than \$60.

The members are required to contribute each month as follows: Class 1, one dollar each month; class 2, 75 cents each month; class 3, 50 cents each month. These contributions shall be made each month during the receipt of benefits from the association and also each month when the member is in receipt of a pension, as well as each month when the member is engaged in his employment.

In case of the decease of a member, there shall be paid to the beneficiary or beneficiaries of the deceased member the sum provided for membership in his class, as follows: Class 1, \$1,000; Class 2, \$750; Class 3, \$500. Provided, however, that members of the association who shall join between the ages of 41 and 50, inclusive, shall only be allowed 75 per cent of the full amount for members of their class as an indemnity to their beneficiaries in case of death, and members who shall join over the age of 50 years shall only be allowed 50 per cent of the full amount for members of their class. This is provided for the purpose of protecting the funds of the association against loss and depletion on account of the advanced age of many of the company's employes at the present time.

Disability of a member, arising through accident or sickness, shall entitle the member to receive the following benefits, for a period of at least 52 weeks (if the disability shall continue so long), and longer if the Trustees shall so elect,—that is: Class 1, \$6 per week; Class 2, \$4.50 per week; Class 3, \$3.00 per week.

In order to safeguard the funds of the association, it has been deemed necessary to provide certain conditions and restrictions, especially with reference to the receipt of benefits in case of disability, the principal conditions being:

a. No benefits shall be paid for the first 10 days of sickness not produced by bodily injuries arising through external, violent and accidental means. In the case of what are commonly termed "accidents," the disability benefits shall be payable from the time disability arises, provided notice thereof is given within two days after the accident occurs; otherwise from the time of receipt of notice.

b. "Disability" is defined to be total incapacity to carry on any occupation in the service of The Denver City Tramway Co.

c. Members are disqualified for receiving benefits, and indemnity shall not be paid in case of the death of members where the accident, sickness or death is caused, in whole or in part, directly or indirectly, by reason of certain prohibited acts and practices, among which are the use of alcoholic liquors as a beverage, intoxication, acts of immorality, fighting, except in self-defense, voluntary and unnecessary exposure to danger of injury, contagion or infection, unless in pursuance of duty as an employe of the company, etc.

d. The Denver City Tramway Co. enters into a contract with the association whereby the company guarantees the contracts made with the members, agrees to pay for the running and operating expenses of the association, and, further, agrees to contribute to the funds of the association the sum of \$25 for every \$100 contributed by the members. In consideration of this contract, members in case of sickness or accident, and beneficiaries in case of the death of members, shall receipt to the company in full, upon payment of benefits or indemnity, for all liability on the part of the company.

All employes joining the association shall have the privilege of exercising the option of continuing to pay hospital dues, as at present, and receive the same benefits therefor as are now received, or of discontinuing the payment of said hospital dues and thus ceasing to participate in the benefits derived from the hospital fund.

Members will be permitted to increase the indemnity to be paid to their beneficiaries, in case of death, to twice the amount provided for their class and age, upon making application for increased indemnity at the time they shall become members, and being approved therefor upon a satisfactory examination by the physician selected by the Trustees for that purpose, and there after paying to the association twice the contribution required from members of their class.

We are indebted to Mr. John A. Beeler, vice-president and general manager of the Denver City Tramway Co., for the foregoing details of the company's plans.

THE JOLIET, PLAINFIELD & AURORA R. R.

Recently work was begun on the Joliet, Plainfield & Aurora R. R., which is to be the connecting link between two important Illinois interurban systems—the Chicago & Joliet Electric Railway Co. and the Aurora, Elgin & Chicago Railway Co. The former extends from Chicago, southwesterly to Joliet, a distance of 35 miles, and the



MAP OF JOLIET, PLAINFIELD & AURORA R. R.

latter from Chicago due west to Aurora, about the same distance. From Joliet to Aurora is about 20 miles and when the new line is built it will complete a triangle of 90 miles through a picturesque and densely populated section. The roads already operating over two sides of the triangle are very substantially constructed and enjoy a large business, which, it is predicted, will be greatly increased by the completion of the third line, while the interchange thus made possible will provide a remunerative traffic for the new road, apart from the local business, which, it is anticipated, will be exceedingly heavy. Joliet has upward of 40,000 population, Aurora more than 35,000, and both cities are growing rapidly. Midway between them is Plainfield, with a population of 1,500, besides several smaller towns, making an average population of more than 4,000 per mile.

The Joliet, Plainfield & Aurora Ry., which has a capital of \$400,000, is being built by the Fisher Construction Co., of Joliet, recently incorporated with a capital of \$50,000. The standard specifications of the American Railway Co., which owns the Chicago & Joliet Electric Railway Co., are being followed, which is a guarantee that the construction and equipment will be first class. At Joliet the new road will connect and use the terminals of the Chicago & Joliet company on equitable terms under a long-time contract; power will also

be secured from this company. At Aurora the road will enter the city over the tracks of the Aurora, Elgin & Chicago company under an advantageous agreement. It is expected that the road will be opened for business between Joliet and Plainfield by August 1st next, and completed to Aurora before the close of the year. It is estimated that the cost of operation will not exceed 50 per cent of the gross earnings.

The officers of the Fisher Construction Company are: President, H. A. Fisher, of Columbus, O.; general manager, F. E. Fisher, of Joliet; chief engineer, Lee D. Fisher, Columbus. H. A. Fisher is general manager and one of the principal owners of the Columbus, Delaware & Marion Electric Railroad Co., and has been prominently identified with the interurban development in and around Columbus during the past three years, besides having had 15 years' experience in financing and building steam roads. F. E. Fisher had many years' steam railroad experience before accepting service five years ago with the American Railway Co. as its general manager at Joliet, which position he still holds. Lee D. Fisher was division engineer during construction of the Columbus, London & Springfield Railway Co.'s system and the Columbus, Buckeye Lake & Newark Traction Co.'s line, and as chief engineer of the Columbus, Delaware & Marion Electric Railroad Co. has a thoroughly established reputation.

THE TECHNOLOGY OF ARTISTIC AND INDUSTRIAL PAINTING.*

BY PROFESSOR A. H. SAEHN.

The subject of paints and paintings is one with which we are all more or less familiar, but outside of a few experts there are a very limited number who, from a theoretical and practical standpoint, know any of the details of the materials used. This is true not only as applied to artistic painting, but to ordinary painting and varnishing as well.

The subject can be broadly treated under two heads, i. e., paints and varnishes. A paint can be simply defined as a vehicle, as linseed oil, mixed with a pigment, which is the coloring matter, and which is in the form of a powder, being ground from a solid, and being in many cases of mineral origin. For commercial purposes the powder should be ground so fine that it will pass through a mesh of 250 to the inch. This is the oil paint of the present day and is not made with varnish, as were the so-called oil paints used by the artists of the middle ages. The oil, or vehicle as it is called, serves as a binder or cementing material, and when exposed to the air it absorbs oxygen and becomes hard and tough. It is claimed that oil cannot be kept for the reason that it will become thick, but this can be prevented by keeping it from contact with air. It is interesting to note that when not mixed with a pigment, one gallon of oil will spread out and cover 600 to 800 square feet of surface, the thickness of the film being from .002 to .003 of an inch. The liquid, after about five days' exposure to the air, changes from its greasy nature to a rubber-like solid, differing from rubber, however, in the fact that it is not one-hundredth part as elastic.

Ordinary varnish is composed of two fundamental parts, linseed oil and some kind of resin. The proportion of oil used depends on the use to which the varnish is to be put. The greater the amount of oil used the more flexible will be the varnish when dry. In other words, the oil gives flexibility and elasticity, while the resin gives hardness, lustre and durability.

Resin (not rosin, which is a manufactured product) is of vegetable origin, and to be valuable for the making of varnish must have passed through a natural aging process lasting hundreds of years. It is true that it is found on trees of the spruce variety at the present time, but it is not of value. The ordinary aging process of nature is brought about by the falling of the tree and the resulting burial of the resin in sand, sometimes to a considerable depth. The best resin found to-day has probably been in the ground for thousands of years, and in proof of this specimens have been found containing the fossils of insects which have been extinct for many centuries. The highest grade on the market at the present day comes from Zanzibar. Medium standard grade resin brings about 35c. a pound. The prices, however, run anywhere from 15c. to 75c. per pound.

Abstract of a paper read before the American Society of Mechanical Engineers, May 5, 1903.

Real resin is quite hard and difficult to melt. In the manufacture of varnish a copper kettle is used. It is of cylindrical form with a flat bottom, and is three feet in diameter and three feet deep. Into this is put 100 lb. of resin in lumps, and the cover then put in place. There are two openings in this cover, one for the insertion of a small steel stirring-rod, by means of which the operator is able to feel when the melting is complete. The other opening is to allow the vapors of organic substances to pass off, for the resin not only melts but also decomposes, about 25 per cent passing out in vapor. This melting is necessary in order to make it soluble in oil. After it has been properly melted, the kettle is drawn away from the fire and hot linseed oil is added, the amount depending on the desired quality of the varnish and the use to which it is to be put. For a hard varnish, which is to be rubbed to a high polish, ten gallons of linseed oil is added. This weighs 75 lb., and therefore in this case we are taking equal weights, for the resin has been previously boiled down from 100 to 75 lb. The resulting varnish is called a ten gallon varnish. Two parts of oil to one of resin makes a 20-gallon varnish, etc. After the addition of the oil, the kettle is again run over the fire and the heating continued for some hours. Care must be taken not to allow the boiling point to be reached during any part of the process. The length of time for this cooking depends on the use to which the varnish is to be put, and temperature curves have been carefully worked out to insure uniform results in manufacture. The resulting mixture is then allowed to cool and in so doing it becomes somewhat thick. A thinner, therefore, has to be added and spirits of turpentine is generally used for this purpose. Benzine is also used and is much cheaper; it has, however, the disadvantage that it sets much more rapidly and does not give the varnish time to run. Hence where benzine has been used, the varnished surfaces are not as smooth and the brush-marks can usually be distinctly seen.

It may be interesting to state that varnish has been made and used for many years. We have a formula for its production which comes down to us from the tenth century, which is essentially the same as the modern method. It consisted in putting linseed oil in a jar and adding a gum called fornix (amber) and cooking (not allowing it to boil) until one-third had evaporated. The details of the process were also nearly identical with those at present. The main difference was that turpentine was not added. It is probable that this recipe came down from ancient times, for we know that the Egyptians used it, as is evidenced by its presence in a fine state of preservation on mummy cases. Turpentine was not used until the 15th or 16th centuries.

Paints and varnishes are also used to a great extent as a protective coating, and for this use the varnish is usually made with about thirty gallons of oil to 100 lb. of resin. This gives a highly elastic and extremely durable varnish, but not a brilliant one.

In the discussion which followed the presentation of the paper, several interesting points were brought out. Perhaps the most interesting of these was the so-called cold-pressing process of manufacturing linseed oil. Ordinarily it is made by boiling the flax seed, but in this process the seeds are placed in cold storage, and after they have reached a low enough temperature for the stearine to have crystallized out they are pressed. The oil obtained in this way becomes almost colorless when heated and is a quicker dryer than the ordinary oil.

Another point mentioned was the so-called blooming or whitening of varnishes when exposed to water. This effect is in general only found where shellac (or spirit varnishes) and varnishes made from common rosin are used. First-class resin varnish will hardly ever whiten, and when it does it is probably due to undercooking.

It was also pointed out that cotton-seed oil, which is one of the semi-drying class, could be made to dry much more rapidly by loading it up with the oxides of lead and manganese, both of which absorb oxygen from the air and give it up to the oil, the action being continuous and the drying hence hastened.

A "Jim Crow" law known as the Gantt bill went into effect in first class cities in Arkansas June 2d. It is similar to the law in Virginia and does not demand that screens or partitions be used, but that the companies shall either run separate cars for white and colored passengers, or designate separate seats for them. The Little Rock Traction & Electric Co. has posted notice in its cars requiring the white passenger to sit from the front end of the car and the colored from the rear.

PARCEL CHECKS AT BUFFALO.

The International Railway Co., which controls practically all the electric railways in Buffalo and the adjacent territory, has instituted a system of parcel checking that is proving very popular with the public and is the source of no insignificant revenue to the company. By this plan, persons can go to any of the prominent dry goods stores or merchants in the city and do their shopping without bothering

Buffalo & Niagara Falls Electric Railway

Merchant's Parcel Check

178 Main St., Corner of Terrace.

| Received. | Delivered. |
|-----------|------------|
| No. 27995 | No. 27995 |

FACE OF PARCEL CHECK.

B. & N. F. E. RY.

DUPLICATE COUPON.

| Received. | Delivered. |
|-----------|------------|
| No. 27995 | No. 27995 |

to carry various purchases around with them. For each purchase, the customer takes a claim tag and the dry goods house or merchant delivers the parcels to the central waiting room of the electric railway company, from which practically all the city and interurban cars leave, delivering the parcels in time to catch any designated car. When ready to return home, the customer goes to the street railway waiting room and claims his parcels just before taking his or her car for home. The electric railway company sells the merchants the

B. & N. F. E. RY.

DUPLICATE COUPON.

To claim parcel present this coupon at Parcel Room
182 Main St., Corner of Terrace.

The depositor, in accepting this Duplicate Coupon, expressly agrees that the Company shall not be liable to him or her for loss of or damage to, any piece to an amount exceeding TEN DOLLARS.

No. 27996

REVERSE OF PARCEL CHECK.

This Coupon must be detached from the Stub when parcel is delivered. Coupons and Duplicate with Reports must be sent daily to the Auditor Passenger Accounts.

COUPON.

STUB.

This Stub with Coupon is to be attached to parcel. This Stub must remain on the parcel when delivered.

tags in quantities at 3 cents each, but no extra charge is made to the customer for the service.

The tag used in this service is 5 in. long x 2½ in. wide and is divided into three sections or coupons. The end coupon is torn off and given to the customer at the time of purchase. The other two sections of the tag are tied to the parcel and go with it to the waiting room of the electric railway company. When the agent delivers the parcel to the holder of the duplicate coupon he tears off the second coupon and sends both this coupon and the duplicate to the auditor's office. The stub remains on the parcel after it is delivered.

The Detroit & Toledo Shore Line Railroad Co., which was constructed in 1901 by the Everett-Moore syndicate of Cleveland, has been transferred to the Grand Trunk and Clover Leaf railroads and the receiver, A. F. Edwards, discharged. The road went into a receiver's hands in January, 1902, at which time a receiver was appointed for the Everett-Moore syndicate.

Construction work on a number of new electric railroads in northern Illinois has been started within the past six weeks, among them the following: Sterling, Dixon & Eastern, from Sterling to Dixon; Kewanee & Galesburg, from Kewanee via Galva to Galesburg; Kewanee, Cambridge & Geneseo, between points named; Dubuque & Eastern, from Dubuque via Platteville, Wis., Warren and Stockton to Freeport; Illinois Valley Traction Co. lines from Spring Valley to Princeton, De Kalb & Southwestern from De Kalb via Seward to Dixon.

STRIKERS CONVICTED AT NEW ORLEANS.

May 20th was the close of the trial of 17 men charged with interfering with United States mails during the strike on the lines of the New Orleans Railway Co. in September last. Of the 17 men on trial the jury found 11 guilty, 1 not guilty and disagreed as to the guilt of 5 who are held for a new trial.

The instruction of the court, Judge Boardman, to the jury concluded as follows:

"It is charged in the indictment that two or more of the defendants entered into a criminal conspiracy, that is, that there was an agreement between two or more of these defendants to do some act which, by the laws of the United States, is a crime; and that in pursuance of such agreement two or more of the defendants did some act lawful or unlawful in furtherance of or to effect the object of the criminal agreement.

"A criminal conspiracy is chargeable where two or more persons by concerted action or agreement combine to accomplish a criminal or unlawful purpose, or some purpose not in itself criminal by criminal and unlawful means.

"The essence of the charge is that two or more persons share or act in the common design. It is not necessary that two or more persons should come together and enter into an explicit or formal agreement for an unlawful act or that they should directly or by words or in writing state what the unlawful scheme was to be, or set out the details of the plan or the means by which the unlawful combination was to be effected. It is sufficient to establish a criminal conspiracy, one which the law denounces, when it is made certain that there was a common design to violate the law, even though the design was entered into but a few minutes before the commission of the unlawful act.

"It rarely occurs that a criminal conspiracy can be established by direct or positive testimony, hence in the nature of things, circumstantial evidence must be largely depended upon to illustrate the issue as to whether defendants or some of them are guilty or not guilty.

"While it is necessary, under the statute, to prove some overt act in pursuance or execution of the conspiracy, such overt act in itself need not be criminal; it is sufficient if the overt act be the ordinary and probable effect of the wrongful act specially agreed upon or the mutual tacit understanding, so that the connection between them may be reasonably apparent.

"The actual facts showing a conspiracy may be established as well from circumstantial evidence as from positive or direct evidence. It is sufficient that the concurring and mutual conduct of these defendants is established either by positive or direct testimony. While it is necessary under the statute to prove some overt act in pursuance or in execution of the conspiracy, such act, if it is in furtherance of the conspiracy, need not of itself be a criminal act. It is sufficient if the overt act be reasonably the ordinary and probable effect of the criminal purpose mutually understood and agreed to by the parties, so that the connection between them, the parties, may be reasonably apparent.

"If it shall appear to you that the employees of a street railway company engaged to the knowledge of said employees in carrying the mail of the United States did corruptly and wrongfully agree or come to a tacit understanding among themselves to quit work and to prevent others by threats, intimidation and violence from taking their places, and such acts would in their own knowledge of consequences result in preventing the operation of mail cars over the line of said street railway, and, therefore, result in the interference and obstruction of the passage of the United States mails over said street railway routes, the parties so agreeing or coming to such tacit understanding would be guilty of a conspiracy to interfere with the passage of the United States mails, and would be guilty of the offense denounced by the statutes, provided one or more of the said parties did some overt act in furtherance or in execution of the conspiracy, although the overt act in itself be not criminal or unlawful.

"When an unlawful act is sought to be effected and two or more persons actuated by the common purpose of accomplishing that end work together in any way in furtherance of the unlawful scheme, every one of said persons becomes a member of the conspiracy, although the part any one was to take therein was a subordinate part, or was to be executed at a remote distance from the other conspirators.

"If you believe that the defendants or any of them knew that the mails were carried over the lines of the street railways company, and that in preventing the operation of the cars on the morning of Sept. 29, 1902, they had a common purpose and object in preventing and hindering the business and operation of the road, and as a consequence it was known to them that mails of the United States would be interfered with, you may take such proof to be a strong circumstance to find them guilty of conspiracy to unlawfully and wilfully obstruct the passage of the mails. If the defendants, or any of them, knew that a certain car was going for the mail for the purpose of carrying and transporting the same, and one or more of them, in execution of the common purpose and design, interfered with said car, you may well find them guilty of conspiracy to wilfully and knowingly obstruct the passage of the mails.

"If you believe that by order of the postal authorities the United States mails were carried from the main postoffice over the lines of the New Orleans Railways Co., and from the substations to the main postoffice over the lines of the Railways company, according to mutual understandings between the government and the Railways company, you may consider mail going over such routes at any time in the Railways company's cars to be lawfully on its passage. You are charged that whenever lawful mail matter is deposited in the United States postoffice that such mail matter is then on its passage, and that the railway's car, in pursuance of a duty which it owes to the government while going after the mail so deposited, is engaged in aiding the passage of the mail. That it is a matter of no value to the legal inquiries in this case whether or not the railway car engaged in such uses is being operated for such use in pursuance of a written contract. It is sufficient to make such a car a carrier for aiding in the passage of the mail, if it is going after mail, in response to a duty which its owner engaged to perform for the government. You are charged that, notwithstanding such orders or laws as are urged in excuse or in defense of these defendants, or some of them, were generally known to the employees that such knowledge of, or action at other times, before the occurrences at the Arabella barn, of the management of the Railways company, in using these mail signs against such said orders, at the barn, or anywhere else, is no excuse in law for stopping a car going after mail with or without such signs, even though there was no mail matter at the time of stopping the car on or in the car, if you believe the defendants or some of them were warned and told by Inspector Cullen or others acting with him or in authority, when he had such sign up on the car and that he was going after the mail.

"You are charged that when these defendants, or some of them, quit or abandoned the employment or service that they may have theretofore contracted as motormen or conductors, to perform for their employer, the Railways company, that when each of the individuals voluntarily quit the service of the Railways company; that when such individual has so abandoned the place in the service which he may theretofore have had or occupied, he does not thereafter continue to hold or control or possess or have any right to a place of any sort which he has so voluntarily abandoned, or has not the right to forbid another man to render such service as he may desire to render to said former employer. That the defendants, if they individually or as a body resolved not to serve the Railways company, thereafter no one of them had any lawful right to go upon the property of the Railways company with the purpose of doing any act to control, direct or interfere with the operations or uses for which the management of the Railways company may desire to operate the cars.

"I charge you that if you find that the former employees of the Railways company, among them the defendants, or some of them, were together trespassing upon the property of the Railways company, or together for the purpose of interfering with the use and operation of the Railways company's cars, that such gathering or assembling of employees that were on a strike or had quit the service of the Railways company, may be—if you find from the evidence that they committed any acts of violence, which resulted in the stopping of the mails—a circumstance which relates back to the meeting of the association and one which may show a criminal conspiracy."

The Toledo, Bowling Green & Southern Traction Co. recently purchased a 250-kw. rotary converter. Alternating current will be furnished by the Naumee Valley Electric Co., which is installing a 250-kw. inverted Westinghouse rotary converter, together with three 100-kw. raising transformers.

REPORTED CONSOLIDATION OF CHATTA- NOOGA LINES.

It is rumored that the street railways and electric light company of Chattanooga, Tenn., will be consolidated. Efforts with this end in view have been made at frequent intervals during the past three years, it being agreed that Chattanooga is not large enough to enable two street railway companies to be financially successful in operating to all the points now reached. About a year ago it was announced that the Chattanooga Electric Railway Co. had purchased the property of the Rapid Transit Co., but this was never consummated. The companies have been strongly competing and to nearly every point they own parallel lines. The Warners, of Nashville, control or own a majority of the stock of the Chattanooga Electric Railway Co., while J. H. Jeffries and F. H. Treat and associates, of Philadelphia, and Samuel Devine, of Chattanooga, control the stock of the Rapid Transit Co. Recently Messrs. Warner stated that negotiations looking toward consolidation were in progress, but all of the details were not determined.

INSTRUCTIONS FOR PASSENGERS.

The International Transit Co., and the Trans-St. Marys Traction Co., of Sault Ste. Marie, Mich., have adopted a novel method of in-

ELECTRIC RAILWAY BRIDGES.

The present tendency toward the separation of electric railways from the highways and the building of interurban lines on private property has brought the design of electric railway bridges into prominence, and a paper on this subject was recently read by Mr. Wilbur J. Watson before the Civil Engineers' Club of Cleveland, which has been published in the Journal of the Association of Engineering Societies. The early city lines used cars of small weight compared with those now in use and the street bridges designed for vehicular traffic were of ample strength to carry them, but the weights of the cars used have increased to such an extent that it is now necessary to examine into the city and county bridges used by railway companies. Many of these lines carry freight traffic at present and many more will in the future. Some of them are now carrying coal, and in some places this traffic will form quite an item of electric railway operation; in fact, there seems to be a tendency to approach steam railway conditions of loading. When the railway lines left the highway it became necessary for the company to build its own bridges, and many of these bridges have been built for present needs only, making no provision for future increase in loading, or designed for passenger and express traffic only, when it is quite probable that in the near future they may be used with heavy freight loads.

What is the probably maximum load which a given bridge will

NOTICE!

These Photographs Illustrate the Incorrect and Correct Way of Getting Off the Cars.

G. W. CHANCE, Manager.



INCORRECT—Very Dangerous!



THE RESULT!
Wait Until the Car Stops!



CORRECT WAY to Get Off!
FACE ABOUT HALF WAY TOWARD FRONT OF CAR AND SIDE

POSTER OF THE INTERNATIONAL TRANSIT CO.

structing passengers as to the right and wrong way to get on and off cars, as shown by the accompanying illustration. An enlarged set of these pictures is placed in each car. The public has a particular failing in this regard, as railway managers well know, and it is a fact that a large percentage of damage claims are carried into court by reason of persons (women especially) getting off the car backward. The idea of the photographic method adopted by the companies referred to is that of Mr. G. W. Chance, manager of both companies. It is stated that while two accidents happened to passengers getting off backward before the illustrative method was used, none has happened since on either company's line.

The steam turbine plant of the Hartford (Conn.) Electric Light Co., which at present consists of a 2,000-h. p. set, is soon to be duplicated by machines built by the contractors for the original installation, the Westinghouse Machine Co. This was the first American plant where steam turbine units of large size were installed, and their success must be highly gratifying to the makers. It is interesting to note that the aggregate power of steam turbine sets completed, in hand and in order to the Westinghouse Machine Co. is reported at not far short of 200,000 kilowatts.

be required to carry within its reasonable life? This is a difficult question to answer and yet it must be answered in order to properly design the structure. Another point which must be borne in mind is the possible use of electric locomotives which may have concentrated loads closely approaching those of the heaviest coal cars. The writer has examined and reported upon many existing bridges over which heavy cars are now being operated, and they have generally been found strong enough to carry the loads which were being run over them, or it was possible to make them so, with slight changes or repairs. He has found many cases, however, where bridges have been seriously overloaded. The most common point of weakness in a bridge designed for highway traffic and later used for electric railway traffic is the floor system and its connections. The greater concentrations of the live load of the electric car over the load used in proportioning highway bridges is responsible for this.

Taking up the design of new structure for electric railways the writer has made a comparison of his specification for use in designing electric railway bridges and has applied them to the design of a 135 ft. through pin connected Pratt truss for a single track road. This comparison is made in order to show the wide variation in

specifications in use, the relative weight of each structure and the relative efficiencies when loaded with live load consisting of a train of coal cars of 50-ton capacity. The first specification is that of the Osborn Engineering Co. using a live load consisting of a train of coal cars. The second is the specification and loading recommended by the Massachusetts Railroad Commission. The third is the Osborn Engineering Co.'s specifications and loading for heavy steam railroad bridges and the other three are specifications in use by three large traction companies. The last column gives the moments in foot pounds produced on a stringer 22 ft. 6 in. long by these respective loads, and does not take into account the question of impact. This column shows the desirability of using some other loading than the ordinary passenger cars on roads which may be used for any other character of loading. The much larger moments produced by the coal car loading are due mostly to the closer spacing of the wheels when the cars are run in trains of two or more.

The matter of impact, that is, the increase in live load stresses produced in a structure by the pounding of the wheels, swaying of the car, etc., is as important in the design of electric railway structures as in steam railway structures. In bridges located in a sag of the grade the impact is still further increased by the momentum of the car. In the practice of the Osborn Engineering Co.

SLEEPING CARS FOR ELECTRIC LINES.

The Columbus, Jackson & Springfield Railway Co. of Columbus, O., will have the honor of being the first to establish a sleeping car service on interurban electric lines. Mr. R. Emory, general manager of the company, advises us that it is expected to put the sleepers in service in July, and a thorough trial made of their practicability. The company is making no rash promises, feeling that so radical an innovation must be considered as an experiment, but we have no doubt as to its complete success. The sleeping cars will be run between Columbus and Cincinnati, leaving between 10 and 11 o'clock at night.

These cars will be operated by the Holland Palace Car Co., of Indianapolis, which was organized Jan. 12, 1903; this company, which has a capital of \$1,000,000, will build cars under the Holland patents. It was the intention to build a single car and use it for exhibition purposes, but there was an immediate demand for two cars to put in practical service and these are now being built at the plant of the Harlan & Hollingsworth Co., Wilmington, Del., under the direction of the Holland company's mechanical engineer, Mr. Mason Rickert. It is very probable that before these first two cars can be delivered orders will be placed for several others, as the

COMPARISON OF SOME ELECTRIC RAILWAY BRIDGE SPECIFICATIONS.

Based upon the design of a 135-foot through, Pratt truss, single track bridge.

| SPECIFICATIONS. | LOADING. | Comparative Weights of Structures. | Strength Based on "a" loading. | Actual Weight on Bridge Allowed by Each Specification. | Live Load Bending Moments on Stringers, Span 22 ft. 6 in. Impact not Considered. |
|--|---|------------------------------------|--------------------------------|--|--|
| Osborn Engineering Co. Specification "a"..... | Train of 62-ton coal cars..... | 100% | 100% | 217 tons | 158,500 lbs. |
| Specification "b"..... | 1-40 ton motor, 5' wheel, base 25' c } to c trucks + 1413 lbs. per ft. . . } | 65% | 35% | 107 " | 88,750 " |
| Specification "c" for heavy steam } railways..... } | 2-177½ ton engines followed by } 5000 lbs. per lineal ft. } | 160% | 190% | 420 " | 320,000 " |
| Specification "d"..... | 1-40 ton motor and 125-ton trailer } or 2000 lbs. per ft. } | 60% | 42% | 135 " | 84,500 " |
| *Specification "e"..... | Train of 75-ton electric cars..... | 82% | 70% | 300 " | 187,500 " |
| Specification "f"..... | 1-40 ton electric locomotive on 7' } wheel base + 2500 lbs. per ft. . } | 96% | 70% | 170 " | 160,000 " |

*Specification "e" uses a very high unit stress.
Note: Column giving relative strength is correct for loading of 62-ton coal cars only.

the impact is taken care of by adding to the live load stress a percentage determined by the formula

$$I = L^2 \div (L + D),$$

in which I = the impact to be added to the live load stress, L = the live load stress and D = the dead load stress. This formula is correct in theory and has been found to satisfy the requirements of practice very well.

The term "factor of safety" of a bridge is misleading and meaningless unless the effect of impact has been fully taken care of in calculating the live load stress. As ordinarily used it means the ratio of ultimate strength of the material when tested to destruction to the actual stresses in the bridge caused by the dead and live loads, not considering impact. As it is impossible to strain steel repeatedly above its elastic limit without causing failure, the factor of safety should be based upon the elastic limit and not upon the ultimate strength.

It is necessary to take the effect of impact into full consideration in order to determine the actual stress in each member of the bridge.

The city of Norwood, O., has brought suit in the Supreme Court to compel the Cincinnati Traction Co. and the Rapid Railway Co. to interchange transfers under an agreement said to have been made in 1901.

By the terms of an agreement effected in New York City between representatives of the Michigan Traction Co. and the Jackson & Battle Creek Traction Co., the former is to build and maintain all tracks entering Battle Creek, Mich., over the disputed right of way, and the latter is to have the use of the tracks.

electric railways operating long lines are much interested in the new service.

It is not the purpose of the Holland company to sell these cars, but instead to operate them for the electric roads in the same manner as sleeping cars are operated on the steam roads, the Holland company to own all cars. The cars now being built are the "Theodore" and the "Francis." These will be operated at night as compartment sleeping cars. The compartments are on each side of a center aisle, there being in each car 10 compartments 6 ft. 10 in. long by 3 ft. 6 in. wide. There will be one upper and one lower berth in each compartment each 27 in. wide (regular steamer size), allowing a 15-in. dressing space between berth and aisle. The partition which forms the compartment is of the same material and is operated on the same principle as a roll top desk and is entirely out of sight in the day time, which arrangement gives an open parlor car with 20 revolving parlor car chairs. The inside of the partition is covered with handsome tapestry, the window shades of the same material and the curtains in the doorways also of the same, making the compartment a handsome tapestry room. The interior decorations of these cars are of inlaid mahogany and brass. The smoking room and men's toilet are at one end and the ladies' toilet at the other. The minor equipment will include electric curling irons for the use of lady passengers; electric cigar lighters in the smoking room; electric fans at each end in the main body of the car to be operated during the day; electric heaters for each compartment to be controlled by the occupant of the compartment, there being three degrees of heat. These cars are 56 ft. 4 in. long over all and will be furnished with their own motors, each car having four 150-h. p. motors, making 600 h. p. per car, geared for 65 or 75 miles per hour. These cars will be painted maroon, which color the company has

adopted for all of its cars in the future; uniforms for the employees will be dark green, which color has also been adopted as standard.

The Holland company has gone into this business with a view of giving the public the best accommodations that can be obtained on a sleeping car, and while there have been many fine and handsome sleeping cars built in the last few years, it is believed that there has been nothing built that surpasses the cars which it is intended to furnish to the electric roads.

The officers of the Holland Palace Car Co. are: Harris F. Holland, president; Amos K. Hollowell, vice-president; Joseph W. Selva, secretary and treasurer; Amzi L. Wheeler, assistant secretary and treasurer, and Judge James E. McCullough, general counsel, all of Indianapolis, Ind.

TWO NEW INTERURBAN ROADS OUT OF TOLEDO.

The People's Rapid Transit Railway Co., of Toledo, is making rapid progress in construction of its road between Toledo and Cincinnati and expects to have it in operation before 1904. Fully 90 per cent of its line between Napoleon and Defiance, O., a little more than 17 miles, is completed and the section between Toledo and Greenville is nearly finished, also. There will be but few curves and at no point on the line will there be a grade of more than one per cent, and there are not more than six places where the grade will be as great as that; with those exceptions the grades will not exceed 4 in. to 8 in. to the 100 ft., even where the country is broken. For almost the entire distance the road will be practically level and is being constructed 14 ft. wide, with slope of embankment of 1½ to 1. The company owns its private right of way, which is 32 ft. in width. It will run through vestibule cars; also local, mail, express, baggage and freight cars.

The People's Rapid Transit Railway Co. was incorporated with a capital of \$500,000, which it is intended to increase to \$5,500,000, to build from Toledo through Napoleon, Defiance, Paulding, Van Wert, Celina, Greenville, Eaton and Hamilton to Cincinnati. Part of the route lies through a very rich oil field. It will have a total mileage of 220 miles touching 56 cities, towns and villages, having an average population of 15,000 persons, while the territory to be served has a population of 700,000, an average of 3,170 per mile. The average distance between the cities, towns and villages en route is 3½ miles. It is interesting to note that there are points along the road now requiring a day to make that can be made in a few hours when the new road is in operation.

The officers and directors of the People's Rapid Transit Railway Co. are: President and general manager, J. Morgan; first vice-president, W. P. Heston; second vice-president, W. H. Pennell; secretary, L. J. Weadock; treasurer, Adam Burger; executive committee, Messrs. Morgan, Burger, Heston and Weadock and T. M. Franey; directors, the foregoing and A. Merkley, George Bloodhart, O. K. Dickerson, T. J. Hostetter and John C. Diehl.

The Toledo, Columbus, Springfield & Cincinnati Ry., which is being built by the United States Construction Co., of Toledo, was organized to connect Toledo, Lima, Indian Lake, Bellefontaine and Columbus, a distance of 140 miles, and as a whole it has no competing lines. That portion of the road near Lima, O., is nearing completion. It is the intention of the company to run through vestibule cars, as well as local passenger, freight and express cars, and it will also carry mail. It is planned to make this one of the best routes from Columbus to the north and northwest, connecting with one to Chicago and passing through many good business towns on the route.

The rolling stock equipment for the section of the road being constructed between Lima and Bellefontaine will include eight closed-body passenger coaches, 52 ft. 6 in. long, equipped with four 55-h. p. electric headlights, electric heater, and air brakes; one baggage, freight and express car, with similar equipment, and four 14 bench open car to be used as trailers.

Toledo, the northern terminus, has a population of 131,822, an increase in ten years of 61.88 per cent; Lima, celebrated for its oil output, has 25,000 inhabitants; between Lima and Roundhead is a fertile garden spot, known as Roundhead Prairie, and Scioto Marsh, from which it is estimated the road will receive annually 3,000 carloads of vegetables, not to mention broken lots and the quantity that would be shipped by express; Indian Lake, about four miles north of Roundhead, is sought by many during the duck hunting, fishing and outing seasons, and is a famous place for summer resorts and parks; Bellefontaine, where are located the Big Four railroad shops, has about 7,500 population, and Columbus, the eastern terminus of the line, has a population of 125,500, according to the census of 1900.

The officers and directors of the Toledo, Columbus, Springfield & Cincinnati Ry. are as follows: President and general manager, Ellis Bartholomew; secretary, I. N. Covault; treasurer, William P. Heston; directors, the above named and Dr. S. S. Thorn, S. M. Finch, J. H. Forrest, S. C. Heston, E. C. Schiness, T. F. Whittlesey.

NEW TRANSFER TICKET.

On June 1st the Washington Railway & Electric Co. of Washington, D. C., put into use a new style of transfer ticket which has one entirely unique feature. The ticket, which is illustrated herewith,

NOTCH PERFORATION

GLOBE TICKET COMPANY, PHILA.

| | | | | | |
|----|---|---|---|---|---|
| 1 | 1 | 2 | 3 | 4 | 5 |
| 2 | 1 | 2 | 3 | 4 | 5 |
| 3 | 1 | 2 | 3 | 4 | 5 |
| 4 | 1 | 2 | 3 | 4 | 5 |
| 5 | 1 | 2 | 3 | 4 | 5 |
| 6 | 1 | 2 | 3 | 4 | 5 |
| 7 | 1 | 2 | 3 | 4 | 5 |
| 8 | 1 | 2 | 3 | 4 | 5 |
| 9 | 1 | 2 | 3 | 4 | 5 |
| 10 | 1 | 2 | 3 | 4 | 5 |
| 11 | 1 | 2 | 3 | 4 | 5 |
| 12 | 1 | 2 | 3 | 4 | 5 |

| | | | | | | | | | | | |
|---|------|------|------|-----|------|------|------|-------|------|------|------|
| JAN. | FEB. | MAR. | APR. | MAY | JUNE | JULY | AUG. | SEPT. | OCT. | NOV. | DEC. |
| COLUMBIA LINE | | | | | | | | | | | |
| TRANSFER—Good only on first connecting car after time cancelled, at Transfer Junction and in direction punched. Subject to rules of this Company. | | | | | | | | | | | |
| W. M. F. H. M., Treasurer | | | | | | | | | | | |
| Station Time Limit, Pat. Aug. 23, 1892 | | | | | | | | | | | |
| Ham Patent, June 9, 1903 | | | | | | | | | | | |
| 4650 | | | | | | | | | | | |
| 14th & N. Y. N. | | | | | | | | | | | |
| 11th & N. Y. N. | | | | | | | | | | | |
| 9th & N. Y. N. | | | | | | | | | | | |
| 5th & Mass. S. | | | | | | | | | | | |
| 5th & Mass. N. | | | | | | | | | | | |
| N. Cap. & H. S. | | | | | | | | | | | |
| N. Cap. & H. N. | | | | | | | | | | | |
| EAST BOUND | | | | | | | | | | | |
| WEST BOUND | | | | | | | | | | | |

| | | | | | |
|----|---|---|---|---|---|
| 1 | 1 | 2 | 3 | 4 | 5 |
| 2 | 1 | 2 | 3 | 4 | 5 |
| 3 | 1 | 2 | 3 | 4 | 5 |
| 4 | 1 | 2 | 3 | 4 | 5 |
| 5 | 1 | 2 | 3 | 4 | 5 |
| 6 | 1 | 2 | 3 | 4 | 5 |
| 7 | 1 | 2 | 3 | 4 | 5 |
| 8 | 1 | 2 | 3 | 4 | 5 |
| 9 | 1 | 2 | 3 | 4 | 5 |
| 10 | 1 | 2 | 3 | 4 | 5 |
| 11 | 1 | 2 | 3 | 4 | 5 |
| 12 | 1 | 2 | 3 | 4 | 5 |

WASHINGTON D. C., TRANSFER TICKET. (FULL SIZE.)

consists of a body-portion and two detachable coupons, one coupon light and the other dark, indicating respectively ante and post-meridian. When the ticket is to be used in the forenoon, the p. m. coupon is detached; when used in the afternoon, the a. m. coupon is detached. The appearance of the transfer when the a. m. coupon is detached is very different from its appearance when the p. m. coupon is detached, and it is in this marked difference of the appearance of the a. m. and p. m. transfers that the value of the ticket exists, as the conductor to whom it is presented can tell at a glance whether it is good for the forenoon or for the afternoon.

The a. m. coupon is next to the stub of the pad. When the ticket is to be used in the forenoon, the conductor detaches the afternoon coupon preferably at the beginning of each trip when it can be done by him without inconvenience or loss of time. When the ticket is to be used in the afternoon, the a. m. coupon is allowed to remain on the stub of the pad, thereby causing no more inconvenience to the conductor than with the ordinary transfer.

The simplicity of the ticket is such as to recommend it to any practical railroad man; the fact of its being good in the forenoon or the afternoon is settled once for all. The conductor issuing the transfer cannot possibly make a mistake, the person accepting it can see without any trouble that it is correct, the conductor receiving it can tell with the merest glance whether it is good for the forenoon or the afternoon, and the counter in the office is relieved of the examination of the ticket to this extent. The rest of the ticket by the elimination of the customary light and dark places for designating a. m. and p. m. respectively, becomes a great deal plainer than before, making the liability of error in punching in other respects much less.

Street railway men realize that conductors often fail to carefully examine transfer tickets offered to them, and that at times such an examination is practically impossible, particularly in rush hour.

also that because of the chance of mistake in purchasing the tickets when issued men must use much discretion in accepting improperly punched tickets. This new transfer is certainly a marked improvement in providing a simple means of distinguishing forenoon tickets from afternoon tickets. Two abuses which it should be effective in restricting are holding of morning transfers by the public for afternoon use, and the trading in transfers by conductors.

This transfer was invented and has been patented by Mr. W. F. Ham, comptroller of the Washington Railway & Electric Co., and while he is inclined to be conservative and await the actual results from the use of the ticket, still he believes it to be a step in the right direction. While not claiming it is a cure for all the evils attendant upon the misuse of transfers, he thinks it a good thing so far as it goes, and believes that by making the difference so plain between the morning and evening transfer, it is a marked improvement over anything now in use. Any time limit can be used on the ticket and furthermore, the a. m. and p. m. coupons can be distinguished, if preferred, by the use of these letters printed separately over the face of the coupon instead of having one coupon light and the other dark.

NEW POSTER OF THE INTERNATIONAL RAILWAY CO.

For some years it has been the practice of the International Railway Co., of Buffalo, to divert special attention to the yellow cars that run from Buffalo to Niagara Falls, by means of artistic posters in colors, which are hung in the windows of all cars belonging to the company, and also in other conspicuous public places in the city and suburbs.

Two of the posters which have been used for this purpose in previous years were reproduced in the Pan-American issue of the "Review" for June 15, 1901, page 342. One of these represented a tall, gaunt tourist with a yellow car carefully stowed under his arm, and across the top of the poster the words "Take the yellow car to Niagara Falls." The other poster showed a fashionably dressed



NEW BUFFALO POSTER.

maiden dashing hastily toward the chrome colored car labeled "To Niagara Falls."

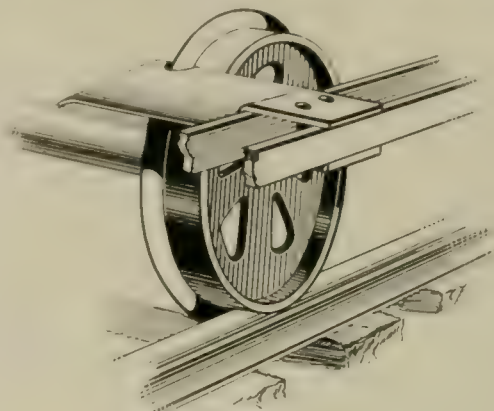
This year the general passenger agent, Mr. J. E. Stephenson, of the International Railway Co., hit upon the original scheme of issuing a colored poster bearing the figure of a uniformed employe pointing to a yellow car as if directing passengers to "Take the yellow car to Niagara Falls." The poster is a particularly forcible one, as the picture of the employe is a faithful representation of Thomas Sellers, who has been in the employ of the Buffalo companies for 21 years, and who for the past 11 years has been stationed at the central transfer point at the corner of Main and Exchange Sts., starting the cars and directing people as to which

car they should take in order to land nearest to the place they desire to reach.

"Colonel" Sellers, as he is called, is a familiar figure to every one who has spent much time in Buffalo, and this picture of him in characteristic pose is particularly apropos for use as a feature of the electric railway service by which Buffalo and its outlying suburbs are so closely knit together.

MUD GUARDS FOR CAR TRUCKS.

The accompanying illustration shows a mud and water guard designed by Mr. Thomas Farmer, superintendent of motive power of the Detroit United Ry., which has been in use on the cars of



MUD AND WATER GUARD.

this company for some time. The guards are about 12 in. long and 7 in. wide and are punched out of sheet steel $\frac{1}{8}$ in. thick. These are bolted onto the side bars of the truck by means of two bolts which extend down through clamping plates beneath the bars, as shown, thus holding the guards securely in position so that they do not come into contact with the wheels. One of these guards is placed behind each of the car wheels and all mud and water thrown up by the wheels is caught on the guards and drops back into the street, and Mr. Farmer states that they have proved very effective in preventing troubles with motors and trucks due to water and dirt.

The guards cost about 12 cents to make in large quantities and with bolts weigh about $4\frac{1}{2}$ lb. each.

STREET RAILWAY ADVERTISING IN VIRGINIA.

"Street Railway Chat" is the title of a weekly bulletin issued by the Norfolk, Portsmouth & Newport News Railway Co., of Port Norfolk, Va. It is a paper folder, 8 pages, $2\frac{1}{4} \times 6\frac{1}{4}$ in., each page being devoted to some outing or entertainment feature, or time schedule. The title page is adorned with a half-tone likeness of one of the players at the company's Casino Theater at Buckroe Beach. The back page of "Chat" for the week of May 25, 1903, was printed in large type, in red, and announced the formal opening of Ocean View Hotel and Cafe on Memorial Day. Another page detailed the plans for opening Buckroe Beach theater June 1st, with instructions regarding transportation. Another page treated of the "epicurean greatness" of the Ocean View Cafe, stating that the management had arranged to have fish and crabs taken direct from the water to the kitchen and prepared for the table, first showing the patrons his order alive, if desired. The closing of the season at the Granby Theater occupied one page; the Decoration Day program at the Hampton Soldiers' Home another; summer schedules of the Ocean View and Old Point division of the Norfolk Railway & Light Co., another, and current attractions at the theater and Hampton Roads Driving Park completed the list of contents. Altogether it is a useful collection of information for both residents and transients.

The Twin City Rapid Transit Co. is erecting a brick and stone building, 80 x 150 ft., corner of Hennepin Ave., and 11th St., Minneapolis, to be used as an office and a branch power house. It will cost \$90,000, exclusive of machinery.

INSTRUCTIONS REGARDING TRACK WORK.

By courtesy of Mr. John Kerwin, superintendent of tracks for the Detroit United Ry., we are enabled to print the following extract from the book of instructions adopted by the track department of that company. The instructions give full information as to the care and repair of track and roadbed on both city and interurban lines and will be found suggestive to other track engineers and superintendents.

Foremen of repairs will have charge of a section of roadway, generally from 7 to 10 miles, marked by a stake at each end of the section. For the safety and good condition of this part of the roadway, the foreman is held responsible. The number of men he may employ, will be designated to him by the roadmaster from time to time, and the foreman may discharge from such employ, any man he finds incompetent or insubordinate. The fact and occasion of such discharge must be communicated to the roadmaster at once.

Address of Section Men.

Foremen of repairs will at all times keep posted in the telephone booth and ticket office nearest their headquarters, the names of themselves and their men, and also the address of each, so that the force can be summoned at any time.

Bracing or Shimming Track.

The shimming of track to preserve its good surface, will be allowed only in winter weather, unless otherwise ordered by the roadmaster. Foremen are directed to use shims up to 1 in. in thickness if necessary, rather than to adze down ties which have heaved. Foremen are directed to give as prompt notice as possible to the roadmaster, of the use or of the necessity to use shims of greater thickness than 1 in., and in such notice to mention the location and approximate number of such shims. Foremen are directed to be very particular to secure a uniform bearing on all shims used, both on rail and on tie. White oak shims 8 in. long and 4 in. wide, are to be used, and they are to be driven under the rail from the outside. Shims $\frac{3}{4}$ in. thick and over on straight track, and $\frac{1}{2}$ in. thick and over, on either rail on curve, must be accompanied by wooden rail brace, extending at least 1 ft. from the neck of the rail and securely held by spike.

Care of Guard Rails.

Foremen of repairs are instructed to make a critical inspection of all main line frogs three times a week. Guard rail braces holding either guard rails or loose wing of guard rail frogs must be maintained in proper position. The flanges at guard rails must be maintained at $1\frac{1}{2}$ in. unless otherwise designated by roadmaster. The loose wings of spring rail frogs must shut tight against frog points, and must move freely through the stop box. Occasional driving back of the loose wing may be required to secure such free movement. The nuts of bolted frogs must be kept tight. If the rivets of frog joints or bolts become loose, such looseness of parts must be reported to roadmaster. If the wing, rails, joints or other parts of the frog become worn so much as to cause rough riding on main track, or be in any degree unsafe on main track, this condition must be reported to the roadmaster, who will determine the necessity for removal. A broken wing rail is equivalent to any other rail in track and demands immediate removal of frogs.

Cutting of Grass, Etc.

Foremen of repairs are instructed to cut all grass, weeds, and other undergrowth upon their sections, beginning such work July 1st of each year, unless otherwise instructed by the roadmaster, and making such work the principal occupation until it has been completed. The rubbish when dried is to be burnt under the supervision of the foreman, who is cautioned to do such work of burning with the greatest care to prevent damage to property.

Reports of Derailment.

Foremen of track work are instructed to make a written report of any derailment of a car occurring within the territory of which they have charge. Full details of the accident are to be given, and in giving such details, foremen are cautioned to state only facts, and not to color the facts by their wish to escape censure in regard to the condition of track or appliance which are in their care. This report is to be made with ink, and sent to the roadmaster, as soon after the accident as possible.

(The "derailment" report blank adopted by the company is $7\frac{1}{4}$

$\times\frac{1}{4}$ in., and has blanks for the following information; "Division"; "Date," "car number," "place of derailment," "time derailed," "time replaced," "time lost," and "cause of derailment." The blank is made out by the section foreman and countersigned by the roadmaster. This report is not for the operating department but is intended solely for the protection of the track department, inasmuch as the track department is held responsible for derailments due to defects in the track or roadbed. The blank enables the track superintendent to inform himself regarding all the facts in the case and if the derailment is actually due to negligence in his department to institute an investigation for the purpose of properly placing the responsibility.)

Reports of Personal Injury.

In case of any accident resulting in injury to employes or others, foremen of track work are instructed to telephone the facts briefly at once to the track department office and to the roadmaster, even if the injury is apparently of little importance. All information necessary to a complete knowledge of the case must be given on blank form specially prepared to cover the case of each individual injured.

Reports of Stock Killed or Injured.

When stock of any description has been killed or injured by a passing car, or from any cause connected with the operation of the railroad, the foreman of the section on which the accident occurred, will immediately obtain all information possible in connection therewith, and make a full report of the same in ink upon the blank form provided for the purpose. This report must immediately be sent to the roadmaster.

Care of Spikes.

Foremen of repairs are instructed to keep all ties full spiked. The spike must be driven square through the top surface of the tie, and this square driving will be accomplished only by strict watchfulness on the part of the foremen. The last blow which springs the head of the spike to the rail, must be given lightly so as not to injure either spike or rail. If a spike is not brought up to flange of rail, or is twisted round so as to touch the flange only with the edge, it is to be drawn and redriven. When a spike has to be redriven, the hole made by the first entry of the spike must be blocked, if the tie is in a state of reasonable preservation; blocks for such purpose will be furnished by the roadmaster on demand. The spikes on the inner side of each rail, must be opposite, and the spikes on the outer side of each rail must be opposite, and staggered at least 3 in. from the position of the inner spikes, provided such amount of stagger will leave both spikes 2 in. or more from the edge of sound timber in the tie. One obvious exception to this requirement of stagger in spiking, is at joints where angle plates are used. Spikes are to be driven through all slots of angle plates except on bridges. On bridges the spikes at joints are not to touch the end of the angle plate, but they are to be as far from the slots as the tie will allow, leaving freedom of movement for the rail lengthwise. All bent spikes suitable for redriving must be straightened. It will be found that the heads of spikes will break off sharp during the winter months. The stubs are not equivalent to spikes, and are to be driven flush with tie, and replaced with new spikes. The spikes are to be driven so that the heads are in contact with the flange of the rail.

Line of Track.

Foremen of repairs are instructed to keep their track in the best possible line. Track cannot be maintained in good line, unless the surface is reasonable good, and the finer points of lining must follow surfacing stakes, which may be given to establish a line of track and which must be carefully preserved; the accidental disturbance of such a stake or monument must be immediately reported to roadmaster. When ballast in track is to be moved to conform to the line as given by stakes, the ballast in the vicinity of stakes is to be removed to the level of the bottom of the tie, so that the stake shall not be disturbed by ballast moving with the ties. Whenever the line of track is in any way impaired, by accident or by work done on the track, it must be relined at once. Track which has been surfaced during the day, must be left at night in perfect line.

Special Duty During Storms.

In case of severe storms or violent winds, foremen of repairs are requested to make examination and see that all is safe. This examination must be made during the storm, whether it occurs at

nights on Sunday or on other days, and the amount of time consumed in such examination and consequent extra work, must be reported at once to the roadmaster.

Care of Supplies.

Foremen or other employees of the track department, are not authorized to lend, sell or give away, any tools or material, new or old, belonging to this company. Foremen of track work must be careful to prevent the theft of any material or disfigurement or damage to any structure or grounds belonging to this company, and must do all in their power to secure the punishment of any such damage or theft.

At the end of every month each section foreman is required to fill out a blank showing just how many of each kind of tool he has on hand, and to whom tools have been transferred during the month. The blank is 20 in. long and down one column are printed the names, arranged alphabetically, of all the track tools used by the company, beginning with adze, adze handles and axe handles, and running down the entire list to wheel barrows, water pails and wrenches.

Care of Switches.

Foremen of repairs are instructed to make a critical inspection of all main line switches three times a week. Switch rods must be adjusted so that the point shuts tight against the stock rail through the length of planing of the point. The gage at the point is to be maintained at just 4 ft. 8 $\frac{3}{4}$ in. unless by specific instructions by the roadmaster.

Tamping of Ties.

The tamping of ties is to extend throughout the length of the tie. If the character of the ballast admits of using tamping bars, the men using them are to stand opposite each other and strike the ballast at the same time. Shovel tamping is permitted only in case of a general lift of 3 in. or over of any kind of material.

Testing the Conditions of Ties.

On September 1st of each year the foremen of repairs are instructed to send to the roadmaster estimates of the number and kind of ties required for tie renewal for the next year, stating in such estimates the number of ties tested on their sections, which may be applied in such renewal. When the ties are received, foremen of repairs are instructed to pile them evenly along the side track, and as time can be spared, are to see that the bark is removed and burnt. No tie with bark on is to be put under tracks.

Use of Track Levels (Level Should be Tested Every Morning.)

The test of the level is to be made by placing the board on the rails square to the line of the track, and bringing the center of the bubble to the center mark on the glass, by a shim if necessary. When in this first position of the board, the bubble has been found to be or has been brought to be in the center of the glass, the board is to be turned end for end and put on the same supports as before. If in this last position of the board the center of the bubble stands at the center mark of the glass, the level is correct; but, if the bubble fails to do so, the level is out of order, and must be sent to the roadmaster for repairs.

Weakness of Bridges.

Foremen of repairs are instructed to watch closely the condition of all bridges, culverts and other openings in and under the roadway. In case any weakness of these structures is discovered, such weakness is to be reported at once to the roadmaster. They are further instructed to keep the nuts tight on all packing behind timber, and other bolts in the floor system of bridges, and to report any looseness, shaking or rattling, of rods, rivets, and other parts of such structures. They are also instructed to keep the expansion rollers under the front ends of iron bridges free from gravel, cinders and other obstructions. They must see that all bridge culverts and drainage pipes are kept free from drift wood or other obstructions.

Creeping of Rail.

Foremen of repairs are instructed to watch closely the creeping of track on grades, also tracks under one way of all traffic. If this creeping is frequent and of any considerable amount, special instructions as to the treatment of that part of the track are to be sought from the roadmaster.

Use of Handcars.

Handcars must not be left standing on highway or private crossing, except for the purpose of letting cars pass. Section foremen

must not leave their handcars standing upon double or single main track, while their men are working on track. When two or more handcars are running in the same direction, they must keep at least two telephone poles apart. No one except employees will be allowed to ride on handcars.

Bonding on Suburban Railways.

The principle of bonding is to make all rails continuous from the extreme ends of all lines to the power house. In so doing you will find a great many minor details, which must be observed in every particular. There are practically three conditions to be obtained, first: mechanical strength; second, electrical contact or conductivity, and third, protection of bond from injury and from theft. Any points whereby you can better these three conditions must be carefully attended to, remembering that for successful operation the "rail circuit" is just as important as the trolley wires.

Foremen of Repairs are Instructed as Follows:

In first starting your bonding be careful in selecting your drills. See that bond-head is a good driving fit in the holes and constantly watch your drills to see that they are not cutting large on account of being reground. The bond-head and hole in rail must be thoroughly cleaned with sand or emery paper before driving. Drive bond square and see that it is completely up to its shoulder.

All bond wires must have a small amount of slack between heads, to allow for expansion and contraction of rails.

If you are to use the Fig. 8 bond, drive pin into head so that it is flush with outside shoulder. Paint all bond heads with a suitable protective paint which will be furnished you by roadmaster.

Great care should be exercised in all special work, such as: Switch points, diamonds, frogs, and especially split switches and derailing devices (which cause an opening in the track circuit). These places should be connected with at least 4-0 copper wires, extending over the complete distance of any points that are movable or liable to heavy jars, etc.

In making these long leads of wires around special work, always use at least two bond heads soldered to your continuous wires. These bond heads should be placed back, at least 36 in. from end of rail to eliminate the constant vibration caused by pounding over joints.

All joints must be thoroughly wrapped with No. 14 bare copper wrapping wire and soldered in a mechanical manner, letting the solder run through the joint. After soldering carefully, wipe all acid from joint and paint with your protective paint. This is to protect your work and neutralize the effects of the acid. Any arching or heating of joint is wrong and should be corrected immediately. If at times you receive slight shocks from rail to earth or from rail to rail, look for your trouble in insufficient bonds. This is an extreme case and should receive immediate attention.

Never open a circuit which has been in use without giving notice to the superintendent, or whoever is in charge, of your intention to do so, and at the same time request that the same line be opened at the main station, and kept open until you have given notice that work on that line has been completed.

If in case a broken trolley wire comes to your notice, immediately clear it from the rail or earth. In doing so stand on a dry wooden surface of any kind; if such is not at hand, a shovel or pike handle, your coat or hat if dry may be used. If you have a lead line or rope, "kink" wires and fasten rope to it so you can swing it clear by snubbing it to nearby pole, tree or span wire. Immediately report any trouble of this nature to dispatching office giving exact location and line if possible, and always station a man to stay with wires until trouble men arrive, which then relieves you of all responsibility.

A MOSQUITO STORY.

An "interesting if true" press dispatch from New York under date of June 2d reads as follows: Mosquitoes stopped a car of the New Brunswick-Dunellen, N. J., line Saturday night. John Olbey, the motorman, was blinded by the swarm and he shut off the power. Passengers on the car declare the swarm was as thick as one of bees, the insects making a solid mass in the air. They invaded the car and the passengers deserted it. As soon as the motorman got the pests out of his eyes he started the car and the breeze soon carried away the mosquitoes.

Street Railway Park Development.—VII.

MONARCH PARK, OIL CITY, PA.

The Citizens' Traction Co., of Oil City, Pa., anticipates a very successful season at Monarch Park, an extremely attractive resort, which was briefly described in the "Review" for September, 1902. This park is midway between Oil City and Franklin, Pa., being five miles from each place. Already the company has booked a number of large picnics and excursions from outside towns. Monarch Park is in reality a summer resort, for its beautiful scenery and delightful location have led a number of persons from the two cities to build cottages on the grounds and reside there during the heated term.

the railway company, every street railway that has a park should own its merry-go-round, for it is a source of great revenue, as, for that matter, is the miniature railway.

In handling the crowd to and from the park the railway company experiences very little difficulty, because the work is done with system. A nicely finished depot, 30 x 150 ft., is equipped with turnstiles, where all fares are collected as people pass out from the park. Passengers are unloaded at one place and taken on at another. A check room is provided for all who desire the convenience and a charge of 5 cents is made for checking.

The police regulation of the park is of the best, each guard being



VIEW IN MONARCH PARK, OIL CITY, PA.

The park covers 60 acres, half of which is open and is cared for by an expert landscape gardener.

The most striking feature of the park is the number of mineral springs, seven in all, each sending forth a different mineral water. The most remarkable of these springs is that known as the "Boiling" water; this spring comes up through black quicksand and is 20 ft. in circumference. A distance of only 500 ft. from this spring is another boiling out of white quicksand, with a 6-in. stream. The waters from different springs meet and make a beautiful brook winding its way through the park. Well-kept flower beds and electric fountains adorn the grounds and rustic seats, hammocks and swings with abundance of shade add to the pleasure of all visitors.

A great deal of money has been expended upon the park. A large theater is fitted with modern furniture and scenes, and performances, chiefly vaudeville, are given every evening. A large double-deck restaurant, 59 x 90 ft., supplies all who do not bring their baskets to the park, and here one may be served as well as at any hotel in the state. Besides this accommodation there is a public hall provided for those who bring their lunch, and there is a kitchen where patrons may make coffee and cook short-order dishes.

Another striking feature is the electric tower, a miniature of the Pan-American electric tower. It has a 20-ft. base, is 112 ft. high, covered with 3,000 lights of different colors, making a very brilliant display.

There are amusement parlors fitted with slot machine devices; a land pagoda, where a good band plays afternoon and evening; a merry-go-round and a miniature railway. The merry-go-round is sheltered under an attractive roof and it and the miniature railway furnish excellent entertainment for the children. The merry-go-round and miniature railway were built by the Armitage-Herschell Co., of North Tonawanda, N. Y., and according to the managers of

a deputy sheriff. No intoxicated persons and no spirituous liquors are permitted on the ground. The buildings are neatly constructed and kept nicely painted; the water works, which are complete in every way, are owned by the railway company, and the sanitary arrangements are perfect in every detail. During the past season



NIGHT VIEW OF RESTAURANT, MONARCH PARK.

the superintendent, Mr. J. H. Forebush, succeeded in making Monarch Park an exceedingly popular resort.

LAKE NIPMUC PARK, MENDON, MASS.

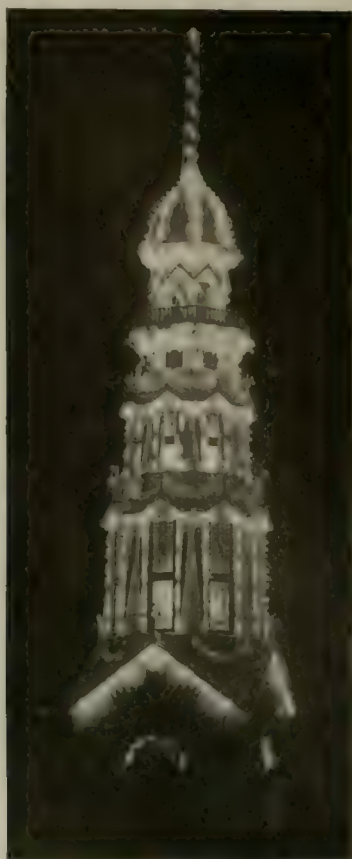
Last winter the Milford & Uxbridge Street Railway Co., of Milford, Mass., purchased Lake Nipmuc Park, located at Mendon, in southern Worcester County, for recreation purposes. It is ideally

located on the western shore of Nipmuc Lake, sometimes called Mendon Pond. The park was formerly called "The Grove" and has been used as a picnic ground for years. Nipmuc is the old Indian name for the lake, so called from a tribe of Indians. The park has many natural resources which have been enhanced since



RESTAURANT BUILDING, MONARCH PARK.

the railway company acquired it; rustic buildings and bridges, flower-bordered walks and smooth lawns have transformed it into a finely appointed outing resort. At the entrance is the waiting station, built in rustic style of field stone. Extending from this at one side is a wall, also of field stone, laid in portland cement; the



ELECTRIC TOWER AT NIGHT, MONARCH PARK.

wall is very firm, although it looks as if loosely built. On the other side of the waiting station, between the highway and the cave, is a heavy stone wall that adds to the substantial attractiveness of the front. On the opposite side of the main entrance to the

park are several stone piers, between which, in rough cedar letters, the name of the park appears.

Not far from the entrance are flying horses and swings for the children and farther on, on the higher ground which rises abruptly from the lake, is the pavilion, with rustic stone foundation. In the pavilion is the dining room, where excellent meals are served, and there are counters for the sale of soda, confectionery, etc. The floor is maple and is kept waxed, for dancing, there being an alcove with raised floor for the orchestra. During the summer there is dancing each evening, except Sunday and Monday, and every Saturday afternoon. From the pavilion veranda, looking eastward over the boat house, almost the entire length of the lake may be seen, its broad blue surface broken only once, and that by a pretty wooded island. On the right, following the irregular shore line, are the picturesque cottages of the summer colony at and near Point Pleasant, and on the left the handsome home of the Nipmuc Canoe Club, with whose canoes and boats the water is dotted. The toilet buildings are separate from and at the rear of the pavilion.

Across a rustic bridge a little farther south and back of the pavilion is the theater building on sloping ground, with the stage at the foot of the slope. It has a seating capacity of 1,000 and an admission fee of 5 and 10 cents is charged. The attractions are high class and consist mainly of vaudeville and light opera. There are two performances daily, at 3 p. m. and 8 p. m., each continuing for one hour and a quarter. On holidays three performances are given, at 2:00, 4:00 and 8:00 o'clock. The entrance is of rustic architecture, of field stone, with cement floor. The stage is very large and complete in its equipment.

Just below and in front of the pavilion is the boat house, where safe and easy-rowing skiffs may be hired. This is also the starting point of the "Nipmuc," a 40-ft. passenger boat that makes trips around the lake. The "Nipmuc" was built especially for this place on Long Island Sound last season, taken around to Providence by water and thence by wagon to the lake. It was recently equipped with a new 8-h. p. Murray & Tregurtha 4-cycle gas en-



MAP OF THE MILFORD & UXBRIDGE STREET RAILWAY CO.

gine. A small sand beach has been made near the boat house for the children.

Animals of various kinds have their cage-homes in the park and ducks and geese are domiciled near the lake. In a large chestnut

grove tables and seats have been erected for picnic and family parties. The park is lighted at night by incandescent lamps and is much sought by those whose work keeps them indoors during the day. No intoxicating liquor is sold or allowed on the park territory and persons who are disorderly or under the influence of liquor are not permitted to remain within the enclosure. The park was opened to the public May 25th.

Visitors to the park come from a wide radius, as will be seen by consulting the accompanying map of the Milford & Uxbridge Street Railway Co., and connecting lines. The company's lines have terminal points at North Grafton, Uxbridge, Medway, Hopkinton and South Framingham and connect at each place with other trolley lines. From whatever point the park is approached the scenery along the way is beautiful. Mr. E. W. Goss, of Milford, is general manager of the road and park.

PRIVATE CAR FOR DENVER CITY TRAMWAY CO.

The car shown in the accompanying illustrations has been designed especially for the use of the officers and directors of the Denver City Tramway Co., but is to be used as well for rental to parties who desire to charter an especially handsome car for excursions, theater parties, etc. It was built by the Woerber Brothers Carriage Co., of Denver, Colo., after the design of the Denver City Tramway Co. Fig. 1 shows the exterior of the car with the vestibule doors open and the folding steps down ready for use. Fig. 2 shows the car with the vestibule doors closed and the steps folded up, this being the position when the car is running. Fig. 3 shows the interior of the car with the curtains up.

The length of the car over all is 37 ft. 6 in. and the length of the main compartment 24 ft. 6 in. The length of each vestibule is 6 ft., the width of the car over panels 8 ft. 2 in. and the height from the rail to the roof canvas 12 ft. The height from the rails to the sills is 2 ft. 6 in. and from the floor to the ceiling 8 ft. 4 in. The electrical equipment consists of four G. E. 58 motors with two K-6 controllers. The motors are geared for a speed of 30 miles per hour on level track. The equipment also includes Christensen air brakes and emergency hand brakes of the Pullman pattern. This car is mounted on No. 27-G Brill trucks having a 4-ft. wheel base and 33-in. wheels.



FIG. 1.

The folding steps shown in the illustrations are of special design and are placed at each end of the car on opposite sides. They are operated from the vestibules by the motorman or conductor. The car has a double floor, the lower floor being of yellow pine and the upper floor is polished maple. The space between floors is utilized for the necessary wires. The sills are made according to the standard design of the Denver City Tramway Co. and are double, consisting of a steel section of 7 in. x 15 lb. I beam and a wood section of Oregon fir 5 in. x 7 in. The sills continue from nose piece to tail piece.

The main compartment is finished in Cuban mahogany highly polished and the vestibule in quarter sawed oak forming a pleasing

contrast with the mahogany finish of the main compartment. The ceiling of the latter is of three-ply veneer handsomely decorated in modified Paris green with a dark green border ornamented with gold. The ceiling in the vestibule is of oak finished in natural color. There are eight plate glass windows on each side of the main compartment with mahogany sash. The distance from center to center of window posts is 36 in. The transom sash are mahogany filled with neat ornamented glass and the decked glass is of beveled plate.



FIG. 2.

Pantasote curtains are used which match the ceiling in color. The car is furnished with 16 easy rattan chairs painted olive green to harmonize with the interior finish and the floor is covered with Royal Wilton carpet. The car is finished with rich bronze moldings and has 133 small Imperial incandescent lamps of 8 and 10 candle power each, all of which have frosted globes. Electric call bells are provided throughout the car and bronze panel heaters made by the Consolidated Car Heating Co. extend the full length of the interior of the car on both sides. The main color of the exterior of the body is Valentine's onyx brown, relieved with light brown on the letter



FIG. 3.

board and a darker brown border filled in with heavy gold ornament and scroll.

We are indebted to Mr. John A. Beeler, vice president and general manager of the Denver City Tramway Co., for the photographs and data.

A dam to cost \$200,000 and furnish 150,000 h. p. is to be built by November 1st across the Rock River, 12 miles west of Rock Falls, Ill., by the Whiteside Construction Co. The dam is the invention of L. E. Rice, of Lyndon. It is to be of concrete and steel, 10 ft. high. It is planned to supply electricity for the vicinity, including railway lines building or projected.

THE TRAINING OF THE HIGH TENSION ENGINEER.*

BY P. M. LINCOLN.

There are two schools in which the electrical engineer may receive his training but only one in which he must receive a course before he can be called a high tension engineer. Those things which are learned in the schools equipped with professors, laboratories and text books must be supplemented by the things which can be learned only in the school of experience. These two schools are quite different in method. The college instructs in theory and in those methods of doing things which have become standard; it teaches positive knowledge. In the school of experience on the other hand one is more apt to learn how not to do it, and by the elimination of the unsuccessful arrive at success. The knowledge gained by experience is often negative. The fresh college graduate could probably solve the problem of the amount of distance to be left between the conductors of a high transmission line by considering the jumping distance of the voltage, the length of span and the sag and perhaps the factor of safety. It is experience only that will show that the distance depends very little on the voltages to be carried and almost entirely on such things as the average length and ohmic resistance of cats, the spread of wing of owls and eagles and the average length of scrap baling wire together with the strength of the average small boy's throwing arm. The college graduate generally feels that the greatest danger of his work lies in the liability of receiving a shock from high tension conductors and not until he has had an experience with accident of an electric nature does he realize that it is the danger of being burned he has to fear more than the danger of shock. The graduate has learned how to make accurate measurements of the power but in practice he will find it much easier to measure power accurately than it is to persuade a customer that his power is being accurately measured. He also enters his practical duties with the idea that rubber is one of the best insulators that exists, but afterward find that rubber, as a high tension insulator, is very treacherous, due probably to chemical changes induced by the brush discharges caused by the high voltage of the conductor. The new graduate usually has a high opinion of efficiency but when he comes to operate a transmission line he finds that efficiency is a vanishing quantity when compared to continuity of operation and that economy is not to be considered as being in the same class as good service. The author considers a technical course as the very best foundation but it is only a foundation and its great advantage is that it gives the man the proper equipment for overcoming the difficulties which he is bound to meet in practice. There is nothing like the college education to equip a man for making every accident a lesson and every failure a stepping stone to success.

The art of long distance electric transmission as it exists today is the result of the accumulated experience of all those who have had to do with transmission work. Those men who today are designing and operating transmission plants are the molders of the art. Their expedients for improving service or reliability or for cheapening costs are noted and when successful have their influence on future installations. The experiences of today are incorporated in the text books of tomorrow but although the result of experience may be taught to the college student the college curriculum can never become the substitute for the school of experience.

ELECTRICAL INSTALLATION FOR SUBURBAN TRAFFIC ON THE NORTH EASTERN.

The North Eastern Ry. of England has decided to electrically equip a portion of its suburban lines in the neighborhood of Newcastle-upon-Tyne and this is the first of all the great English lines to face the conditions which must sooner or later be faced by other railway managers in England if it is desired to increase or even to maintain the profits derived from suburban traffic. Newcastle is situated about eight miles from the mouth of the Tyne and the districts on both banks of the river are densely populated and contain an almost unbroken succession of shipbuilding wards and other engineering works. To the north of the mouth of the river lie Lynemouth and Whitley Bay which are residential districts contain-

ing favorite holiday resorts. There is a large traffic throughout the entire year between Newcastle and the sea which attains very large proportions during holiday seasons.

The lines which are being changed for electric passenger service are at present operated with steam locomotives with the exception of the line from Gosforth to Ponteland which is now being built. The Quayside branch which is now used for freight traffic only is also being electrically equipped with the object of preventing the ventilation difficulties now obtaining on the line. It is for the most part in a tunnel having a heavy grade. It has been decided to operate the trains by continuous current taken from a single collector rail with a return circuit through the track rails. This current will be supplied from rotary converters and static transformers which convert three-phase current at 5,500 volts into continuous current of 600 volts. The third rail will be of steel of special high conductivity. It weighs 80 lb. per yard and is supported on insulators composed of reconstructed granite placed outside of the track rail at a distance of 3 ft. 11½ in. from the center of the track. On double track the two third rails will be usually placed between the two tracks but at junctions, crossings, etc., where there is any obstruction it can be transferred to the outside of the track. The third rail will have no protection except at special places but holes are being punched in the rails so that protecting boards may be supplied at any place desired. At crossings, stations, etc. protecting boards are used which are creosoted and bolted against distance pieces on each side of the rail. Provision has also been made so that a return collector rail can be installed between the track rails and used instead of the latter for the return circuit if it should prove desirable in the future. Protected bonds are being installed and as the old fish plates did not allow sufficient space to use these bonds new fish plates are being put in place as the bonding proceeds.

Current will be supplied from five sub-stations all of which are of uniform design, and fourteen 800-kw. rotary converters will be distributed among the various sub-stations as the load requires. The static transformers are of the single phase, oil insulated self-cooling type. To each rotary converter is coupled a small induction motor fed by a special transformer and a rotary converter is started by means of the induction motor until it attains a synchronous speed of the rotary when it is switched on the high tension bus bar.

The high tension switches are placed along one side of the sub-station and the low tension switchboard will be placed on the opposite side of the building. Only the positive leads will be taken to the low tension switchboard, the negative bus bars running near the floor behind the switchboard and the equalizing switches being mounted close to the rotary. The high tension switches are of the oil type, the feeder switches being provided with an automatic reverse current release and the converter switches with an overload time limit release, all being operated electrically by current supplied by a small battery in each sub-station. The rolling stock for the road will comprise motor and trail cars which will be built at the shops of the North Eastern Ry. The cars will be mounted on double trucks built by the Brush Electric Engineering Co. and each car will be equipped with two G. E. 66 motors rated at 150 h. p., both motors being carried on one truck. The trains of cars will be controlled by the multiple unit system and each car will be fitted with Westinghouse air brakes and a motor driven air compressor. The company will not build its own generating station but will purchase its current from the Newcastle-upon-Tyne Electric Supply Co., Ltd. The electrical equipment of the rolling stock and permanent way will be supplied by the British Thomson-Houston Co., Ltd., the complete equipment of sub-stations by the British Westinghouse Electric & Manufacturing Co., Ltd., and the three-phase high tension, telephone and other cables by Messrs. Siemens Brothers & Co., Ltd.

The first spike on the San Jose-Los Gatos Interurban Ry., San Jose, Cal., was driven June 13th. It was a silver spike and it was driven by a silver hammer.

The Cincinnati, Newport & Covington Railway Co. recently completed a steel water tank of 15,000 gallons capacity in the center of its reservoir which supplies the boilers in the Newport power house. When the tank overflows the water runs back into the reservoir instead of going to waste. The company uses more than 1,000,000 gallons of water daily.

*Abstract of a paper read at the annual convention of the Canadian Electrical Association, Toronto, June, 1903.

SEMI-CONVERTIBLE CARS FOR THE ARGENTINE REPUBLIC.

The J. G. Brill Co., of Philadelphia, recently shipped six semi-convertible cars to the Cia de Tramways Electricos de Buenos Ayres. These cars are interesting on account of their remarkably low window rail. The rail is lower by four inches than in the regular semi-convertible car built by this company, and six inches lower than usual. This extremely low rail was adopted because of the



BRILL CAR FOR ARGENTINE REPUBLIC.

warm climate of Buenos Ayres making it desirable to have the cars as open as possible and still retain the solid sides. This form of semi-convertible car lends itself particularly well to such a modification, since there are no wall window pockets to interfere with the desired height of the window rail. All that is necessary is to deepen the roof window pockets to correspond with the increased depth of the sashes, and this does not cut down the width of the monitor deck appreciably; in this case the monitor deck has a clear width of four feet. It will be seen that an arm rest is required, as the window rail comes several inches below the elbow of an adult. An arm rest was therefore devised by the builders that exactly met the requirements of the case. Apparently such a thing is very simple, but in reality it must have been not a little puzzling, as the window catches at both lower corners of the sash had to be taken into account; an arm rest reaching from post to post was out of the question, as it would come right in the way of these catches. To have it attached to the seat would mean a loss of seating space. The rest consists of a bar of wood 2½ in. wide, held by brackets which are



INTERIOR OF BRILL CAR.

secured to the side lining of the car. Ample room is given to rest the arm and at the same time space is left between the rest and the posts, so that operation of the window locks is not interfered with.

The side sills of the cars are re-enforced with 6 x 3½ x ¾-in. angle-iron, the lower part of which comes directly upon the wheel pieces. The platform timbers are also re-enforced with angle-iron. The side sills are 4½ x 6 in., and the end sill 3½ x 6 in. The thickness of the corner post is 3¼ in., and the side post 2½ in. The depth of the upper sash of the window, measured over the frame, is 18½ in., and over the lower sash, is 27½ in. The system of metal grooves and trunnions enables these large windows to be raised into the roof pockets with a turning gear. Cane seats with reversible backs

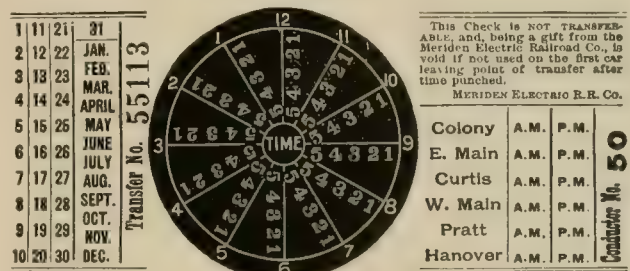
afford seating for 32 passengers. These seats are 35 in. long and the aisles are 22 in. wide. When it is known that the width of the cars over the post at belt is but 8 feet, it will be a matter of interest to see how the aisles and seats can have so much space. It is obtained simply by introducing the seats between the posts and against the side lining, possible because of there being no wall pockets.

The general dimensions of the cars are: Length over end panels, 20 ft. 8 in.; length over crown pieces, 30 ft. 3 in.; from end panels over crown pieces, 4 ft. 9½ in.; width over sills, 7 ft. 8½ in.; width over posts at belt, 8 ft.; sweep of posts, 1¾ in. The interiors are finished in quartered oak with ceilings of the same. The metal trim throughout is solid bronze. The trucks are Brill 21-E, with 7-ft. wheel base and 30-in. wheels. Each car is equipped with folding gates, gongs, brake handles, angle iron bumpers, and other of the company's patented specialties.

TRANSFER CHECK USED IN MERIDEN, CONN.

The accompanying illustration is a reproduction of one-half of a transfer check issued by the Meriden (Conn.) Electric Railroad Co. This check is in duplicate, the conductor giving one-half to the passenger and retaining the duplicate to turn in to the company with his account. As will be seen, it is necessary to punch the check in four places, one each for the month, the day of the month, the route (punching the a. m. or p. m. column as the case may be) and the time.

The time dial in the center of the check is an ingenious arrangement, being divided not only into hours, but subdivided by the fig-



ures "1, 2, 3, 4, 5" into 10-minute fractions, so the conductor receiving the check can tell at a glance whether the passenger complied with the stipulation to board the first car after obtaining the transfer. In the upper right hand corner is printed the condition under which the transfer is granted, as follows: "This check is not transferable, and, being a gift from the Meriden Electric Railroad Co., is void if not used on the first car leaving point of transfer after time punched."

The color of the check is deep pink and the printed matter is black. The checks are numbered consecutively in red by a numbering machine; and the conductor's number is in red, also.

INTERNATIONAL EXPOSITION AT ROME, ITALY.

An "International Samples Exhibition" will be held in the Fine Arts Palace, Rome, Italy, Oct. 1 to Dec. 31, 1903. There will be an American section for the display of samples and photographs of the leading American products, the object being "to facilitate their importation into Italy." The manager of the American section is Mr. Montrasi Giuseppe and the general committee of arrangements comprises the presidents of the various chambers of commerce, arts and agriculture throughout Italy, bank presidents and public officials. Mr. Guido Baccelli, Minister of Agriculture, Industry and Commerce, lends his endorsement, also. Full information may be obtained from the American commissary, or from the Italian Chamber of Commerce, New York City.

The Brooklyn Rapid Transit Co. has issued an order requiring conductors and motormen to wear a new style of coat and keep it buttoned up to the collar while on duty. No room is left for the display of shirt front or necktie.

PERSONAL.

MR. J. J. HACKNEY, of Guelph, Ont., has been appointed manager of the Guelph Street Railway Co.

MR. R. E. HAMNER, formerly superintendent, has been appointed manager of the Sedalia (Mo.) Electric & Railway Co., to succeed Mr. T. J. Osborne, resigned.

MR. MAXHAM E. NASH, superintendent of the Milford & Uxbridge Street Railway Co., of Milford, Mass., has been promoted to the office of claim agent for the company.

MR. JOHN V. DIENER, superintendent of the Wilmington & New Castle Electric Railway Co., of Wilmington, Del., has resigned. Mr. Chauncey P. Holcomb is acting superintendent.

MR. JOHN A. CAMPBELL, recently resigned as superintendent of power distribution for the Boston Elevated Railway Co., to accept a position with the Westinghouse Electric & Manufacturing Co.

MR. JOSEPH T. RICHARDS has been appointed chief engineer of maintenance of way for the Pennsylvania Railroad Co., and Mr. Alexander C. Shand has been appointed engineer of maintenance of way.

MR. ROBERT S. GOFF, general superintendent of the Old Colony Street Railway Co., of Boston, succeeds Mr. E. C. Foster as vice-president and general manager of the Boston & Northern Street Railway Co.

MR. M. J. KENNEDY, formerly superintendent of the Montreal Street Railway Co., has been appointed superintendent of the Ninth Ave. division of the Brooklyn Rapid Transit system, vice Mr. George C. Goodwin, resigned.

MR. JOHN SPEER, general manager of the Speer Carbon Co., St. Marys, Pa., was a caller at the "Review" office early this month. Mr. Speer reports that it has been necessary for his factory to run nights since the first of May.

MR. H. D. FITCH, manager and part owner of the Bowling Green (Ky.) Railway Co., and president of the Paducah Steam Heating Co., has been elected a director of the Paducah City Ry., Incorporated, to succeed Mr. Charles S. Maltby, of Cincinnati.

MR. JERE C. HUTCHINS, president of the Detroit United Ry., was married June 12th to Miss Sarah Russell, eldest daughter of Dr. George D. Russell, of Detroit. Mr. and Mrs. Hutchins left immediately after the wedding ceremony for a three months' trip in Europe.

MR. H. H. VREELAND, president of the Interurban Street Railway Co., New York, will sail for London early in July, in response to an invitation from the royal commission on London traffic, to advise the commission on means to overcome traffic congestion.

MR. HAROLD B. SMITH, professor of electrical engineering, Worcester Polytechnic Institute, delivered the commencement lecture before the Washburn Engineering Society, June 9th, his subject being, "The Relation of the Electrical Engineer to Modern Social and Industrial Progress."

MR. F. J. STOUT, general superintendent of the Lake Shore Electric Railway Co., of Cleveland, has resigned to accept a position with a steam railroad. His resignation will not take effect until August. Mr. E. K. Owen, superintendent of the Sandusky division, has resigned also. His successor is Mr. L. K. Burge.

MR. S. L. NELSON was on June 2d appointed receiver of the Ft. Wayne & Southwestern Traction Co., Ft. Wayne, Ind., of which company he has heretofore been general manager. The petition for a receiver was, we understand, due to a controversy between some of the stockholders and not to any financial difficulties.

MR. GEORGE R. FOLDS, for the past seven months connected with the legal department of the Brooklyn Heights Railroad Co., has been appointed assistant to the general manager of the Brooklyn Rapid Transit Co. Mr. Folds was several years with the Twin City Rapid Transit Co., and for three years was in charge of the claim department of that company.

MR. CHARLES E. HARRIS is the new superintendent of the Jackson & Suburban Traction Co. and the Wolf Lake Railway Resort Co., of Jackson, Mich. Until recently Mr. Harris was connected with the Brooklyn Heights Railroad Co. Mr. J. B. Foote, who has been managing the Jackson company, will devote his entire attention to superintending the construction work.

MR. GEORGE K. HOWARD, who was formerly chief engineer of the power station of the Aurora, Elgin & Chicago Ry. at Batavia,

Ill., has been appointed chief engineer of the 39th St. power station of the Brooklyn Rapid Transit Co., assuming charge June 1st. Mr. Howard succeeds Mr. J. J. Chisholm, who has gone to the Waterside station of the New York Edison Co.

MR. HENRY M. BYLLESBY, of Chicago, has been elected president and general manager of the Mansfield (O.) Railway, Light & Power Co., which was recently reorganized and its capital stock increased to \$1,000,000. Other recently-elected officers of this company are Mr. Charles F. Ackerman, vice-president; Mr. W. D. Breed, of Cincinnati, secretary, and Mr. Reid Carpenter, treasurer.

MR. D. A. BELDEN resigned as general manager of the Birmingham (Ala.) Railway, Light & Power Co., to which position he was appointed a short time ago, and has gone to Boston, Mass., to become general manager of a New England company, whose headquarters are in that city. Before going to Birmingham Mr. Belden was general manager of the Georgia Railway & Electric Co.

MR. C. E. COLLINS, superintendent of the Cincinnati Traction Co., resigned last month and has gone to Topeka, Kan., to assume management of the reorganized Topeka Railroad Co. Mr. Collins was connected with the Cincinnati company seven months. He was formerly superintendent of the North American Railway Construction Co., of Chicago, and has been connected with railways and railroad building for the past 15 years.

MR. C. E. FLYNN on May 1st tendered his resignation as general manager and director of the Wheeling Traction Co., Wheeling, W. Va., to take effect on the appointment of a successor, but in any

case not later than August 1st. His withdrawal is largely because of his daughter's health and the desire to attend to personal business that will require his time for a few months. Mr. Flynn has been in the electrical railway business as electrical engineer and manager since 1883. He went to Wheeling in 1887 for the Vanderpoole company and installed the first or beginning of the present system there. In November, 1901, Mr. Flynn took charge of the Wheeling properties, since which time a number of betterments have been made. About 75 per cent of the rolling stock and electrical



C. E. FLYNN.

equipment has been renewed; a new brick and steel car house with capacity for 150 cars has been built, as well as new shops; the power house has been thoroughly refitted with three large direct connected units of 800 kw. capacity each, and new boilers, pumps and other machinery have been added. Mr. Flynn also designed and built a 2,000-h. p. plant at Brilliant, O. A large part of the feeder lines, track and track bonding have been renewed, also, and the generally bettered physical conditions and increased earnings made it possible to pay the first dividend in the history of the company in January of this year. The prospect for the continuance of dividends is bright.

MR. HENRY F. GENTRY has been appointed general passenger agent of the Pacific Electric Railway Co., of Los Angeles, Cal., with jurisdiction over all the Huntington-Hellman lines. Mr. H. F. Stewart has been made assistant passenger agent. Mr. Gentry was formerly at Pasadena, having been connected with the company since 1897, first as purchasing agent and later as ticket agent. Mr. Stewart was formerly with the Southern Pacific company.

MR. THOMAS N. MC CARTER, president of the Public Service Corporation of New Jersey, Newark, N. J., on June 3d announced the following elections and appointments: Secretary, Frederic Evans; treasurer, James P. Dusenberry; general manager car department, H. D. Whitcomb; general manager electric department, Dudley Farrand; general manager street railway department, Walter W. Wheatley; comptroller, Percy S. Young; purchasing agent, J. A. Pierson; superintendent of supplies, Arthur D. Ball.

MR. E. C. FOSTER resigned as vice-president and general manager of the Boston & Northern Street Railway Co., of Lynn, Mass., to accept the presidency of the New Orleans Railways Co. He assumed his new duties June 15th. Mr. Foster, who is vice-president of the American Street Railway Association, began railroading in Lynn a number of years ago as a horse car conductor. He was

gradually promoted until he became superintendent of the old Boston & Lynn road. Afterward, for a time, he was engaged in street railway work in Boston. Then came his appointment as general manager of the Boston & Northern, followed by his election as vice-president.

MR. THEODORE STEBBINS, who has been identified with the Thomson-Houston and General Electric companies since 1887, and more recently as engineer of the committee on local companies of the General Electric Co., has severed his connection with that company and become associated with Messrs. A. E. Appleyard & Co., with headquarters at Boston. Previous to his connection with the committee on local companies Mr. Stebbins had general charge of construction work for the General Electric Co. He was born in Iowa and graduated from the Massachusetts Institute of Technology in 1886. He is a member of the American Institute of Electrical Engineers.

MR. EMIL G. SCHMIDT has been appointed general superintendent of the Springfield (Ill.) Railway & Light Co., which was formed to take over the Springfield Consolidated Railway Co. and the lighting, power and heating companies of Springfield. Mr. Charles K. Minary, formerly general superintendent of the railway company, retains a directorate in the new company. Mr. H. H. Jones, until recently with the Summers Construction Co., of Chicago, has been appointed assistant general superintendent of the new company. He was for some time in the engineering department of the Chicago & Alton Ry., and later served the Chicago, Peoria & St. Louis Railway Co. in a similar capacity.

MR. FRANK S. GANNON has been elected vice-president of the Interurban Street Railway Co., of New York City, succeeding Mr. Daniel S. Hasbrouck, resigned. Mr. Gannon was born in Spring Valley, N. Y., in 1851. He began railroading as a telegraph operator for the Erie R. R. in November, 1868. Thence he went in April, 1875, to the Long Island R. R., as a train dispatcher. Mr. Vreeland was an operator in the same office. From 1881 to 1886 Mr. Gannon was general superintendent of the New York City & Northern R. R., with which Mr. Vreeland was also connected at one time. In 1886 Mr. Gannon was made general superintendent of the Staten Island Rapid Transit Co., and afterward president of that road, and general superintendent of the New York division of the Baltimore & Ohio R. R. In 1896 Mr. Gannon became vice-president and general manager of the Southern Ry.

MR. WALTER W. WHEATLEY has been appointed general manager of the street railway department of the Public Service Corporation of New Jersey, with headquarters at Newark. This company controls nearly 300 miles of track in and around Newark, Jersey City, Hoboken, Paterson, Elizabeth and the Oranges. Mr. Wheatley, who was formerly superintendent of the Brooklyn Rapid Transit Co., took up railway work in 1875. Before going to Brooklyn he was chief train dispatcher and afterward assistant superintendent of the Buffalo division of the West Shore R. R. His first appointment in Brooklyn was as division superintendent and his promotion to assistant general superintendent of the Brooklyn Rapid Transit Co. soon followed. When Mr. Ira A. McCormack resigned, Mr. Wheatley was appointed superintendent of all the surface lines. He resigned from the Brooklyn system Oct. 1, 1902. Mr. Wheatley is first vice-president of the New York Railroad Club and for a number of years has acted as its secretary.

NEW PUBLICATIONS.

PENNSYLVANIA STREET RAILWAY ASSOCIATION. Verbatim Report of the 11th Annual Meeting Sept. 10 and 11, 1902, Held at the York (Pa.) Country Club. This pamphlet comprises 24 pages, 6 x 9 in., and contains, in addition to the minutes of the meeting, the organization, membership and other data pertinent to such publication.

AMERICAN STREET RAILWAY INVESTMENTS, published by the McGraw Publishing Co., New York. Price \$5.00. This is the 10th annual volume of the "Red Book," a very valuable office accessory. This edition contains reports of 1,361 companies, showing in detail the financial and physical condition of the properties. Nearly 1,000 of these reports were furnished by the railway officials. All new roads, all important consolidations for the year and both operating and leased roads are included. The reports are

arranged by states, instead of alphabetically by towns, as heretofore. There are 25 folding maps, some in colors, of important systems, and a table showing by comparison the gross receipts of all companies earning \$25,000, or more, for 1901 and 1902. Each report is followed by the date the company supplied the information.

A NEW SYSTEM OF REWARDING MACHINE SHOP LABOR. By H. L. Gantt. Reprinted from the Machine Shop Number of Cassier's Magazine. In pamphlet form, 12 pages, 7 x 10 in. Published by The Cassier Magazine Co., 3 W. 29th St., New York. Price 10 cents. This pamphlet deals not only with the bonus system for engineering works, but with the method of accomplishing what the system aims to accomplish—increased production and satisfied workmen. It is called "the latest advance in the art of shop management."

TROLLEY WAYFINDER, published by the New England Street Railway Club, Herald Building, Boston, Mass. This is a street railway guide to New England, published under the auspices of the New England Street Railway Club. Its object is to supply valuable information for travelers by trolley, and it gives in tabular form the distance, fare and time from Boston to points touched by electric railway cars throughout New England. The cities and towns that may be reached by trolley are arranged alphabetically, making the guide a handy and convenient reference book for anyone who desires to reach designated points by electric cars. Sixty-four pages; price, 10 cents.

REPORT OF JOHN CRERAR LIBRARY, CHICAGO, FOR 1902.—46 pages, 6.5 x 10 in., paper covers. The report of the president, Peter Stenger Grosscup, shows that there were 66,500 visitors, a daily average of 213, and an increase of 11,600 over the previous year. The total use of the library was over 155,000 books and periodicals. It now contains 89,219 volumes and receives 1,054 periodicals and 4,644 other serials. The treasurer, William J. Louderback, reports receipts, including cash on hand Jan. 1, 1902, \$513,179.18; disbursements, \$458,961.24; balance on hand Dec. 31, 1902, \$54,217.94. The building fund amounts to \$457,084.43; book fund, \$184,047.58. The report will be sent gratis on request.

TUBERCULOSIS. By Addison W. Baird, M. D. Published by James T. Dougherty, 409 West 59th St. Price 25 cents. This is a pamphlet of 24 pages, illustrated with 30 half-tone engravings, dealing with the subject of "tuberculosis" and methods of preventing and curing this dread disease. Dr. Baird treats the subject from a new standpoint. After describing the tubercle bacillus, the germ of tuberculosis, he speaks of the various forms and ways in which the microscopic organisms are transmitted. He believes the disease is preventable by the exercise of reasonable care and observance of a few simple precautions and also thinks it is curable in the majority of cases, especially if treatment is undertaken at the outset. Among other agencies by which the disease may be spread, he calls attention to the electric railway car and points out the necessity of keeping cars clean and wholesome. He also points out that the rules forbidding passengers to spit in the cars and on the car platforms should be vigorously enforced. He advocates the placing of cuspidors in cars where practicable.

NOTES ON TRACK CONSTRUCTION AND MAINTENANCE. By W. M. Camp, editor Railway and Engineering Review, and member American Society of Civil Engineers. 1,214 pages, 620 illustrations. Vellum de Luxe Cloth, 6½ x 10 in., long primer type. Published by W. M. Camp, 7418 Parnell Ave., Chicago. Price \$3.00, postage paid. This is a useful book for railway engineers, superintendents, roadmasters, track foremen, bridge men, signal men, railway contractors, supply men and engineering students. It embodies an exhaustive treatment of track construction and maintenance from a practical standpoint, and, being just issued, brings such practice up to date. Every phase of track work is treated and special attention has been paid to costs and other data, and particularly to modern labor-saving machinery in track service. While the author's chief aim has been to treat the subject from the standpoints of both the trackman and the engineer, it has been written for all who have to do or expect to have to do with track construction or maintenance. The index is full and complete and enhances the value of the book as a reference work. It covers 18 pages of the book and contains 3,036 headings and 3,714 separate references. A very valuable department, also, is that devoted to supplementary notes, which embrace a considerable volume of descriptive matter that is used largely in illustration of practice or of principles discussed.

A NEW ENGINEERING COMPANY.

The Chicago Engineering & Constructing Co., the incorporation of which was noted in our issue for May, has acquired the established engineering and contracting business of the well known firm of Weston Brothers, consisting of Charles V. Weston and George Weston, with offices at 741 Merchants Loan & Trust Building, corner of Adams and Clark Sts., Chicago. This firm was organized January, 1901, to carry on a general engineering and contracting business, and has paid special attention to examinations, consultation and reports upon proposed and existing steam, electric and

It will take contracts to build steam, electric, and elevated railways, bridges, buildings, tunnels, subways, viaducts, wharves, piers, manufacturing gas and electric light plants, and will make a specialty of creating new electric railway properties, delivered with operating organization perfected and in actual operation.

After making investigation of the physical condition and operating practice of existing properties, the company will undertake the rehabilitation of such properties, reorganize operating forces and bring up entire systems to modern standards of practice, at the same time developing revenue-producing possibilities which have been overlooked or neglected, and reducing operating expenses to a mini-



C. V. WESTON.



G. WESTON.



G. A. YUILLE.



H. B. HICKS.

elevated railways, and has also carried on the construction in many instances. Among the recent accomplishments of the firm may be mentioned the designing of the intramural transportation system for the Louisiana Purchase Exposition at St. Louis, which has been adopted, and the valuable assistance rendered to Mr. Bion J. Arnold in the preparation of his report to the Local Transportation Committee of the Chicago Common Council, for which the firm was accorded due credit in the report.

The officers of the new company which has a capital of \$250,000 will be Charles V. Weston, president; George Weston, vice-president; George A. Yuille, secretary and general manager; Hervey B. Hicks, counsel. Addison E. Wells, Fred A. Wells and Edward B. Burling, all of Chicago, together with the officers named, constitute the board of directors. The Messrs. Weston are already so well and favorably known to the profession and the public as well that a re-iteration of their past work seems unnecessary.

Mr. Yuille was formerly vice-president and general manager of the West Chicago Street Railroad Co. and an officer of other street railroad companies in Chicago. His service has covered both the construction and operation of railway properties and he is known to those familiar with this field as a manager of great force, tact, skill and ability. His connection with the new company will enable it to reorganize existing properties and bring them up to the best modern standard of practice.

Messrs. Addison E. Wells and Fred A. Wells are known throughout the country as leading building contractors, in which field they have been engaged for many years. They operate under the name of the Wells Brothers Co., and are now carrying on the construction of large buildings in Chicago, Baltimore, Philadelphia, New York and elsewhere. Their connection with the new company is an assurance to the business world of its stability and of conservative and efficient management.

For a number of years Mr. Hervey B. Hicks, who is a Chicago attorney, was engaged in engineering service on western railroads and irrigation works, and recently has made a special study of the electric railway field, all of which will make his services peculiarly valuable to the new organization.

Mr. Edward B. Burling is a member of the firm of Bentley & Burling, Chicago attorneys.

The Chicago Engineering & Constructing Co. is now carrying on the supervision of construction of electric railroads, among which may be mentioned the line from Rockford to Freeport, Ill., and is preparing plans and specifications for extensions of existing properties. It is prepared to make surveys, estimates, plans and specifications; examinations and reports upon proposed or existing properties, with recommendations for improved operation when desired.

num. On account of the rapid construction of electric railroads during a period when so many improvements in type and economical operation have been made, there is a large field for activity in this line.

"LIGHT ON THE TRACK AT ALL TIMES."

On April 17th Mr. George F. Chapman, president of the Chapman Headlight Adjuster Co., took a party of street railway men on a trolley trip between Waltham and Hudson, Mass., for the purpose of demonstrating the merits of the Chapman headlight adjuster. The party included W. H. Greene, superintendent of the Lexington & Boston line, Charles H. Parsons, vice-president, and J. W. Ogden, superintendent of the Concord, Maynard & Hudson Street Ry., on which lines the adjuster is now being used. At Concord the party took the parlor car "Concord" of the latter company to which the adjuster was transferred.

The headlight adjuster is a unique device which is attached to the cross beam of truck, and reaching forward and up in front of dashers or vestibule are tee brackets on which the lamp is carried, so that the slightest turn of the truck imparts a movement in the direction of the curve. The rays of the lamp are constantly on the track, and when the truck strikes the curve, slight or sharp, the light is on the curve. This gives the motorman at all times a complete view of the road. On the trip mentioned the value of the shifting light was demonstrated, the light following the curves perfectly as the car turned, giving a clear view of everything ahead for a long distance.

All of the double truck cars of the Fitchburg & Leominster Street Ry. are equipped with the Chapman adjuster, and the superintendent, Mr. W. W. Sargent, is quoted as stating that their use has saved the company from a number of serious accidents, any of which would have cost far more than the cost of these devices.

ADDITION TO NEWARK WESTINGHOUSE PLANT.

The increase in sales of integrating wattmeters and other electrical recording instruments made by the Westinghouse Electric and Manufacturing Co. has made necessary an extensive addition to its Newark works, which will practically double the size and productive powers. The company manufactures its meter tools, jewels and special appliances, and while the mechanical features mark the perfection of their kind, equal attention is given to the comfort and convenience of the 3,000 employees.

NEW LINES OPENED TO TRAFFIC.

The Jackson & Battle Creek Traction Co. has just completed its line, although cars have been running between Albion and Battle Creek and between Jackson and Allegan, Mich., since the last of May.

The Southern Indiana Interurban Railway Co. issued invitations for the opening of its line between Jeffersonville and New Albany May 16th. City service in Jeffersonville was begun May 28th.

All connections are complete and through trolley cars now run between Providence, R. I., and Danielson, Conn., over the tracks of the Providence & Danielson Ry., which instituted an hourly service June 1st. Connections may be made for Wauregan, Central Village, Moosup, Dayville, Putnam, Conn., and Worcester, Mass.

The Tamaqua & Lansford (Pa.) Street Railway Co. new line to Mauch Chunk was opened for a 30-minute service about June 1st.

The Lackawanna & Wyoming Valley Rapid Transit Co's. system between Scranton and Pittston was opened May 20th. The run of 12 miles was made in 25 minutes with 5 stops. The third-rail electric system is employed for passenger traffic. For freight, which is hauled at night, steam locomotives are used. Work on the extensions between Scranton and Carbondale, and Pittston and Wilkes-barre is being pushed. The company owns its private right of way. The entire cost of the road will be \$12,500,000.

The first car on the new line which connects Florence, Neb., with Omaha made the round trip May 23d with Mr. F. A. Tucker, superintendent of the Omaha Street Railway Co., as the only passenger. A 30-minute schedule has been established.

The Rapid Railway Co., of Cincinnati, now a part of the Interurban Railway & Terminal Co., ran its first cars to Mason, O., May 23d. There was a celebration at Mason and everybody was given a free ride.

The Milwaukee Electric Railway & Light Co., on May 22d, sent one of its new interurban cars over the new Waukesha Beach line, via West Allis and Hales Corners. The regular schedule will go into effect July 1st. The first car on the Milwaukee, Racine & Kenosha division was sent over the line June 4th.

The Elgin branch of the Aurora, Elgin & Chicago Railway Co. was opened May 26th, thereby completing the road. Trains will run between Wheaton and Chicago every 15 minutes, with half-hour schedules on the Aurora, Batavia and Elgin branches. Arrangements are being made to give express service on the Metropolitan West Side Elevated from W. 52d St. to the Union loop in Chicago.

The Pan Handle Traction Co., of Wheeling, W. Va., began to run through cars to Wellsburg May 30th. The line was opened May 24th, but it was necessary to transfer once en route.

The Lancaster (Pa.) & Rocky Springs Ry. was opened Sunday, May 24th. Rocky Springs is a pleasure resort on the Conestoga River.

The first car over the Hamilton, Glendale & Cincinnati Traction Co's. line, May 25th, was greeted by a display of fireworks upon its arrival in Hamilton. The regular schedule was adopted June 1st.

The Indianapolis & Eastern Railway Co., on May 27th, completed the connecting link between Indianapolis and Richmond, Ind., entering the latter city over the Richmond Street & Interurban Railway Co's. line. Through service has been established. The line is 70 miles long.

The Webster (Pa.), Monessen, Bellevue & Fayette City Street Railway Co's. line was opened from Monessen to Bellevue May 30th. The Webster end of the road was completed June 15th and it is expected to have the entire road in operation July 4th.

The Pittsburg, McKeesport & Connellsville Railway Co. placed in operation the division between Connellsville and Uniontown June 1st, and the division between Scottdale and Mt. Pleasant is completed. The company now has in operation in the coke region 62 miles of road. The Pittsburg Railways Co. has placed in operation its Charleroi division between Allenport and Riverview, 12 miles.

The Birmingham Railway, Light & Power Co. established its electric car service between Birmingham and Bessemer, Ala., June 2d. Heretofore a team dummy was used.

The Cincinnati & Eastern Railway Co. sent the first car over its new line to Bethel, O., June 1st.

The Utica & Mohawk Valley Railway Co. has opened its new line to Rome, N. Y., the official trial being held June 9th.

The Grand Rapids, Grand Haven & Muskegon Railway Co. planned for a celebration at Grand Haven on or about June 15th,

when it was expected the first car would enter Grand Haven. The city contributed toward the celebration and The Press Newsboy Band was retained to accompany the special train on the initial trip.

The Columbus (O.) city division of the Urbana, Mechanicsburg & Columbus Electric Railway Co. was opened June 6th. This is the sixth interurban to enter the city.

The first regular service of the Montreal Terminal Railway Co. was inaugurated June 3d. Power is supplied by the Shawinigan Co.

The Northampton Traction Co's. new line from Bangor, Pa., to Easton, 25 miles, is in operation.

The Western Ohio Traction Co's. line has been completed between Lima and Piqua. It is now possible to run electric cars from Cincinnati to Toledo, the Cincinnati, Dayton & Toledo forming the southern connection, and the Toledo, Bowling Green & Southern the connection at the Toledo end.

June 7th the Woronoco Street Railway Co's. new line between Westfield and Holyoke, Mass., was traversed throughout its entire length for the first time by officials and invited guests and it was announced that it would be open to the public as soon as the railroad commissioners made their official inspection.

THE NEW CAR WORKS AT PEORIA, ILL.

The Peoria Car Co., incorporated with a capital of \$1,000,000, as noted in the "Review" for May, 1903, plans to erect at Peoria, Ill., one of the most modern and completely equipped car building plants in the country, to be in operation and ready to deliver equipments by Feb. 1, 1904. Peoria is practically in the center of the United States; it is situated upon the Illinois River and is reached by 15 railroads, so that in point of shipping facilities the location of the new plant is ideal. In addition, raw material rates are low, fuel cheap and skilled labor abundant at reasonable rates, all of which combine to give the company advantages not to be found in many sections of the country.

Mr. A. L. Jacobs, until recently superintendent of the Niles Car & Manufacturing Co., and who has had 20 years' experience in car building, is general manager of the new company, and associated with him are men of high standing and practical business experience. When Mr. Jacobs was with the Pullman Co., he built the original electric car equipped with Vanderpoole motors set on the front platform and operated by sprocket wheel and chain. He recently designed and built some of the Aurora, Elgin & Chicago Railway Co. cars, which have been highly commended. Among other designing and building work with which he has been concerned were cars for the Rockford, Beloit & Janesville Railroad Co., the Trenton & New Brunswick Railroad Co., Louisville, Anchorage & Pewee Valley Electric Railroad Co., Western Ohio Railway Co., and the Interurban Construction Co., of Alliance, O. All these bespeak a high grade of skill, which Mr. Jacobs hopes to surpass when the new works are completed.

It is understood that the new company has been assured of a large number of orders, which will keep the works busy from the outset.

CONTACT DEVICE FOR TROLLEYS.

A contact device for trolleys has recently been invented by Mr. Charles L. Fitch, of Grand Rapids, Mich., which is designed to be attached to the fork of a trolley harp and which contains an easily detached revolving part which bears lightly against the trolley wheel. The device contains a roller adapted to travel in the groove of the trolley wheel, and this roller is supported on spring arms the lower ends of which are fastened to the trolley harp and the upper ends are bent inwardly to form journals for the roller and to hold it in yielding contact with the trolley wheel. Another modification of this device consists in substituting a ball for the roller, the ball being held in contact with the trolley wheel by means of a spring the lower end of which is fastened to the trolley harp and its upper end formed into a ring in which the ball rests. By means of these arrangements the current is transferred to the trolley pole and the liability of arcing is reduced to a minimum. The advantage claimed for this device is that the ball or roller may be replaced on the road in a few moments' time while where washers are used the car has to be taken to the barn and considerable time spent in replacing worn out washers. Mr. Fitch's device is at present being tested on some of the cars of the Brooklyn Rapid Transit Co.

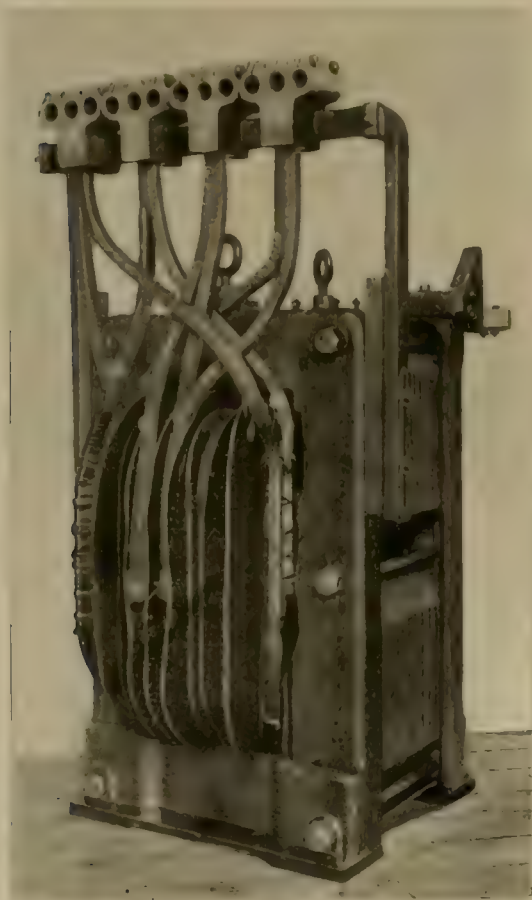
WESTINGHOUSE SELF-COOLING TRANSFORMERS.

The most successful transmission of high voltage current over long distances has been made possible by the use of high voltage transformers, and at these the oil insulated self-cooling type ranks most important at the present time. The accompanying illustration shows the interior of a Westinghouse transformer of this type. The many advantages of oil insulation have made it almost essential for high voltage transformers while the great heat conducting power of oil also serves to keep down the temperature. Both the high and the low tension windings of these transformers are divided into a number of flat coils. The high tension conductor is a flat copper ribbon wound concentrically with only one turn per layer. These layers are separated from each other by a specially prepared insulating material and the coils are insulated individually and are separated by heavy insulating washers. The low tension winding is of the same

brought out from the high tension windings for three lower voltages and is made up of duplicate transformer at both ends of the transmission line. The tap of the lowering transformer is accommodating them to the reduced line voltage. These machines are made in sizes from 10 to 500 Kw.

SAFETY STOP FOR MOTORS.

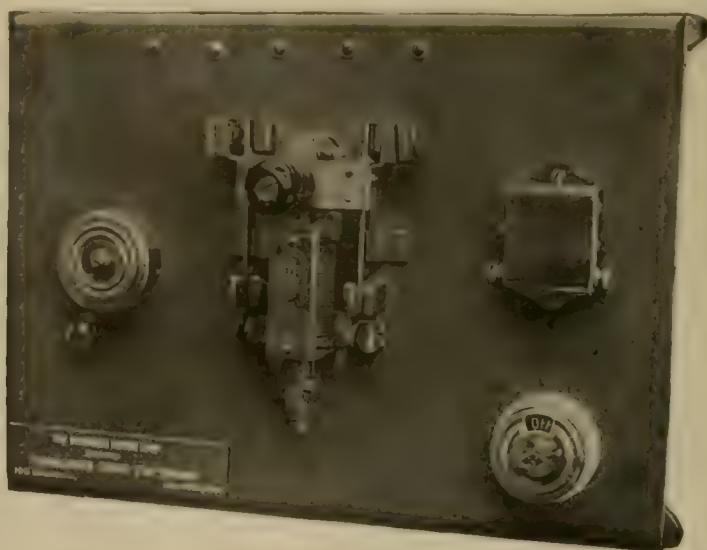
It is only necessary for one to recall the frequency with which serious accidents due to bursting of flywheels are reported to appreciate the need of providing power plants with the most efficient safety devices that are available. The field for the application of emergency stopping apparatus to other than prime movers is also wide. The increase in the use of electric motors for power purposes has produced a unique but an exceedingly practical device for a quick stop in the case of accident. For several years the Consolidated Engine Stop Co. has been installing the "Monarch" engine stop and speed limit system in a great many of the largest plants in all parts of the country where steam is used for power. The latest addition to the company's speed limiting and quick stopping device is known as the "Monarch" motor stop, and places an electric motor, or a motor-driven machine, under absolute control from any part of the factory. The new apparatus gives the company a system of power control and speed limiting devices designed



WESTINGHOUSE TRANSFORMER.

general design the conductors being of a rectangular cross section. By this method of winding the total electro-motive force of the transformer is divided among a number of coils and the pressure between the layers is reduced to that of a single turn. The provision for free circulation of oil between the coils and the transformer is very important, as its absence permits the interior to attain a temperature much higher than that of the exterior, sometimes resulting in the destruction of the insulating material by unequal expansion. For this reason oil passages between the coils and the iron are arranged so that when the transformer is operated a circulation of oil is set up directly through the interior of the winding. These transformers are mounted in heavy sheet iron cases protected by an outer frame work of angle iron. A large surface area is required to dispel the heat generated in the transformer and for this reason the surface area of the case is increased by making it corrugated.

The transformers may be wound for practically any voltage desired but the following voltages have been adopted as standard: 2,200, 6,000, 11,000, 16,500, 22,000, 33,000 and 44,000. Taps are



MONARCH SAFETY MOTOR STOP

to meet every condition of need or desire for electrical as well as steam driven machinery.

The "Monarch" engine-stop and speed limit system is applied to an engine not only to prevent "racing" but also to provide means for stopping the engine from any point, or any number of points in the plant, in the case of accident to an employee or to the machinery, and the motor stop is designed to do the same for the electrically driven machinery.

Snap switches of the improved dial pattern are placed at different points wherever desired, and one turn of the switch operates a separate battery system which throws the main switch at the board. A bell in the office or engine room, or any part of the plant desired, immediately rings a warning so that the person in charge may know that the power has been shut off. The switches are installed so as to be available for immediate use, yet protected from meddlesome and unauthorized employees.

The switchboard itself is of marble or slate and carries a testing apparatus as well as the main switch. The board may be used as a main switchboard, or placed in the office or other part of the plant and used only in emergencies.

The claims to which the company directs special attention are as follows: The apparatus can be tested from the switchboard to detect low battery power or short circuits. The system of wiring, which is patented, is so simple that chances of trouble with it are extremely remote. The cost of the apparatus is infinitesimal compared with its conveniences and accident-preventing features. The

"Monarch" motor stop can be connected to any size of motor and for any current. It will stop a machine under load in from two to five seconds. It can be applied to protect the whole line, or a limited number of motors, to a single motor.

DEMONSTRATION OF ECLIPSE CAR FENDER.

A remarkable test of the efficiency of the "Eclipse" car fender was made on May 22nd, near the 52d St. shops of the Brooklyn Heights Railroad Co. in the presence of several electric railway officials connected with the systems in Brooklyn, New York and adjacent cities. The inventor of the fender, Mr. Benjamin Lev, stood in the center of the track and permitted himself to be struck by the fender while the car was moving at speeds of 6, 12 and 20 miles an hour. This last speed was vouched for by officials of the Brooklyn company. In each case Mr. Lev was instantly picked up by the fender and carried without injury until the car could be brought to a stop. After the series of tests Mr. Lev pronounced himself unhurt and stated he had suffered in no way from the shock. A series of microscope pictures were taken during the trials and show plainly the



TEST OF ECLIPSE FENDER.

position of the fender and the person struck at each instant of the experiment.

At the conclusion of the tests the fender was tried with a bag of sand and shavings on the track and demonstrated its ability to pick up small objects as well as larger ones.

The "Eclipse" fender comprises a flat apron extending across the width of the track, pivoted below the center and normally carried at an angle of 45 degrees to the plane of the roadbed. The lower edge of this apron is protected by a heavy rubber hose designed to strike between the ankle and the knee of any person standing or moving upon the track. Upon coming in contact with an obstruction, such as a person, the apron releases itself and drops back forming a basket or scoop into which the person is thrown and from which it is claimed the object struck cannot be released until the car stops. A buffer of plate steel springs behind the apron is designed to break the force of the blow and prevent injury to the head and shoulders of the person struck.

The fender is made and sold by the Eclipse Car Fender Co., 267 St. Clair St., Cleveland, O.

METHOD OF DRYING TRANSFORMERS.

In a paper on "Transformers for High Voltage Transmission Lines," by J. W. Farley, read before the 13th annual convention of the Canadian Electrical Association recently held in Toronto the author described an interesting method of drying out transformers at the place of installation immediately before the oil is placed in the cases. The example mentioned was the case of a number of transformers which were shipped to Montreal and Shawinigan Falls. These transformers left the United States in December and arrived in Canada in one of the coldest periods of the winter. Before they arrived at their destination the weather suddenly moderated and the atmosphere was heavily impregnated with moisture. The transformers, however, were at a temperature many degrees below freezing point and on being unpacked were found to be entirely covered with a white frost to a thickness of from 1/2 to 1 in. The frost gradually melted leaving a considerable amount of water throughout the transformers.

As soon as possible the transformers were placed in their cases without oil and the tops put in position. The low tension windings were short circuited with the high tension winding. Thermometers were placed at those points which might be expected to develop the

highest temperature under these conditions of heating. The thermometers were very carefully watched and the current was so regulated that the actual maximum temperature remained in the vicinity of 100° C. At this temperature both oil and water vapors were thrown off in great quantities.

Energy at 500-volts direct current was available and electric heaters accommodated to this voltage were made. These heaters were enclosed in sheet iron boxes and connection was made between them and an opening at the bottom of the transformer case by means of ordinary stove pipe. The heaters delivered a large volume of air to the transformers heated to a temperature of almost 200° C. Baffle plates were placed inside the transformer cases so that the hot blast would not blow directly against either the coils or the insulation. The hot air rose from the bottom of the case to the top escaping from an opening left in the cover. The circulation of dry air tended to remove from the inside of the case the vapors expelled from the interior of the transformer by the heat generated there. This process was continued for several days and measurements of the insulation resistance were taken from time to time until the results showed that the transformers were in better condition than they had been when they left the factory.

While the transformers were still hot the oil was placed in the cases and an increased current circulated through the windings. The amount of this current was such that the heat generated in the windings was sufficient to maintain a fairly vigorous circulation of oil through the interior of the transformer. No trouble was encountered in bringing the transformers up to a full voltage for the first time and nothing has since arisen which indicates that the installation is in any other than first-class condition.

BARRETT JACKS.

Editor "Review":

Last month we were granted a permanent injunction restraining the Buckeye Jack Manufacturing Co., agent et al., from selling their product, which is an imitation of the Barrett jack, by fraudulent methods, such as using our advertising matter, and our catalog, verbatim, even to the using of the same type. These makers of imitation jacks have gone so far as to attempt to sell their product, as being the original Barrett jack, and the court has emphatically enjoined them. In all these instances we have received a broad injunction by the United States Circuit Court of the Southern District of New York. Judge Lacombe was emphatic in his order restraining these people, and the decision was arrived at without leaving the bench, in 15 minutes.

The court's order restrains "the sale or shipment of the so-called Buckeye jacks, or of any other jacks, upon orders solicited, received or taken by the said defendants for Barrett jacks, and from making any statements or representations which might be calculated to mislead the trade or the public into the belief that such jacks are the Barrett jacks manufactured by the said complainant herein, and from making any statements or representations that the jacks sold or offered for sale by the said defendants are Barrett jacks or are the product of the said complainant herein, unless that be the fact, until the further order of this court."

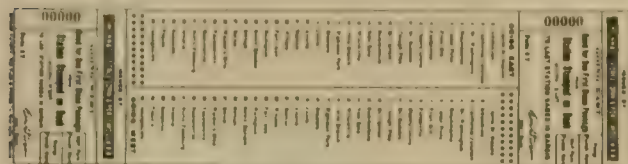
The makers of imitation Barrett jacks, on which the patents have expired, can only manufacture a few sizes of the same, and the patents on the other sizes of Barrett jacks are still good.

The Duff Manufacturing Co.

The Illinois Valley Traction Co. is installing a block signal system on its Ladd-La Salle division.

THE MOHAN PATENT RAILWAY TICKET.

The Farr & Foster Co., 186 E. Jackson Boulevard, Chicago, has been appointed sole agent in the United States for the Mohan patent railway ticket, a sample of which is reproduced herewith reduced in size, the original being $2\frac{3}{4} \times 10\frac{1}{4}$. This ticket is being adopted by interurban electric roads having fixed stations at which ticket agents are employed. It was designed by Mr. J. E. Mohan, stationer of the Michigan Central located at Detroit, to simplify the passage ticket system and prevent manipulation. It is what might be termed a double-headed ticket. A contract coupon is printed at each end, between which in duplicate columns are shown the stations in geographical order, those in one column being arranged one line below those in the opposite column. Station numbers appear opposite the



MOHAN RAILWAY TICKET.

names. The direction of the station from the issuing point is indicated in each coupon and at the top of first and at the bottom of the second column by the words, "Going West"—or north, or east, or south, as the case may be. In the selling of the ticket it is cut horizontally at the destination point with a straight edge cutter. Thus cut, a complete ticket, from the issuing station printed in the contract coupon to the last station named in the margin, is produced without the use of pen and ink. That portion of the ticket reading in the opposite direction, but which by the grouping of the stations also shows the destination to which it is cut, is retained by the agent. On the round trip form all that is necessary is to fill in with a pen on the "going" coupon the number of the station to which the ticket is sold; the return portion of the ticket shows the printed destination.

The cutter used in connection with this ticket is a simple device. It consists of a soft-metal base, $2\frac{1}{2} \times 5 \times \frac{1}{8}$ in., beveled edges, with a thin steel cutter, $\frac{3}{4}$ in. wide, securely fastened on top, and with a back-stop guide. The cutter is attached to the ticket counter. Following are the principal meritorious features claimed for the new ticket:

It takes the place of all card and book forms, thus reducing the number of forms of local tickets to a minimum.

It leaves with the selling agent a stub for every sale, showing the name of the station to which sold, making it possible at all times to make a quick and thorough check of offices.

Its value cannot be raised, nor can it be manipulated without detection.

It can be issued as quickly as a card ticket and much more so than the ordinary book forms.

The ticket stock supplied to offices is reduced to the actual requirements—no dead stock need be carried.

The Farr & Foster Co. was incorporated in November, 1902, being organized chiefly for printing street railway and interurban tickets. Its officers are as follows: President, R. N. Baylies; vice-president, F. N. Baylies; secretary and manager, Eugene H. Farr; treasurer, W. W. Foster. Mr. R. N. Baylies is president of the Rockford (Ill.) & Interurban Railway Co., formerly the Rockford Railway, Light & Power Co. Mr. F. N. Baylies, his son, was until recently the superintendent of the Rockford & Interurban Railway Co., but now devotes his entire time as traveling representative of the new company. Mr. Farr was with Poole Brothers for nine years in the ticket and ticket supply departments. Mr. Foster is an Iowa man.

At 186 E. Jackson Boulevard, Chicago, the company has a complete plant for the manufacture of local card, book and coupon tickets, mileage and commutation books, conductors' cash fare receipts, etc. In addition, it has an outside factory for the manufacture of ticket cases, map cases, tariff files and office cabinets, conductors' ticket punches, station dating stamps, cap and coat badges and buttons, brass and card baggage checks and tags.

The company makes a specialty of supplying new roads with complete outfits, or overhauling those of old roads, submitting a complete system of tickets, record books and blanks.

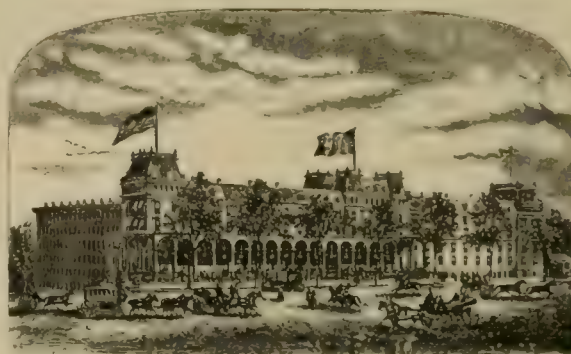
BLOCK SIGNALS.

The American Automatic Switch & Signal Co. was incorporated last April to manufacture the electrically-operated block signal patented by Robert Skeen and has opened an office at 84 La Salle St., Chicago, room 507. This signal is in successful operation upon a section of the Chicago & Joliet Railway Co.'s system, it is stated, and has also been adopted elsewhere. It is operated by the trolley circuit and it is claimed for it that it will operate with a car running at 60 miles an hour with absolute certainty. The signal mechanism is enclosed in a box and red and white lights are used in conjunction with semaphore signals, or either can be used separately. It is stated that the chief engineer of the American Railways Co., A. S. Kibbe, recently made a thorough test of the new switch and signal and pronounced it the best he had seen. The company proposes to manufacture the apparatus upon an extensive scale. Martin B. Madden, president of the Western Stone Co., and a director of the Metropolitan Trust & Savings Bank, Chicago, is president of the new company and Mr. Skeen is manager. The device is thoroughly covered by patents.

CONGRESS HALL, SARATOGA SPRINGS, N. Y.

Congress Hall, Saratoga Springs, N. Y., one of the renowned hostleries of the world, accommodates comfortably 1,000 guests. It is conveniently located on Broadway in the center of the fashionable part of the village, midway between the celebrated Congress and Hathorn Springs, being one minute's walk from each. The main structure faces Broadway and extending from it toward Putnam St., in the rear, are two wings, each 300 ft. long, one extending from the end of the building and the other from the center, the shape of the entire building resembling the letter F.

On the Broadway front is a fine promenade piazza, 250 x 20 ft., and at the rear of the hotel, between the wings, another piazza overlooks an interior park, which is much appreciated by the children as a playground. The north wing commands an excellent view of Hathorn Spring, while from the south wing a picturesque view of Congress Spring and Park may be obtained. The walls of the hotel are 20 in. thick, hollow in the center, thereby securing protection



CONGRESS HALL.

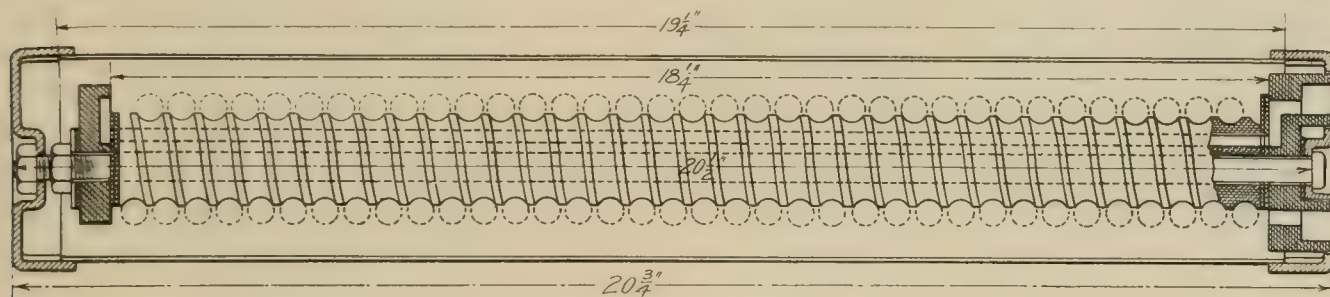
from the summer heat. In the cool days of summer and early autumn there is steam heat in all the apartments, with grate fires in the halls and public rooms. To prevent the spread of fire massive fireproof walls extend from cellar to roof, the openings being protected by iron doors.

On the opposite side of Spring St., upon which the north wing faces, is the ball room structure, connected with the hotel by an ornamental iron bridge, which, when illuminated by colored lights, presents an unique and attractive appearance. It is the largest and most handsomely decorated ball room in the village and between its walls have occurred some of the most brilliant events known in the history of Saratoga. A fine orchestra provides morning and evening concerts daily, with hops in the ball room twice weekly. The hotel is equipped throughout with all the modern improvements, and the cuisine is far-famed.

Special rates will be made to those attending the street railway conventions in September next.

NEW ELECTRIC HEATER FOR CROSS SEATS.

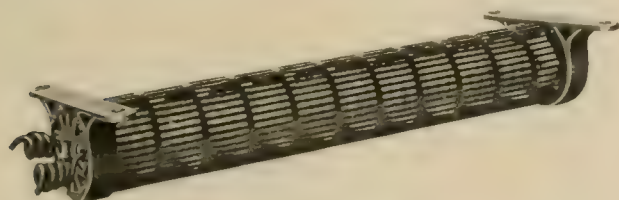
The Consolidated Car Heating Co. of Albany and New York, has developed a new type of electric heater in response to the demand for a small efficient heater suitable for cross seat cars. With this new type, all lead wires are brought out at one end of the heater and are then carried in molding along the side of the car; there are, therefore, no wires carried along the seat frame. The hole in the porcelain spindle, through which the supporting rod runs, is set a little off center and this gives sufficient space for a small hole through the porcelain to run a bare copper wire, which is connected at one end to the heater coil and at the opposite end to the lead



CROSS SECTION OF CROSS-SEAT HEATER.

wire. The total length of the heater is $20\frac{3}{4}$ in. and the diameter is $1\frac{3}{4}$ in. The type has been named "Heater No. 192." As evidence of the probable popularity of this new pattern, it is stated that this type of heater has recently been ordered by a large road for 515 cars.

In speaking of the advantages claimed for this style of heater, a representative of the Consolidated Car Heating Co. draws attention to the following features: "The heater spindle on which the coil



CROSS-SEAT HEATER.

is wound is 50 per cent longer than the spindle of many of the cross seat heaters now in use, and the current consumption in watts per inch in length is about half that of the heaters now used. This absolutely prevents the overheating of seats, but of course necessitates the use of a few more heaters per car. In some cases heaters have been put out by another company with the lead wires brought out at but one end. In such cases it has been necessary to use two parallel rods, one coil to each rod, and these coils joined at one



END OF CROSS SEAT HEATER

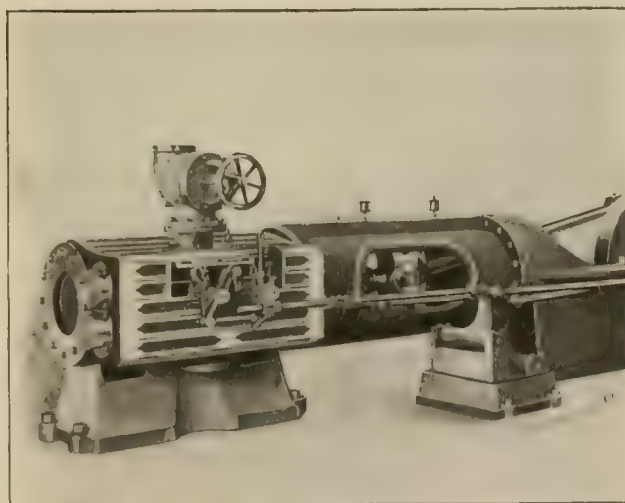
end of the heater. At the opposite end of the heater, the two coils are connected to two lead wires. There is, with such an arrangement, the full difference of potential between the two coils, which invites short circuiting."

The recent order mentioned together with large orders for electric heaters from the Manhattan Railway Co., of New York, the Interborough Rapid Transit Co., of New York, and other prominent roads in the East, were closed by Mr. Cornell S. Hawley, general agent for the company with headquarters in the Park Row Building, New York City. Mr. Hawley's office has sold in the eastern territory during the year ended June 1st, 1903, more than 25,000 electric heaters.

FITCHBURG ENGINES.

The accompanying illustration shows a general view of the valve gear of the engines made by the Fitchburg Steam Engine Co., of Fitchburg, Mass. These engines can be run at any desired speed but are generally built for moderate speeds which can be increased or reduced to meet special cases without disadvantage to the engine. The entire cylinder is lugged and the cylinder heads are made with air spaces and are polished outside so as to prevent as far as possible all radiation as well as conduction of heat. The automatic cut-off is secured by the use of positive valve gear with independent steam and exhaust valves. An effective wrist plate cam valve motion is

used by this company which needs to be seen in order that its noiseless working, its extremely rapid opening and closing of valves and its simplicity may be fully appreciated. The company states that this device has been used for more than eight years on many hundreds of engines and that the wear is so slight that the first cams ever made are running today without the tool marks worn off them, though they have been running ten hours or more every working day since they were started. Steam being at both ends of each valve the unbalanced area of the small valve rod passing out to the cam has the effect of always keeping the long and easy curved side of the cam against its driving roll with no lost motion or noise so that as long as there is steam pressure in the steam chest the back side of the cam is of no service. The upper valves operated by the wrist



VALVE GEAR, FITCHBURG ENGINE.

plate control the points of admission and of cut off the latter being automatically varied by the regulator. The lower valves control the points of the exhaust release and closure which are adjustable when the engine is set up or at any time to meet the conditions under which the engine is to run. The governor used, which is covered by patents owned by the company, permits of variation in speed of from 60 to 350 r. p. m. by changing the arrangement of weights and springs. The regulation of this governor is such that electric railroad work and electric lighting may be carried on the same engine with entire success.

CONVERTIBLE CARS FOR AUSTIN, TEXAS.

The American Car Co. of St. Louis, has recently shipped eight convertible cars for use on the city line of the Austin (Tex.) Electric Railway Co., which also operates several lines running into the suburbs, including a line to the park and fair grounds under its control. It is an excellent field for electrical operations.

The new cars are of the regulation Brill convertible type, with the well known roof pocket storage of windows and panels. The length



CAR FOR AUSTIN, TEXAS, AMERICAN CAR CO.

over end panels is, 20 ft. 7 in., over crown pieces, 29 ft. 7 in. From end panel over crown piece is 4 ft. 6 in. The width over sills and sill plates, 6 ft. 10 in., and over the posts at the belt, 7 ft. 9 in. The corner posts have a thickness of $3\frac{3}{4}$ in. and the side posts, $3\frac{5}{8}$ in. Sweep of posts, 5 in. From center to center of posts, 2 ft. 7 in. The side sills are $5\frac{1}{4} \times 6$ in., plated on the outside with $\frac{5}{8} \times 6$ in. steel. Guard rails are provided on either side and when not in use are held under the water-boards by patented gravity catches. The interiors are finished in natural ash with ceiling of neatly decorated



INTERIOR OF AUSTIN CAR.

birch. The monitor deck has a clear interior width of 49 in. The spring cane seats are of the Brill patented revolving type. Other specialties of the same make with which the cars are furnished are, "Dumpit" sand boxes, "Dedenda" gongs, folding gates, radial draw bars, and ratchet brake handles. The trim throughout is solid bronze, and the locks, etc., are of generous proportions. The cars are mounted on Brill 21-E. trucks with 33-in. wheels, and a wheel base 7 ft. 6 in. Two motors are used, each of 25 h. p.

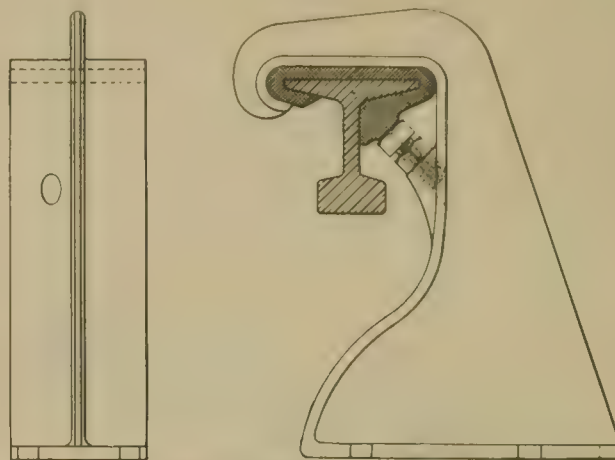
NEW TROLLEY GUIDE.

DERRAH'S OFFICIAL STREET RAILWAY GUIDE FOR 1903—253 pages. Compiled by Robert H. Derrah, 16 Beach St., Boston, Mass., and published by the J. K. Waters Co., 16 and 18 Beach St., Boston. This is the seventh edition of Derrah's well-known street railway guide to eastern New England. Mr. Derrah announces that this edition is more complete in every respect than any of its predecessors. The guide is not intended as a history or a geography; its object is to enable the passenger to learn what may be seen from the cars of the different lines described, to tell him how

to reach any place, to give the mileage, running time, fare and such additional information as will contribute to the enjoyment of the passenger and to the increase of pleasure travel on the electric railways. No part of the United States contains so much of scenic and historic interest accessible by trolley lines as the country around Boston and the system of electric railways in eastern New England has grown so that there is hardly a spot of interest that is not reached by the trolleys, and by a study of the information contained in Derrah's guide, intending tourists will undoubtedly be able to plan for many days of pleasant summer outings. The arrangement of the guide is practically the same as in former years with the exception that much new and valuable information and data have been added.

INVERTED THIRD RAIL SYSTEM.

A special type of underrunning third rail has been devised and patented by Messrs. Leonard Wheeler and John T. Murphy, formerly with the Aurora, Elgin & Chicago Railroad, and is shown in the accompanying illustration. This arrangement of the third rail has two principal objects, namely, the avoidance of troubles caused by sleet and safety. The contact shoes are supported in the usual position on the car journal boxes, the spring being arranged so that



INVERTED THIRD RAIL INSULATOR.

the pressure of the shoe is upward instead of downward. The insulator bracket consists of a cast iron piece as shown and the insulating material is divided into two parts so that in laying the rails or renewing worn out insulation the two parts of the insulator may be slipped onto the rail and pushed into position under the bracket, avoiding the necessity of slipping the insulation along the whole length of the rail or of uncoupling the rails to insert new insulation, as would be necessary if the insulator was made in one piece. It will be readily seen that in this position of the rail the problem of sleet is altogether avoided as the contact surface is on the bottom, and the problem of safety is met by painting the entire rail with the exception of this bottom contact surface with an insulating compound so that contact with any of the exposed part of the rail would be perfectly harmless. The insulation is held in position by means of an ordinary bolt and check nut, the end of the nut being inserted into a cored hole in the bracket, and the bolt is tightened by unscrewing the nut until the head of the bolt is wedged tight against the insulation. The simplicity and low cost of the insulator is one of its best recommendations.

The Louisville Railway Co. paid the city \$74,400 for franchise taxes for 1903, the largest individual tax ever paid in Louisville.

The conductors and motormen employed by the Winnebago Traction Co., Oshkosh, Wis., instead of organizing a labor union, have organized a mutual accident and sick benefit association. The company has agreed to furnish the services of a physician free. The officers of the new association are: President, Eugene Clark; vice-president, John Lentz; secretary, Martin Kitz; treasurer, Evan M. Griffith.

SOLIDIFIED OIL FOR ARMATURE BEARINGS AND CAR JOURNALS.

The new process of making solidified oil for lubricating purposes, now being extensively exploited by the Bruck Solidified Oil Co., of 256 Dover St., Boston, Mass., is attracting attention from practical electric railway men. Mr. Bruck, president of the company, reports



J. N. BRUCK.

a recent successful business trip through the East and Middle West and states he took orders for lubricants from electric railway companies in about 25 large cities.

From the statement of Mr. Bruck we quote the following:

"Solidified oil is not a saponified grease but a pure oil—a refined lubricating oil of the highest viscosity, low specific gravity, high fire test, and low cold test, and is supplied by us in a solidified form, convenient for use, economical, and especially adapted for railway purposes. Our process is new and does not destroy the lubricating properties of the oil by saponifying it; we do not saponify, and do not employ acids, alkalies or water, as is done in making greases, but instead, we turn out the solid product and guarantee it to be pure oil, and that it is not affected by heat or cold or destroyed by water.

"We manufacture solidified oil especially for electric car motors, journals and gears, and it is now being used on such bearings with perfect success both with felt wicking and saturated waste. The grade that feeds through felt wicking is unique—it feeds through the felt as well in the journal boxes as from the wells beneath the bearings of the motors, and not being affected by heat or cold works as well in winter as in summer weather. Our goods are in use on several thousand of electric cars in New England and New York, and some of the motors have made runs of from 10,000 to 16,000 miles with only a single application of the solidified oil, and the journals have run as high as 36,000 miles without replenishing.

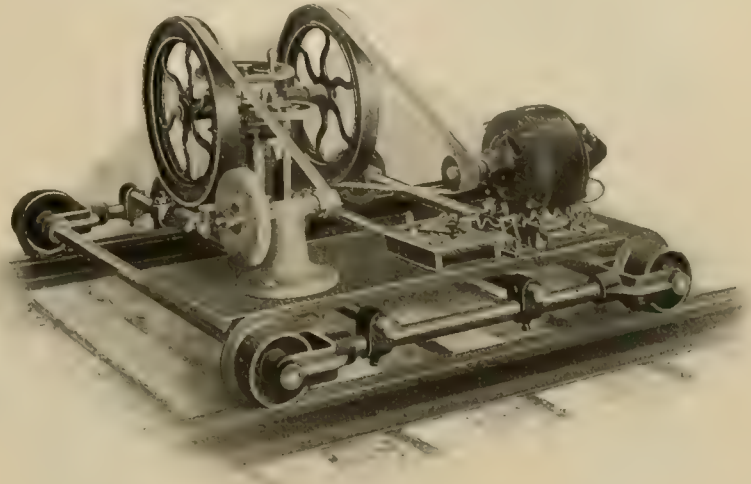
"We have a report from the Manhattan Railway Co., of New York, stating that on a test of solidified oil the boxes of a car were packed Nov. 5, 1902, and ran until May 2, 1903, without repacking. This is 178 days of service and the run was probably close to 36,000 miles."

CLEVELAND TRACK DRILLING MACHINE.

In the "Review" for February we illustrated the hand power drilling machine which is now known as the "Cleveland"; the accompanying engraving shows the machine in its improved form with motors for operating, which is claimed to be the most powerful, and best adapted for new construction work of anything of the kind yet produced. The drill can of course be operated by hand or other available power as well as by electricity. In case the motive power gives out the belt can be easily slipped off and the work continued by hand at almost no perceptible loss of time or power. In ordinary work the drill will cut a $\frac{7}{8}$ -in. hole through the web of a 70 lb. A. S. C. F. rail in 30 seconds.

The Ludlow Supply Co., of Cleveland, which is the manufacturer of the "Cleveland" track drilling machine, advises us that the sales

on the drill have been very large this season, many duplicate orders having been received. All the machines which have been sent out are reported as giving the best of satisfaction and as prompting letters of commendation confirming all the claims made for it. The machines sold this season for the most part are equipped with a drill grinder which can be operated by the same power as that driving the drill, the adjustment requiring but little time or work



CLEVELAND TRACK DRILL.

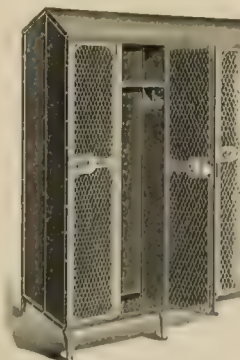
to make. This attachment overcomes one of the greatest drawbacks in this class of work as dull drills mean slow work and loss of both time and money.

Different types of the "Cleveland" drill will be exhibited at the A. S. R. A. convention in September.

The western agents for the Ludlow Supply Co. are Porter & Berg, Incorporated, of Chicago, and the Western Electrical Supply Co., of St. Louis.

STEEL LOCKERS FOR STREET RAILWAY USES.

The illustration shown herewith is that of a steel locker made by the Narragansett Machine Co., of Providence, R. I. The company makes a variety of styles of wooden and steel lockers, but this one, which is 12 in. square by 60 in. high, is said to be especially adapted to street railway uses. They are put together and locked at the corners with special cut steel plates forming the hinges and



STEEL LOCKER FOR MACHINE SHOP.

door stops and holding the lock. There are three hinges to each door and each door is stiffened by plates in the center. A three-bolt lock with over-lapping catch prevents prying open the door. The legs are strong as are the connecting bolts holding the sections together. The sheet metal slanting tops prevent things being put on top of the lockers and keep dust off the clothing. There are no unprotected short ends or corners. Not only are these lockers serviceable, but they are made in attractive designs, and of course, are fire and water proof. The Narragansett Machine Co. makes a specialty of this kind of work and has special facilities for doing it

TWO NEW PENNSYLVANIA LINES.

The Harrisburg & Lewisberry Street Railway Co., and the Star Street Railway Co., Pennsylvania roads controlled by the same interests, have each issued bonds to the amount of \$100,000 at 5 per cent, interest payable semi-annually. The Harrisburg & Lewisberry company is capitalized at \$50,000, and is under construction from New Cumberland, Pa., where it connects with the line from Harrisburg, to Silver Lake, running through New Market, Nauvoo, Yocumtown and Lewisberry. Silver Lake is 10 miles from Harrisburg and will be used as an outing resort. The company owns 126 acres adjoining the lake, which covers 44 acres. The officers of this company are: President, Jacob Foreman, Carlisle; vice-president, J. E. Phillips, York; secretary and treasurer, Harry Hertzler, Carlisle; general manager, H. W. Smith, Mechanicsburg. The directors include these officers and R. N. Stoneseiffer and N. A. Parks, of Lewisberry, and E. A. Lawton, of Carlisle.

The Star Street Railway Co. is building from Mechanicsburg through Koller and Shepherd's town, Bowmansdale, Siddonstown to Mt. Pleasant, a distance of 5 miles. The population contiguous to the line aggregates 13,000. At Mechanicsburg the road will connect with Carlisle and Harrisburg. The officers are the same for this company as for the other. The directors include the officers and Samuel Hertzler and E. A. Lawton, of Carlisle.

JIM CROW LAW INVALID.

The Supreme Court of Tennessee on June 6th, declared unconstitutional the "Jim Crow" law passed at the session of the Tennessee Legislature, recently adjourned. This law provided for the separation of white and colored passengers in street cars, being an amendment to an act passed at a previous session and applying to steam railroads operating within the state. The bill was stubbornly fought in the legislature, but finally passed as applying to the city of Memphis only.

The Memphis Street Railway Co. had violated the law and action was brought against the officials and the lower courts decided against the company, but this judgment was reversed and the indictment quashed against the company at the cost of the state.

The Court held in quite a lengthy opinion that the law in question was invalid because it did not in its title or body recite the title or substance of the act intended to be amended, but only referred to it by chapter and year. The court held that while by such reference the original act could be found and identified, it did not recite either the title or substance of that act, and reading the amended act alone no person could tell what the original act related to or contained.

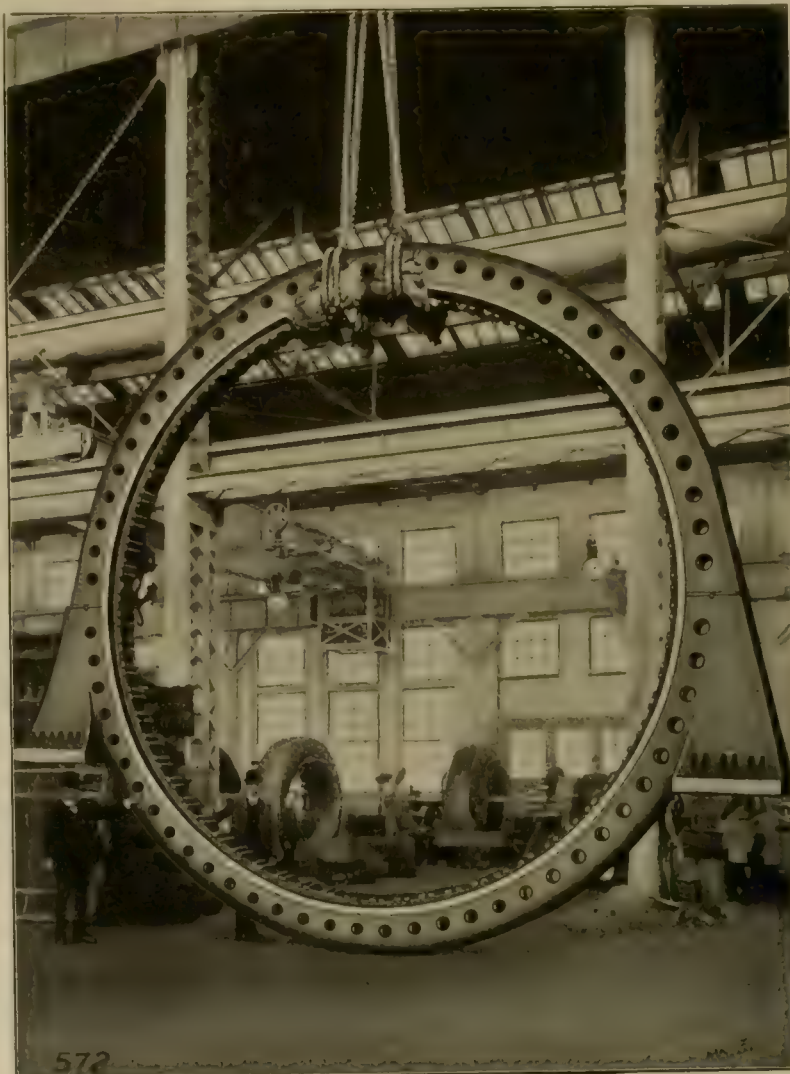
AN ECHO OF AN ACCIDENT.

Our readers may remember the account of the operations of the fake accident man by the name of Frank Lieblang, which appeared in our issue for September, 1900, page 497. The Cleveland City Railway Co. had become suspicious of Lieblang because of the number of accident claims in which he was interested and detailed one of its inspectors, J. A. Hosman, to investigate the matter. In the number of the "Review" already cited an account of Mr. Hosman's experiences in New York, Paterson and Detroit is given. He had secured employment from Lieblang and pretended to join the latter in his alleged scheme to defraud street railways. Aug. 27, 1900, Hosman fell from a car in Detroit, feigned injuries and was removed to a hospital. Lieblang on Hosman's behalf, effected a settlement with the Detroit company for \$200 of which Hosman received \$95. As soon as Hosman received the money he exposed the conspiracy and Lieblang was arrested. There was a failure to convict him, however, and sometime thereafter Lieblang brought suit for damages against the Cleveland Electric Railway Co. alleging

that the payment by the Detroit Company was a malicious one made at the instigation of the Cleveland Electric Railway Co. This case was tried May 14th last, the judge instructing the jury to return a verdict in favor of the company, as Lieblang's charges were unsupported by the evidence.

BULLOCK APPARATUS.

The accompanying illustration shows one of the most interesting types of alternating current machines recently installed by the Bullock Electric Manufacturing Co., of Cincinnati. The engraving represents the stationary armature of a 1,500-kw. three-phase generator operating at 100 r. p. m., and built for the Denver Gas & Electric Co. This machine is designed for 2,400 volts at 60 cycles. The generator is of fly-wheel type, the poles being put directly on the



BULLOCK THREE-PHASE GENERATOR.

rim of the flywheel. The inside diameter of the armature is 18 ft., the outside diameter being 23 ft. The armature is bar-wound, with two conductors per slot, each conductor consisting of three strips in order to prevent eddy currents in the bars.

The Metropolitan Street Railway Co., of Kansas City, Mo., recently tendered to the authorities of Kansas City, Kan., 100 acres of land for a park, in accordance with an agreement whereby the street railway franchises were extended. It was originally proposed to pay the city \$100,000. The ground selected is one-half mile beyond the city limit, on the proposed Ohio Ave. extension.

STRIKES OF THE MONTH.

The motormen and conductors of the Montreal Street Railway Co. struck May 23d, chiefly for "recognition of the union," and notwithstanding the fact that they struck last February and what was supposed to be a satisfactory agreement was then signed for one year. This time the company immediately posted notices that all employes who did not report at once for work were discharged; non-union help was obtained, even members of the Montreal Amateur Athletic Association volunteering, and several cars were run the first day. On the second day there was much rioting and eight people were hurt, and 15 persons, including the business manager of one of the unions, were arrested. A striking conductor was sentenced to jail for six months and fined \$25 for assaulting a non-union man and a striking motorman was fined \$50 for a like offense. There were riots and arrests every day, the company gaining meanwhile. May 28th the strike was declared off; the company did not recognize the union, but discharged 80 employes who were prominent in the strike.

May 5th a committee of the newly organized union of the employes of the Union Electric Co., Dubuque, Ia., waited upon the manager of the company, F. L. Dame, and presented the draft of a proposed contract, which the manager stated he had no authority to accept but promised to lay before his directors and give an answer within a week, which answer was satisfactory to the committee. Two members of the committee, who were the president and secretary of the union, had been discharged by the company some days previously for violation of rules, and on May 6th the other members of the committee made a peremptory demand for the reinstatement of these two men. The same day the local trades council made a similar demand and were notified that the matter would have to be referred to the directors. Between 5 and 6 o'clock the manager was notified that the two men must be reinstated by 8 p. m. or a strike would be called. The city failed to afford police protection and the company was able to operate cars for only about two hours when they were stopped by rioters. The engineers and firemen of both the railway and lighting power stations also went out but new men were secured in their places. The new firemen were driven from both stations but the company was able to keep the lighting plant in operation. After the strike began the company offered to arbitrate the matter of reinstating the two men but this was refused. Early in June the labor organizations of the city declared a boycott on two hotels because the manager of the street railway lived at one of them, and the other was operated by the same management; a livery stable in which Mr. F. D. Stout, president of the Union Electric Co., is interested and one other were also put under the ban.

Street car traffic was resumed June 11th with non-union men. June 16th the strikers made a demonstration that culminated in attacks by mobs on the power houses and car barn of the company. The mobs were dispersed by militia.

The Bridgeport, Conn., strike, referred to in the "Review" for May, 1903, seems to be settling itself, as did the Waterbury strike, but with less rioting and bloodshed. At the end of a week the service was re-established. The Connecticut Railway & Lighting Co. offered to increase the men's wages, but refused to "recognize the union." About 25 linemen quit work May 25th in sympathy with the strikers, but the company said their places could be easily filled.

The New York subway strike, mentioned in the "Review" for May, 1903, was officially declared off June 15th. The contractors obtained more men right along and the greatest trouble during the past two weeks lay with Italians, who asked to be taken back, but were refused. Riots ensued and one day 23 were arrested. Some men were taken back at the old scale of wages.

May 29th the firemen employed at the plant of the United States Electric Co., Newark, N. J., struck for a shorter work day at the same pay. May 30th all but two or three of the 50 men at the North Jersey Street Railway Co.'s power house struck in sympathy and the trolley service was temporarily tied up. The strike was settled the same day by an agreement to divide the working staff into three shifts of eight hours each.

Ten men employed as repair men at the Hall St. barns of the Grand Rapids (Mich.) Railway Co. struck June 9th for \$1.75 per day instead of \$1.50. Six were discharged.

Armature winders and electricians employed by the Metropolitan West Side Elevated Railroad Co., Chicago, went on strike about

May 20th and May 20th 10 carpenters were discharged for refusing to take the places of others who had struck. June 5th the difficulties were adjusted.

May 20th the linemen employed by the Cincinnati, Newport & Covington Light & Traction Co. struck for \$2.50 per day of nine hours. After three weeks they went back to work at the old rate.

Six machinists employed by the Lake Street Elevated Railroad Co., Chicago, were called out May 20th to enforce the union's demands of 30 cents an hour for machinists and 35 cents for tool and die makers.

DAMAGE BY FLOOD AND HEAVY RAINS.

During the latter part of May and the first of June the Mississippi Valley was visited by unusually disastrous floods and rain storms. The loss of life was heavy and property damage considerable. The street railway companies in various sections suffered more or less loss, either in property or traffic. The Metropolitan Street Railway Co., of Kansas City, reported the most serious trouble. The flood struck the town May 30th, reached its height June 1st, remained stationary until June 4th, and June 11th had receded to below the danger line. All the bottom lands were flooded from 4 to 12 ft. deep and the water flowed at the rate of 18 miles an hour through the principal streets, washing out buildings and making deep channels. On James St., in the West Bottoms, is an old cable track with concrete foundation; the water washed out the street around and between the tracks, leaving them suspended for a distance of 35 ft. in one place, the earth being washed out under the tracks to a depth of 10 ft. Five bridges of the Metropolitan Street Railway Co. were washed out; 21,000 ft. of spans were lost and in nearly every instance the abutments and piers are either entirely gone or will have to be rebuilt. Four power houses were flooded. The Central Ave. power house of 4,800 kw. normal capacity was stopped May 30th when the wheels began to throw water; the Kaw River power house of 3,000 kw. capacity, a new one started this year, was stopped the next day and later both of these power houses became more than half submerged. Two smaller power houses were stopped the same day as the Kaw River house. The city water works were also disabled and the cable power houses, not having water, were compelled to shut down and May 31st, for the first time in the history of the company, every street car was stopped. Water was hauled from ponds to the power houses and June 1st the cable cars were operated again, with the exception of the 12th St. line, part of which runs through the West Bottoms and was submerged till June 7th. Some of the small reserve generators at the cable power houses furnished power June 2d for a few electric cars on the three trunk lines. June 8th the work of cleaning the machinery began. Mud of a gummy character had washed into every crevice and even steam gages with closely fitting glass covers were completely filled with it. The company is building pile trestles over the river to serve until permanent bridges can be erected. We are indebted for these particulars to Mr. W. O. Hands.

The Des Moines City Railway Co., of Des Moines, Ia., suffered severely from the floods. Mr. G. B. Hippee, general manager of the company, writes us that the city was completely without service two days, as the water was two feet over the power house floor, and part of the fields, the armatures and portions of the commutators of two 1,000-kw. machines were under water about 30 hours. The electric current was used to dry these out under the supervision of an engineer sent by the General Electric Co. In the meantime the road was operated with the old power plant and small machines.

The Topeka Railway Co., Topeka, Kan., lost its pile bridge over the Kansas River, which it had intended replacing with a steel one. Mr. L. E. Myers, vice-president of the company, writes that it also lost 1,000 to 1,200 ft. of 35-lb. T-rail track and that the overhead construction was damaged slightly.

June 3d the Mississippi reached a height of 21.8 ft. at Hannibal, Mo. and the city power plant from which the Hannibal Railway & Electric Co. takes its power was flooded and the railway company lost two days' receipts. It was necessary to start up the company's reserve plant. June 8th the water stood from two to four feet deep over a section of the line, preventing operation of about 1½ miles of track. For a quarter of a mile the road parallels the river and the manager, Mr. J. S. Mainland, writes that the desire of the people to see the flood kept the company's receipts up to standard.

The actual loss sustained by the Ottumwa (Ia.) Traction & Light

Co. was very slight. Mr. J. F. Springfield, the general manager, states, the greatest damage being to traffic, which was impaired a few days, and a slight cost for repairing the tracks in a few streets where the water was highest.

Oklahoma City, Okla., was visited by the heaviest rainfall ever known in that region May 23d-24th. Street railway traffic was suspended, the power house being partially submerged.

During a severe storm June 8th the lightning burned out all but one of the dynamo machines in the power house of the Eastern Ohio Traction Co., at Chagrin Falls, O. Passenger and freight traffic were badly crippled in consequence.

A cyclone visited Spartanburg County, South Carolina, and northern Georgia June 2d and caused damage to street railway property amounting to \$40,000. The North Georgia Electric Co., which owns the Gainesville & Hall County Street Railroad Co., lost several cars.

The overflow of the Mississippi River at East St. Louis was exceptionally heavy and street railway connection between East St. Louis and St. Louis had to be abandoned. Venice, a suburb, was almost entirely submerged, in some cases to a depth of 20 ft.

EXTENSIONS OF THE HUNTINGTON SYSTEM.

A new company known as the Los Angeles Interurban Railroad Co. was incorporated June 5th by interests identified with the Huntington-Hellman syndicate with the object of extending the interurban lines out of Los Angeles into entirely new territory in southern California. The company has a capital stock of \$10,000,000 and its purposes and operation will be similar to those of the Pacific Electric Railway Co. The directors of the new company are George E. Pillsbury, George S. Patton, J. A. Muir, S. C. Baxter, Epes Randolph, John D. Bicknell and Howard E. Huntington. It is stated that Mr. Huntington's plans for the extension of trolley lines in California contemplate an expenditure of \$30,000,000. The Pacific Electric Railway Co. has spent nearly \$10,000,000, the new company is organized to spend \$10,000,000 more and a third company will probably be organized in the future to spend another \$10,000,000.

The Los Angeles Interurban Railroad Co. will build 350 miles of double track covering 175 miles of territory. When the line now building through Whittier is completed the Pacific Electric Railway Co. will have almost 100 miles of double track making 275 miles of route in operation and contemplated. The new company proposes to build electric lines through the La Habra Valley, also to Redlands and Riverside with a branch to Colton, San Bernardino and by Highlands to Redlands. Another branch will run to Randolph and Santa Ana, thence to Newport Beach and northwest to a junction with the Pacific Electric line thus reaching Los Angeles. Another line will be built from this branch to Alamitos and Artesia, thence to Los Angeles. A line will be built through San Fernando to Santa Barbara, another through Glendale to Burbank and one to Ontario by way of Covina. Several of these routes have already been surveyed under the direction of the Pacific Electric Railway Co. but Mr. Huntington states that this company has all it can well look after now and if enlarged it will become too unwieldy. For this reason a new company was organized to carry on the extensions and perfect the plans which have been under consideration for a long time.

STANDARD CONDUIT EXHIBIT.

The Standard Vitrified Conduit Co. had a very attractive exhibit of its conduits at the Auditorium Hotel, Chicago, Ill., during the convention of the National Electric Light Association, held last month. The exhibit was in charge of Mr. B. S. Barnard, vice-president and secretary of the company. The new factories of this company at South River, N. J., are now in full operation, in addition to the old factories, and have a daily capacity of multiple and single duct conduits claimed to be equal to the entire demand of the United States, and after July 1st the company can supply the world. The company reports having secured practically all of the orders for conduit in New England this season, and the greater part of the orders east of the Ohio River. Upwards of 1,000,000 ft. of conduit was recently purchased through it for Salt Lake City, Utah, by the Stromberg-Carlson Co. This will be shipped from western factories, the Standard company being in a position to supply conduits in any part of the United States. Another late order was for one-

half million ft. for Memphis, Tenn. Among the corporations well known in the trade that are using the company's product this season in large quantities are: Philadelphia Rapid Transit Co.; Bell Telephone Co.; Rapid Transit Subway Co., New York; Metropolitan Traction Co., New York; Brooklyn Rapid Transit Co.; Boston Elevated Railway Co.; Springfield Street Railway Co., Springfield, Mass.; Mobile Light & Railroad Co., Mobile Ala.; Consolidated Subway Co., New York; Niagara Falls Power Co. The company also reports a very satisfactory business in third rail insulators. Engineers interested in conduits will be granted the privilege to visit the factories, which are not affiliated in any way with the so-called trust or combination. The company's catalog is among the finest books published on conduits and is strictly up-to-date with any new suggestions, especially on manhole construction.

MACHINERY FOR PHILADELPHIA SUBWAY.

Westinghouse, Church, Kerr & Co. recently closed a contract with the Philadelphia Rapid Transit Co. covering 15,000 kw. of steam turbines and approximately 50,000 kw. of electrical generating and converting machinery for the new rapid transit subway and elevated system under construction, and for a large amount of transforming and converting machinery. Steam turbines will be used exclusively for power generation at the new central station. There will be three turbines, each of 5,000 kw. normal capacity, connected to Westinghouse 3-phase 25-cycle generators and the units will run at 750 revolutions per minute with 175 lb. of steam, 27½ in. vacuum, and possibly 100 to 150° of superheat. The three will operate in multiple upon a common bus bar and power will be distributed at a potential of 13,000 volts.

The new power station will be located upon the Delaware River, near the foot of Green St., and is laid out for an ultimate capacity of 50,000 kw. The new rapid transit system will cover the Philadelphia business district and includes a subway about 1¼ miles long.

The Winnebago Traction Co. management is instituting a number of improvements in Electric Park, Oshkosh, this season, including a cage of monkeys, an imitation rock mound for the electric fountain and a biograph for the summer theater. The entire railway system is being put in good shape for the summer.

ADVERTISING LITERATURE.

THE ELECTRIC STORAGE BATTERY CO., of Philadelphia, has issued bulletin No. 78, for May, 1903, treating of installations of "Chloride Accumulators" in the stations of the Edison companies of New York, Chicago, Brooklyn and Boston.

THE H. W. JOHNS-MANVILLE CO., 100 William St., New York, has just issued catalog R. containing data, views and price list of asbestos roofings. The views show a number of manufacturing plants where these products have been applied.

THE NEW PROCESS RAW HIDE CO., Syracuse, N. Y., has issued a booklet, 3½ x 6 in., on "Noiseless Gearing," setting forth concisely and attractively the principal meritorious points of New Process noiseless gearing and pinions and their adaptability for use on electric railway motors.

THE WESTINGHOUSE ELECTRIC & MANUFACTURING CO., of Pittsburg, Pa., recently issued a 30-page pamphlet, 6 x 9 in., in its "industrial series," on "Electricity in Mining." It is freely illustrated and describes tersely a few of the uses of electrical machinery in mining and its advantages.

THE KINNEAR MANUFACTURING CO., Columbus, O., has just published catalog "L", 8 x 11 in., 52 pages, descriptive of the Kinnear steel rolling doors and shutters. It contains a large number of tinted half tones showing car and round houses here and abroad equipped with the Kinnear doors, as well as views showing the application of the Kinnear shutters to stores and office buildings. The construction of the appliances is also depicted.

THE KEYSTONE TRAVELER, which is the house organ of the Mayer & Englund Co., of Philadelphia, is out for May and will be sent free upon request to anyone interested in the electric railway business. The issue for May contains much valuable information about bonds, registers, fenders, third rail insulators, overhead material and other products of the Mayer & Englund Co., the whole

arranged in attractive form, with here and there a little nonsense to interest and please.

THE SPRAGUE ELECTRIC CO., New York City, has just issued catalog 306, 20 pages, 7 x 9 1/4 in., treating of Lundell fans. It is copiously illustrated and very neatly gotten up. These fans have been manufactured by this company a long time and are said to have been the first practical electric fans on the market. The standard of merit set up at the start has since been maintained.

THE ALLENTOWN ROLLING MILLS, Allentown, Pa., has issued bulletins Nos. 1 and 2 relative to the Aldrich vertical triplex electric pump and the Aldrich quintuplex electric pump, respectively. Each bulletin is 6 x 9 in., 8 pages, illustrated, and describes its subject clearly, yet briefly, giving tables of range of operation, details of construction and prominent features.

THE CINCINNATI MILLING MACHINE CO., of Cincinnati, is sending out the second series of "Examples of Rapid Milling." This is a 32-page pamphlet containing illustrations and data on 28 milling operations taken from actual practice and showing the class of work for which Cincinnati geared-feed millers are adapted. It is issued for free distribution among shop men with a view to giving instruction on the subject of milling and it is a valuable addition to shop literature.

THE NORTON EMERY WHEEL CO., of Worcester, Mass., has published in booklet form, 16 pages, 3 1/2 x 6 in., a reprint of an article by Mr. Charles H. Norton, of the Norton Grinding Co., entitled, "A Few Points on Grinding." It treats of grinding and its possibilities when used in conjunction with proper grinding machines and grinding wheels. Mr. Norton has given 16 years to the exclusive study of grinding and abrasives. The article will be of especial interest to metal-workers.

THE GENERAL ELECTRIC CO. has issued the following publications: Bulletin No. 4,318 (supersedes No. 4,275), "The C E Motor." Bulletin No. 4,320 (supersedes No. 4,238), "Railway Motor Controllers." Bulletin No. 4,319, "Continuous Current Two-wire Switchboards with Circuit Breakers." Bulletin No. 4,324, "C L Slow and Moderate Speed Motors." Catalog and Price List No. 7,578 (supersedes No. 7,528), "Parts of Carbon Feed Enclosed Arc Lamps for 110-Volt Direct Current Circuits."

THE UNDER-FEED STOKER CO. OF AMERICA, Marquette Building, Chicago, issued in May the first number of The Publicity Magazine, devoted to the interests of the Jones stoker. It is the outgrowth of the "Publicity" series of bulletins the company formerly published in leaflet form. It contains 16 pages of business announcements, interspersed with humorous selections, and is freely illustrated. The front cover is strikingly designed to represent the front of a boiler equipped with a Jones stoker.

THE AMERICAN CAR SEAT CO., Brooklyn, N. Y., has issued a 16-page catalog, 6 x 8 1/2 in., of car seats of all descriptions manufactured by it. Illustrations show the "Pushover" and stationary back seats in rattan and plush upholstery, "Pushover" slat seats with spindle and slat back, longitudinal seating, etc., as well as illustrating the method of upholstery and the different kinds of materials used in the general construction. Especial attention is called to the simple construction, excellent quality and low prices.

RIDLON'S REPRESENTATIVE for May is as bright and interesting as usual. One of the prominent features appearing this month in the pamphlet are some "leaves from prominent advertisers," showing how the Ridlon Co. could do things if the Wilson trolley catcher were a breakfast food, a ginger snap, a whiskey or a lamp chimney. These adaptations of well-known advertisements to the Wilson trolley catcher are worth reading and have to be seen to be appreciated. The issue of the Representative has been sent to electric railway companies in all parts of the world, but will be forwarded to any electric railway man who may have missed it.

THE JOSEPH DIXON CRUCIBLE CO., in the June number of Graphite, a readable little paper published in the interests of the Dixon specialties, reproduces an article from the pen of Mr. John A. Walker, the vice-president and treasurer of the company, in which he says: "With lead pencils we interest every man, woman and child; with crucibles, every man in the metal-melting business; with graphite for lubricating, every firm that runs machinery; with paint, all the building community; with stove polish, all the housekeepers, and from our standpoint we are having good trade weather, and the barometer points steadily and persistently toward the good." The company also issues a handy blotter, 3 1/2 x 6 in., one side of which is tastily ornamented and bears the monthly calendar.

THE BATES MACHINE CO., Joliet, Ill., is distributing its revised and enlarged catalog, 73 pages, 9 x 12 in., treating of the Bates-Corliss engine, comprehensively illustrated, and describing several recently installed gas compressing plants. This catalog is really a very fine thing. It is printed on heavily embossed paper, pica type is used throughout, with illuminated initial letters, and the views are nearly all full page, showing detail very clearly. There are many engine room views, including those of the Rockford (Ill.) Edison Co., Hampton Roads Railway Co., Heidelberg Roodeport Gold Mining Co., Johannesburg; E. L. Mansure & Co., Chicago; Chicago General Railway Co., and others. There are excellent views of the compressor rooms of the Fort Wayne Gas Co., the La Fayette (Ind.) Gas Co., and similar plants. Tables of sizes, indicated mean effective pressure, etc., are also given.

THE BRUSH ELECTRICAL MANUFACTURING CO., Ltd., with offices at 106 to 112 Belvedere Road, London, and works at Loughborough, Leicestershire, Eng., has begun the publication of a series of bulletins which are of value to those interested in electrical machinery. Bulletin No. 1 is on steam dynamos and describes the Brush high speed, double acting enclosed engines and dynamos for electric lighting, traction and power work. In this bulletin are illustrated two units, a 300-kw. three cylinder engine and dynamo and a 200-kw. two cylinder engine and dynamo set. The company makes these steam driven generator sets in sizes from 10 to 1,000 kw. Bulletin No. 2 describes and illustrates the Brush-Parsons steam turbo-generators which the company will soon be in a position to supply in such sizes as may be desired up to 10,000 kw. Both of these pamphlets are very handsomely printed.

THE J. G. BRILL CO., of Philadelphia, is out with a new catalog on the 27-G Brill truck, which is a truck for fast and heavy city and suburban service under narrow and low cars. As stated in the pamphlet, the features which commend the truck particularly for the various forms of service are side frames of cast steel or solid forgings, and semi-elliptical spring equalizers suspended from the frame by spring links. The design permits the body to be carried low, specifically, in a closed car with 33-in. wheels, the step is 16 5/8 in. from the track; from step to platform is 1 1/2 in., and from platform to car floor is 8 in. The specific claims made for this truck are: Greater durability; fewer repairs; greater ease of riding; less strain on the car body; less flange wear; and less brake adjustment than any other truck on the market. Considerable space is given in the pamphlet to the "squareness" of this truck and all that is included in that desirable characteristic.

JOHN A. MEAD MANUFACTURING CO., 11 Broadway, New York, issues an illustrated booklet, 25 pages, 6 x 9 in., entitled, "Something New in Belt Conveyors." It is intended mainly to advertise the Ridgway patent conveying belt. It tells briefly of the evolution of conveyors during the past half century, the difficulties in meeting requirements and the various methods employed. It calls attention especially to the flexible edges of the Ridgway belt, intended to permit the edges to be turned up without injury to the belt. Double carrying conveyors, deliveries and elevating are among the subjects treated, and Ridgway's patent traction system and Selleck's conveyors are also included. The necessary information upon which to furnish estimates is specified and a list is given of the labor-saving machinery handled by the company. The company also issues a 6 x 9-in. pamphlet, illustrated, showing the United States naval coaling station at Frenchman's Bay, Me., equipped with coal-handling machinery by the Mead company, together with announcement that the company is under contract for similar installations at the navy yards at New York, Boston, Washington, Portsmouth and Narragansett Bay.

THE PENNSYLVANIA STEEL CO., Steelton, Pa., has issued in the interest of its bridge and construction department a very handsome book, entitled, "From Steelton to Mandalay." It contains 78 pages, 6 1/4 x 9 in., and is printed on heavy, calendered paper. It contains a description and a pictorial history of the Gokteik Viaduct, built for the Burma (India) Railways Co., Limited, which spans the Gokteik Gorge formed by the Chung-Zoune River, 80 miles east of Mandalay. The viaduct was built in the Pennsylvania Steel Co.'s bridge works at Steelton and transplanted in sections to India. Accounts of some of the difficulties attending its construction, the formal opening of the viaduct and a general description of the work make interesting reading, while a section of the book is given over to photographs, there being 75 excellent views. A page of statistics furnish food for thought, some of the more pertinent data being

the following: Shipped weight of viaduct, 9,700,000 lb.; shipped weight of erection outfit, 44,000 lb.; total length, 2,260 ft.; greatest height, 120 ft.; number of bridge erectors sent from America, 35; average number of skilled natives employed, 150; number of rivets driven in field, 200,000; number of shop rivets, 800,000; number of separate pieces shipped, 242,808; total number of miles from Steelton to Cockeys Bridge, 10.500.

TRADE NOTES.

FRESH & SPEICHER, of Cumberland, Md., proprietors of Fresh's emergency car brake, have just obtained a patent for the brake in Canada.

THE BRIDGEPORT BRASS CO., Bridgeport, Conn., recently secured a contract calling for 22 miles of "phono-electric" wire for shipment to England for street railway use.

THE CENTRAL ELECTRIC CO., of Chicago, announces that it is prepared to furnish direct and alternating current desk brackets, ceiling and battery fan motors and ventilating fans of every description, and that catalogs describing this apparatus will be sent upon request.

THE LUMEN BEARING CO., Buffalo, N. Y., presents customers a handsome calendar each month representing a framed painting, the subject for June being Margaret Winner's "June Roses." The picture is 3 x 4 in. It makes an exceedingly attractive desk ornament.

THE WESTINGHOUSE TRACTION BRAKE CO., 26 Cortlandt St., New York, recently received from the St. Louis Transit Co. an order for from 1,500 to 2,000 air brake equipments, this being the largest order for electric railway cars ever placed in this country or abroad.

THE VAN DORN COUPLER CO., of Chicago, reports a great demand for special couplers for large interurban electric cars for high speed train service. The company's latest attachments and couplers are designed to make a solid train, no matter how many cars are coupled together.

THE ALLIS-CHALMERS CO. reports among its engine sales for May, 1903, the following: Northwestern Elevated Railroad Co., Chicago, one 34 and 70 by 60-in. heavy duty, horizontal cross compound direct coupled Reynolds-Corliss; Delaware & Hudson Co., Scranton, two 16 x 30-in. girder frame Reynolds-Corliss.

THE BENDIT MERCANTILE ENGINEERING CO. has succeeded to the business of the Laufketter-Bendit M. E. Co., engineer and contractor, St. Louis. Mr. F. C. Laufketter has retired from this concern to become president of the Victor Manufacturing Co. He is succeeded as secretary and treasurer by Mr. E. O. Edson, Mr. Louis Bendit being president.

THE RAILWAY APPLIANCES CO. has recently issued an attractive pamphlet entitled "Kinks", which illustrates the Q & C-Bonzano rail joint, a device which has lately been taken in hand by this company. This joint is designed to support the rails both vertically and laterally, and the name "Kinks" doubtless is taken from those faults which the joint prevents.

THE IRONSIDES CO., Columbus, O., reports the business of its past fiscal year just closed as showing a gratifying increase, with favorable prospects for a further enlarged business the coming year. The company manufactures and supplies special lubricants for wire ropes, fibre ropes, gearing and belting, a line of paints for metallic surfaces, and the "Ironsides" improved car wheel oiler.

THE SHEPHERD ENGINEERING CO., maker of the well-known line of Shepherd steam engines, will after July 1st, have its general offices and works at Franklin, Pa., where it has secured the large and modern plant constructed a few years ago by the Grant Tool Co. This plant will enable the Shepherd Engineering Co. to take care of its greatly increased business, and will also enable it to make prompt deliveries on future work.

THE G. P. MAGANN AIR BRAKE CO. has just completed the equipment of the Detroit United Ry's. double-truck city cars, and the Rapid Railway Co's. system between Detroit and Port Huron, with the Magann storage air brake, which has been in successful operation upon the Detroit suburban lines for the past four years. Compressor plants were recently installed at the Woodward Ave., Gratiot Ave. and Michigan Ave. barns for the operation of the brakes.

THE COLUMBUS STEEL ROLLING SHUTTER CO., Columbus, O., maker of steel rolling shutters, doors and partitions, has

appointed the Pittsburg Cornice & Skylight Co., of Pittsburg, to represent it in that territory. A recent order received by the company is for rolling fire doors to equip the elevator openings of the new Joseph Horne Building, two large partition shutters in the same building and rolling doors for the Bailey-Farrell Manufacturing Co's. plant in Pittsburg.

THE UNITED ENGINEERING & FOUNDRY CO., of Pittsburg, installed last year a complete heating and ventilating equipment in the roll shop of the Lincoln foundry department. The apparatus, which was furnished by the B. F. Sturtevant Co., consists of a steel-plate exhauster direct-connected to a horizontal, side-crank engine. The exhauster draws air from out-of-doors through a large steam heater built up in sections of 1-in. pipe, one of the sections receiving the exhaust from the fan engine.

PORTER & BERG, INCORPORATED, 309 Dearborn St., Chicago, has been appointed general agent of the Federal Supply Co., of Chicago, for the sale of steel wool improved journal packing in Illinois, Indiana, Wisconsin, Missouri, Iowa, Minnesota, Michigan and Nebraska. This journal packing is guaranteed to retain its condition and position, with little attention and no removals, 15 months. It is further stated that street railway companies will find this packing economical, as but half the ordinary amount is required.

THE BROWN-CORLISS ENGINE CO., Corliss, Wis., has contracted with Mr. Henry R. Cornelius, of Pittsburg, to assume the entire charge of its output in the Pittsburg district, where for several years he has been the direct representative of The Southwark Foundry & Machine Co., of Philadelphia. Not only is Mr. Cornelius well posted in the territory, but he has spent a great deal of time in the mills and works at Pittsburg, with the result that he is considered an authority on rolling mill and blowing engines. He has opened offices in the Frick Building, Pittsburg.

WITTING BROS., LTD., electrical engineers and contractors, of London, Eng., recently admitted to partnership Mr. A. C. Eborall, who has had the technical management of the business from its commencement, and the firm name has been changed to Witting, Eborall & Co., Ltd. At the same time, on account of the increasing needs of the business, the company has removed to more commodious offices at Temple Bar House, E. C. The special feature of the company's business is the carrying out of complete installations in connection with traction, power and lighting work.

THE WALWORTH MANUFACTURING CO., 128-136 Federal St., Boston, Mass., advises us that it has purchased the locomotive injector department which was formerly a part of the business of the National Tube Co. For the purpose of notifying those interested, and for the convenience of the trade, the Walworth company has issued a new descriptive catalog giving full information and prices. This book is written in such a manner as to be of great value to master mechanics, superintendents of motive power of railways, and engineers of steam plants. Engineers desiring a copy of this may secure it by addressing the company.

J. HOLT GATES & CO. have taken the agency for the West, of the C. & G. Cooper corliss engines for direct-connected and belted railway engines, and complete steam power plants. The reputation of this engine is national for fine workmanship, heavy design, and prompt delivery. With the new shop of the C. & G. Cooper Co., engines of the larger sizes can be speedily built. The company's most recent installations in the west are the three 2500-h. p. cross-compound condensing engines for the Aurora, Elgin & Chicago Ry. at Batavia, Ill., and the 2,500-h. p. cross compound engine at the new Deering Rod Mill at South Chicago.

THE STERLING-MAEKER CO. placed its new single register the "No. 5" on the market about a year ago, it being shown only in a square case. This register is now offered in either round or square cases, the diameter of the round case being the same as the diagonal diameter of the square one, 11 in. The accuracy, simplicity of construction and power of endurance of this design have commended it very highly, and it is not too much to say that it has acquitted itself with great credit. The manufacturer has courted the most severe tests and reports that the register has been run at high speed up to 200,000 registrations on several occasions.

THE RAILWAY APPLIANCE CO., with office and factory at No. 12 Plain St., Albany, N. Y., was incorporated in January, 1902, to manufacture an improved signal lamp in which the color of the light can be changed without any part of the lamp. Alexander Selkirk, the patentee of this lamp, and the general manager of the Railway Appliance Co., later designed and patented what is known

as the Selkirk standard self-lubricating trolley wheel, and the company is soon to take up the manufacture on a large scale of other railway specialties. A foundry is to be added to the present plant in Albany. The company's capital stock has been increased to \$100,000 to provide the new capital needed.

A. B. DUPONT, vice-president of the St. Louis Transit Co., has recently executed a contract with the Electric Storage Battery Co., of Philadelphia, manufacturer of the "Chloride Accumulator" for the installation of a 3,000-kw. storage battery to be used in a rotary sub-station with rotaries having a capacity of 6,000-kw. The battery will regulate on the fluctuations and assist in caring for the morning and evening peaks. The sub-station is in the center of the city, and this installation is one of the extensions being made for the purpose of caring for the increase of traffic. It is interesting to note that this contract represents the largest individual installation of storage batteries in the world for railway service.

WESTINGHOUSE, CHURCH, KERR & CO., who sell the product of the Westinghouse Machine Co., reports that in less than five years a total of over 160,000 h. p. in corliss engines has been sold by it, comprising four distinct types: Vertical 3-cylinder compound, vertical cross compound, horizontal cross compound and horizontal tandem compound. The equipments include those for New York Edison Co., Brooklyn Edison Co., Third Ave. Railroad system, N. Y., and Boston Elevated Railway Co. The Franklin Electric Co., of Franklin, Pa., is equipped with five 125-h. p. Westinghouse vertical 3-cylinder gas engines, which will be belted to a corresponding number of 75-kw. alternating current generators, to be operated in parallel. The fuel is natural gas.

FRESH & SPEICHER, proprietors of Fresh's emergency car brake, have recently made a test on the Cumberland (Md.) Street Ry. using emery friction plates as a substitute for the steel cutters, with the brakes with most satisfactory results. They report that with the emery plates stops can be made one-third quicker than with the steel and that the emery does not wear dull as does the steel. The emery bar used is $1\frac{1}{2} \times \frac{1}{2} \times 10$ in. and is dovetailed into a malleable iron plate which serves to protect the emery and yet leaves the latter clear to bear in the center of the rail. The emery and the iron wear down together, all crushing of the emery being prevented. The emery plates are to be substituted on all the brakes which are now on trial in order that the opinion of operators as to the advantages of the emery may be secured. Canadian patents on the Fresh brake were granted May 26, 1903.

THE LOOMIS-PETTIBONE CO. has removed its offices from 52 Broadway to 52 and 54 William St., New York. The company has recently increased its capital to \$2,000,000 and will soon begin the erection of a plant near New York for the manufacture of gas engines in large units, in addition to the Loomis-Pettibone gas apparatus which it has heretofore made. Until the company has its plant in operation it will deliver engines made by Crossley Bros., of Manchester, Eng., for which concern the company has the exclusive agency in North America. The company has a number of its gas engines in operation. The officers and directors of the company are: President, Benjamin Guggenheim; vice-president and general manager, Cyrus Robinson; second vice-president and manager of sales department, Burdett Loomis, jr.; secretary and treasurer, Leon P. Feustman; consulting engineer, Burdett Loomis, sr.; chief engineer, Hawley Pettibone; Charles E. Finney.

THE DETROIT GRAPHITE MANUFACTURING CO., of Detroit, Mich., has recently advised us concerning the experience of an American street railway manager in Spain, which points a moral and adorns a tale. This manager, who may be known as Murphy, took charge of an electric railway in Spain bought by an American syndicate shortly after the Spanish war. The property was badly run down and the new manager undertook to make temporary improvements at a minimum cost and among other changes, painted the cars a bright red so that they might make up in appearance what they lacked in stability. One hot day a trolley excursion was returning to the city and was caught in a severe thunder storm. The paint which had been put upon the car roofs had peeled off during the hot weather and the passengers received a thorough wetting. The action of the authorities was prompt. Murphy and his force of American motormen and conductors spent the night working and the next morning were fined 20 pesetas for every man, woman and child who got wet. The outcome was that the manager ordered for to barrel of "Superior" graphite paint which is now the recognized standard for road, bridge, boiler, track, and pole.

EARLY HISTORY OF NEW YORK CENTRAL RAILROAD.

The 50th anniversary of the incorporation of the New York Central Railroad Co. occurred May 17, 1903. The early history of the company is interesting, inasmuch as it made possible enormous industrial and commercial development. The New York Central is the consolidation of 10 short lines that formed a continuous route from Albany to Buffalo, known as the Albany & Schenectady, the Schenectady & Troy, the Utica & Schenectady, the Mohawk Valley, the Syracuse & Utica, the Syracuse & Utica Direct, the Rochester & Syracuse, the Buffalo & Rochester, the Rochester, Lockport & Niagara Falls, and the Buffalo & Lockport railways. Articles of agreement were filed May 17, 1853, the first board of directors was elected July 6th, and the whole line delivered to the new company Aug. 1, 1853. This also opened the way for the consolidation of the New York Central company with the Hudson River Railroad in 1860, which event presaged an era of wonderful progress in the undeveloped West, creating a direct line from the ocean to the great lakes, traversing the only break in the Appalachian chain between the Gulf of Mexico and the St. Lawrence River. The old Mohawk trail is almost identical with the New York Central of today and this trail was also the pathway of war during the French and Indian wars and the Revolution.

It is a far cry from that primitive line of 50 years ago to the great railroad of today with its "Twentieth Century Limited." In an interesting letter of reminiscences written by Mr. Joshua Wilber, of Lockport, N. Y., describing railroad travel in 1839, he states that the journey from New York City to Lockport consumed nearly four days, the traveler being on the move all the time except a night spent at Albany. In Albany the cars were drawn to the city line by horses, locomotives not being allowed in the city. The speed across country, he says, was tremendous—12 miles an hour. Arrived on the ridge opposite Schenectady, the cars were "let down an incline" plane, secured to a large rope cable, the other end being attached to flat cars weighted with stone, which were drawn up on a parallel track as we went down. At Schenectady it was necessary to change cars for Utica, which was then the end of railroad travel. Canal packets did the rest. The writer concludes "Not long afterward the roads built from Albany westward and from Buffalo eastward met and a continuous line was formed, but with many changes of cars and other inconveniences. Then the Hudson River road was opened and Buffalo and New York became neighbors."

The Albany & Schenectady line, which was chartered in 1826 as the Mohawk & Hudson, was opened Sept. 12, 1831, and was the first railroad built in the state of New York.

NEWS NOTES.

NEW INCORPORATIONS

SHEBOYGAN, WIS. Sheboygan & Chilton Railway & Electric Co., capital \$50,000, to build an electric line for passengers and freight to Howards Grove, Franklin, Kiel, New Holston and Chilton. Where it will connect with the proposed "east shore" line from Fond du Lac. Sheboygan men are the organizers.

TOLEDO, O. Ohio & Michigan Traction Co., capital \$1,500,000, to build an electric line from Toledo to Ann Arbor via Lima, Perrysburg, Dundee and Azalia. President, J. H. Clausen, Fremont, vice-president, H. C. Stahl, Fremont; secretary, and manager, L. L. H. Austin, Toledo; treasurer, J. W. Pedro, Fremont; general counsel, J. H. Southard, J. O. Zable, William Baldwin, directors, J. B. Foraker, William Ford Cincinnati, Thomas H. Jungk, Fremont, M. I. Wilcox, Toledo, M. C. Briggs, Easton, and Messrs. Claus and Stahl. The Ohio & Michigan Construction Co., composed of the same men will do the work.

JEFFERSONVILLE, IND. Ohio Valley Electric Railway Co., capital \$50,000, to build an electric line from Jeffersonville to Madison, via Charlestown and New Washington, and a line from Jeffersonville to Henryville, Ind., through Sellersburg and Memphis. Ind. incorporators, Louis Schneck, Seymour, Ind., Edward G. Conner, the William H. Hallbrook, Syracuse, N. Y., George H. Holzhner, George H. Vaughn, Jeffersonville.

NEW YORK, N. Y. Hudson & Manhattan Railroad Co., capital \$3,000,000, to build a loop from Church St., New York, beneath the North River to Exchange Pl., Jersey City, N. J. President, A. G. McAdoo, vice-president, Walter G. Oakman, treasurer, Henry A. Murray, secretary, Charles W. King, directors, Messrs. McAdoo and Oakman, F. B. Jennings, John S. Williams, Anthony S. Brady, H. B. Hollins, John G. McCullough, E. H. Gary, E. C. Conners.

CANTON, ILL. Fulton County Electric Railroad Co., capital \$300,000, to operate a street railroad. Incorporators, J. W. Lowrey, H. H. Fuller, H. G. Shannon.

DECATUR, ILL. Decatur Springfield & St. Louis Electric Railway Co., to build between cities named. Work to begin at once to have road open for World's Fair traffic.

PHILADELPHIA, PA. Passaic & Palmyra Rapid Transit Street Railway Co., capital \$500,000, to build 29 miles of road. President, C. P. Weaver, Philadelphia.

PHILADELPHIA, PA.—Philadelphia Rapid Transit Street Railway Co., capital \$1,000,000, to build 100 miles of road. President C. P. Weaver. 1903.

PHILADELPHIA, PA.—M. J. McGuire & Son, Electric Rapid Transit Street Railway Co., capital \$1,000,000, to build 100 miles of road. President C. P. Weaver. 1903.

PHILADELPHIA, PA.—Greenwood Rapid Transit Co., capital \$1,000,000, to build 100 miles of road. President C. P. Weaver. Philadelphia.

PHILADELPHIA, PA.—N. C. Fairbank, Chas. Street Railway Co., capital \$1,000,000, to build 100 miles of road. President C. P. Weaver. Philadelphia.

PHILADELPHIA, PA.—Greenwood Rapid Transit Co., capital \$1,000,000, to build 100 miles of road. President C. P. Weaver. Philadelphia.

LOS ANGELES, CAL.—Los Angeles Interurban Railway Co., capital \$1,000,000, to build 100 miles of road. President C. P. Weaver. Los Angeles.

SAN BERNARDINO, CAL.—San Bernardino Valley Traction Co., capital \$1,000,000, to build 100 miles of road. President C. P. Weaver. San Bernardino.

WINCHESTER, IND.—Dayton & Monic Traction Co., mentioned in the "Bulletin" for Apr. 2, 1903, capital \$500,000, to build 100 miles of road. President C. P. Weaver. Winchester.

DIXON, ILL.—De Kalb & Southwestern Electric Railway Co., capital \$500,000, to build 100 miles of road. President C. P. Weaver. Dixon.

CEDAR RAPIDS, IA.—Cedar Rapids & Iowa City Railway & Light Co., capital \$2,000,000, to build 100 miles of road. President C. P. Weaver. Cedar Rapids.

MONMOUTH, ILL.—Western Illinois Traction Co., capital \$500,000, to build 100 miles of road. President C. P. Weaver. Monmouth.

SEABROOK, ME.—Caribou, Washburn & Perham Electric Ry., capital \$200,000, to build 100 miles of road. President C. P. Weaver. Seabrook.

FRANCHISES ASKED OR OBTAINED

ATLANTIC CITY, N. J.—Delaware Valley Traction Co., mentioned in the "Bulletin" for Mar. 12, 1903. Has applied for a franchise in Ewing township. This road will bring all the towns on the Delaware River between Trenton and Lambertville in direct communication. Wilbur F. Sadler, of Trenton, is at the head of it.

JANESVILLE, WIS.—Rockford, Beloit & Janesville Railroad Co., mentioned in the "Bulletin" for Mar. 26, 1903. Granted a franchise in Edgerton, Wis.

JANESVILLE, WIS.—Janesville Traction Co., mentioned in the "Bulletin" for May 21, 1903. Granted a franchise in Janesville.

SAN JOSE, CAL.—San Jose-Los Gatos Interurban Ry., mentioned in the "Bulletin" for May 7, 1903. Granted franchise for line in San Jose.

PORTLAND, ORE.—West Side & Suburban Railway Co., mentioned in the "Bulletin" for May 7, 1903. Granted franchise from line to Hillsboro.

PATCHOGUE, N. Y.—South Shore Traction Co., mentioned in the "Bulletin" for May 21, 1903. Granted a franchise in Amityville, L. I.

SYRACUSE, N. Y.—Rochester, Syracuse & Eastern Railroad Co., mentioned in the "Bulletin" for Sept. 25, 1902. Granted a franchise in Arcadia.

PONTIAC, ILL.—Bloomington, Pontiac & Joliet Electric Ry., mentioned in the "Bulletin" for May 7, 1903. Granted a 50-year franchise in Dwight, Ill.

DAVENPORT, IA.—Davenport & Suburban Electric Railroad Co., mentioned in the "Bulletin" for Dec. 18, 1902. Capital \$1,000,000, to build 100 miles of road. President C. P. Weaver. Davenport.

CRIPPLE CREEK, COL.—Colorado Springs & Cripple Creek District Railway Co., granted a franchise in Victor, Col.

TOPEKA, KAN.—Topeka Railway Co., granted a 30-year franchise in Topeka, the company having been reorganized recently. A temporary track will be built over Melan Bridge to give North Topeka street railway service and various extensions and improvements are planned. The company will either build a new bridge across the Kaw River, or buy the Lehigh Valley's four-span steel bridge and set it on concrete piers parallel with the Melan Bridge. L. E. Myers, of Chicago, is vice-president and general manager.

MADISON, IND.—Yoder Hubbard and others were granted a franchise for an electric line to Columbus, Ind., to connect with the Indianapolis, Columbus & Southern Traction Co.

BANGOR, ME.—Aroostook Valley Railroad Co. Has applied for authority to extend its line from the present terminus in Washburn through Washburn, and West into Bangor.

CINCINNATI, O.—Herman Dahms, James B. Foraker, John A. Caldwell, James A. McGaw and Miller Outcalt were granted a 25-year franchise in Hamilton, O., for an electric line from Hamilton to Richmond, mentioned in the "Bulletin" for Apr. 23, 1903.

HAINESTOWN, N. J.—Baltimore County Traction Co., granted a franchise in Mount Holly.

CAUSKILL, N. Y.—Causkill & Albany Railroad Co., granted a franchise in Causkill.

LOS ANGELES, CAL.—Pacific Electric Railway Co. Has applied for a franchise in Causkill, and the city of Los Angeles was ordered advertised. The company recently purchased a franchise in Whittier for \$100.

LOS ANGELES, CAL.—The board of public works voted unanimously to refuse to advertise for sale the franchise asked for by William M. Garland, mentioned in the "Bulletin" for May 23, 1903. A 3-cent fare was proposed by the projectors.

ROCKAWAY, N. Y.—Ocean Electric Railway Co. Has applied for a franchise for an electric railway between Rockaway and Far Rockaway. The Long Island R. R. is said to be behind the company.

INDIANAPOLIS, IND.—Consolidated Traction Co., granted a franchise in Crawfordsville, Ind., with the stipulation that any other interurban or electric railway seeking to enter the city must do so upon the Consolidated Traction Co.'s lines. The ordinance also provides for the assignment of the Crawfordsville Traction Co.'s rights to the Consolidated Traction Co. The company has been financed and the work on the proposed line between Indianapolis and Crawfordsville is well under way. Edward Hawkins, of Indianapolis, is president.

HOUSTON, TEX.—W. E. Scott, Henry C. House, J. O. Ross, H. E. Fuller, E. L. Dennis, W. B. Slosson and Hyman Levy have applied for a franchise in Houston for a proposed electric line from Houston to Galveston through Seabrook, La Porte and other points. It is proposed to incorporate with a capital of \$1,000,000.

MISCELLANEOUS.

INDIANAPOLIS, IND.—Indianapolis & Northwestern Traction Co., mentioned in the "Bulletin" for April 23, 1903. Has filed a mortgage to the Knickerbocker Trust Co., New York, and Frank L. Eldridge to provide for the issuance of bonds to the amount of \$3,000,000. For building an extension from Lebanon to Crawfordsville \$650,000 is reserved; for future additions, \$430,000.

NEW ALBANY, IND.—Southern Indiana Interurban Railway Co., mentioned in the "Bulletin" for April 9, 1903; name changed to Louisville & Southern Indiana Traction Co.

HARTFORD, CONN.—Stafford Springs Street Railway Co., mentioned in the "Bulletin" for Dec. 18, 1902, charter has been amended to permit it to build electric lines from Stafford Springs to West Stafford, Stafford Hollow, Oronville and Wales, Mass. The Anthony-Eldridge syndicate, of Boston is behind this company.

OKLAHOMA CITY, OKLA.—Oklahoma Traction Co., mentioned in the "Bulletin" for May 21, 1903. Has awarded the contract for construction of 35 miles of road to the Metropolitan Construction Co., to cost \$300,000.

SIoux FALLS, IA.—C. H. Natwick, B. H. Lien and Eugene Coughran, of Sioux Falls, are promoting an electric line from Sioux Falls to Le Mars to connect with the line projected by the Sioux City & Le Mars Interurban Electric Railway Co., mentioned in the "Bulletin" for May 21, 1903.

CUMBERLAND, MD.—Cumberland & Westernport Electric Railway Co. Has elected officers as follows: President, R. H. Koch, Pottsville, Pa.; treasurer, Walter H. Bryant, Philadelphia, Pa.; secretary, Lindley P. Bane, Directors, Messrs. Koch and Bryant and Willis L. Bryant, Schuylkill Haven; William R. Miller, Frostburg; Harry E. Weber, Cumberland. Cars will enter Cumberland over the tracks of the Cumberland Electric Railway Co., mentioned in the "Bulletin" for May 7, 1903.

STERLING, ILL.—Henry C. Higgins, president of the Sterling, Dixon & Eastern Electric Ry., mentioned in the "Bulletin" for June 4, 1903, proposes to build an electric light and coal gas plant at Dixon, Ill.

COLUMBIA, S. C.—Augusta & Columbia Railway Co., mentioned in the "Bulletin" for March 12, 1903. The proposed line has been laid out and the section between Columbia and Aiken surveyed. When finished, this will be the longest road in the South.

CHICAGO, ILL.—Chicago & Indiana Air Line Co., mentioned in the "Bulletin" for June 4, 1903. Has filed 10 deeds conveying right of way in La Porte County, Indiana.

HARRISBURG, PA.—Application has been made for a charter for the Central Pennsylvania Traction Co., capital \$2,100,000, to take over the Harrisburg Traction Co., mentioned in the "Bulletin" for May 7, 1903, and subsidiary lines.

FREEMONT, ILL.—Freemont General Electric Co., mentioned in the "Bulletin" for May 7, 1903, name changed to Freemont Railway, Light & Power Co.; capital increased from \$500 to \$550,000, and number of directors from three to seven.

WESTERLY, R. I.—Westerly & Hopkinton Railway Co., chartered in January, 1902, is to be completed this year by the Eastern Electric Construction Co., of Boston, and work has begun. It will be primarily a freight line, but will carry passengers, running from Westerly through Potter's Hill, Ashaway to Hopkinton.

EAST ST. LOUIS, MO.—Springfield & Jacksonville Rapid Transit Co., mentioned in the "Bulletin" for June 4, 1903. Is being surveyed by Charles S. Butts, C. E., with temporary headquarters at Springfield, Ill. The line will be 30 miles long.

WASHINGTON, D. C.—Work on the proposed Fairfax, Potomac & Washington Electric Railway Co. will begin July 1st. All franchises and rights of way have been acquired. The road has been financed also. The route is from Arlington Junction to Arlington Station, Falls Church, Dunn Loring, Vienna, Fairfax Court House. The distance from Washington is 17½ miles. The cars will enter the city over the Washington, Alexandria & Mt. Vernon Railroad Co.'s tracks. President, Daniel K. Trimmer, York, Pa.; vice-president, Joseph S. F. Kerr, Philadelphia; secretary and treasurer, George P. Robinson; general counsel, Robert E. Doan.

MANSFIELD, O.—Mansfield Railway, Light & Power Co., recently reorganized and capital increased to \$1,000,000; to expend \$250,000 on improvements and extensions. President and general manager, H. M. Bylesby, Chicago; vice-president, Charles F. Ackerman; secretary, W. D. Breed, Cincinnati; treasurer, Reid Carpenter.

OMAHA, NEB.—The Omaha & Council Bluffs Railway & Bridge Co., of Nebraska, filed a deed of conveyance to the Omaha & Council Bluffs Railway & Bridge Co., of Iowa, the original company, as a step in the consolidation of the lines controlled by these interests.

VICKSBURG, MISS.—Press reports state that the Vicksburg Railroad, Power & Manufacturing Co. will be reorganized and S. S. Bullis, president of the Natchez Electric Street Railway Co., will be made president.

STREET RAILWAY REVIEW

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No. 7

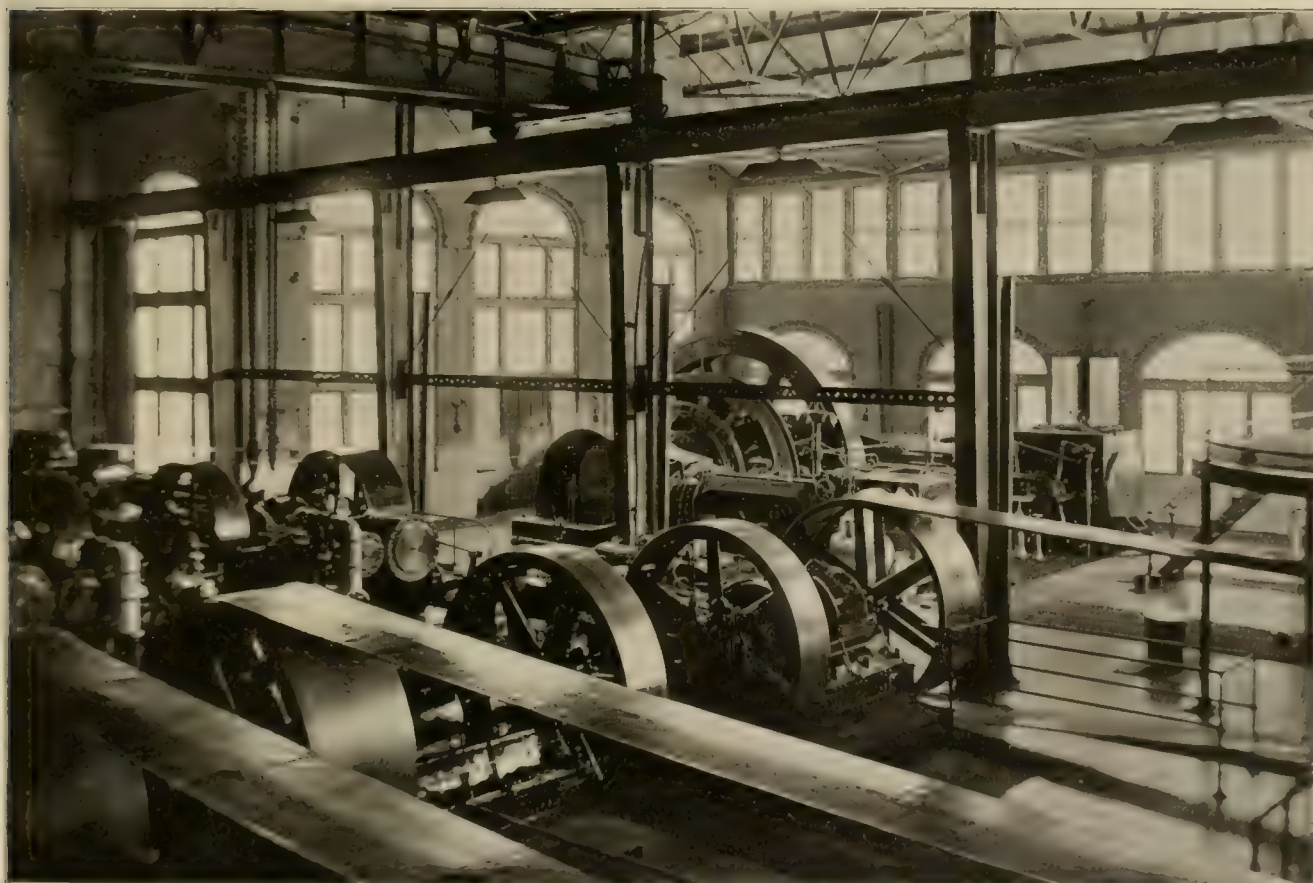
Hartford Street Railway Co.

Additional Power Generating Facilities and New Car House at Hartford, Conn.

The power station of the Hartford Street Ry. supplies power for practically 100 miles of electric railway track, the longest single line of which extends 13 miles from the power house. As originally built in 1894-95 this station contained eight 300-h. p. cross compound condensing high speed engines, each belted to a 220-kw. multipolar generator. On the plan of station shown herewith, these units are numbered 1 to 8 inclusive. As the demands of the system increased it became necessary to make additions to the generating equipment.

or no difficulty in making the necessary changes for the larger units of power that have been required to meet the demands of the system since electricity has been introduced. The original design of the boiler room and the loop arrangement of piping hereafter described have especially simplified problems and conditions arising with the necessity for additional generating units.

Another feature in connection with this plant, which is worthy of study, is the efficiency, convenience and general flexibility gained by



INTERIOR OF POWER HOUSE, HARTFORD, CONN.

The first of these additions comprised a 1,350-h. p. cross compound engine, direct connected to an 850-kw. generator, this unit being shown as No. 9. A second unit is now being installed, and comprises a 1,500-h. p. cross compound engine direct connected to a 1,000-kw. generator, and shown as No. 10. There is space, as shown, for an additional 1,000-kw. unit when the requirements may make it necessary.

It is in the care displayed in planning and laying out this station with a view to future extensions that attention is particularly directed. At the outset, boilers, generating units, piping and auxiliaries, were so designed and located that there has been very little

operating a number of small units in conjunction with one or two units of large capacity. As now operated, the bulk of the load at this station is carried by one or both of the large direct connected units, but just as soon as the heavy peaks begin to come on, one or more sets of the small belted units are started up but are kept in operation only so long as the load remains above the capacity of the large direct connected unit.

It may not be out of place to state here that there is a good suggestion in this arrangement. The tendency in recent years toward large direct connected units for electric railway work is fully justified by the economy secured in cost of attendance and maintenance

that go to make up cost of power, but the satisfactory results secured at Hartford with small units operating in conjunction with very large units indicate that perhaps the small belted unit should still retain a more conspicuous place under certain conditions of electric railway work than is now afforded it. For instance, in connection with the design of the Hartford Street Railway power house, if the power generating machinery represented by the eight small belted units were centralized in one large unit, there would be many periods in the day when this large unit would have to be operated at a very uneconomical load. At night it would often be necessary to run this large unit to furnish power for merely two or three cars. By the arrangement as outlined, the load on all units in operation can be kept nearer the point of maximum economy by starting or stopping one or more of the smaller units, and at night two or three of the smaller units will frequently carry the entire load, permitting the large direct connected units to be shut down.

Among other features of this station to which attention will be directed are the automatic oiling system and the extensive use of concrete in and about the engine foundations, building foundations, etc.

Boiler Room.

The boiler room equipment consists of eight Heine safety water tube boilers rated at 300 h. p. each. These are set in two batteries of four, with the furnaces facing each other, with ample space between the boilers for coal and convenience of firing from either side of the coal pile. The boilers carry a steam pressure of 140 lb. per square inch. There are two No. 12 Monitor injectors and two Spencer damper regulators.

Feed Water System.

The pumps are of the Worthington piston pattern and are in duplicate, each pump 10 in. x 16 in. x 10 in. They are provided with all necessary fittings which go to make up a modern feed pump system, and are placed on foundations of brick and cement in a room adjacent to the boiler room. The pumps are so connected as to permit them to be used simultaneously and receive their water supply from the city main or the hot well which receives the discharge from the

to either battery or boiler. The city water is also arranged to pass through any one of the heaters of the boilers in case the pumps should become disabled. The exhaust steam from five condensers,

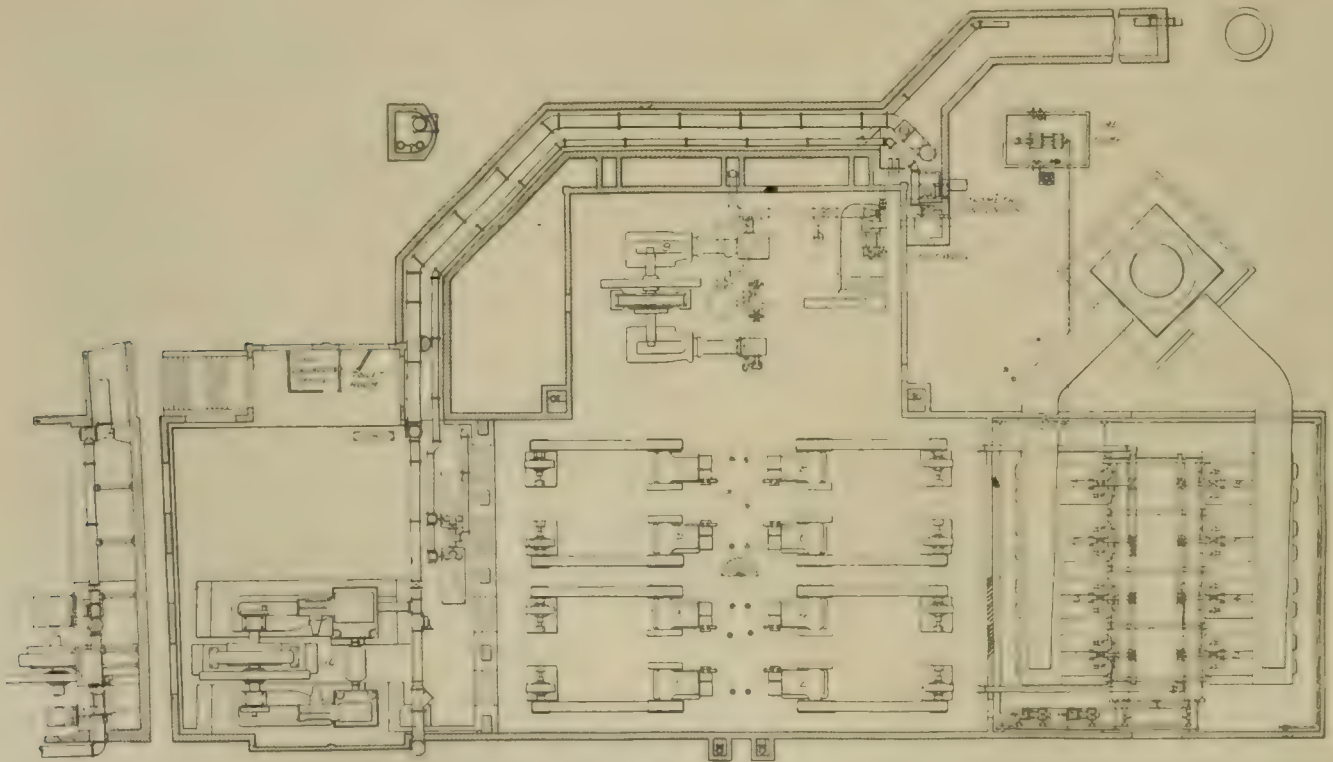


POWER HOUSE, HARTFORD, CONN.

two feed pumps, and other small pumps is taken to a header through the two heaters giving the feed water a temperature as stated.

Piping.

The boilers being set in two batteries, it will be seen from the plan of the station that each battery is connected in opposite directions to



PLAN OF STATION, HARTFORD STREET RAILWAY CO.

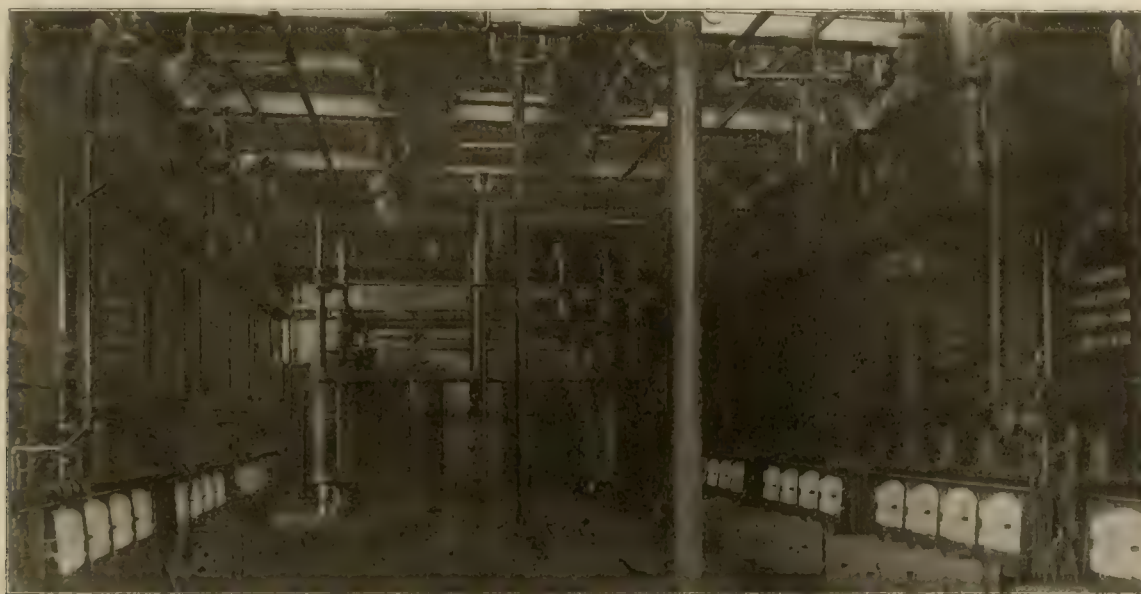
Worthington duplex jet condensers. The water from the pumps passes through two American-Whitlock heaters of 500 h. p. each before entering the boilers, and is raised to an average temperature of 220 degrees F. The pumps and heaters are so connected as to permit either pump to pass water through any one of the two heaters

a 12-in. header on each side of the boiler room and with suitable valves for cutting either boiler, or any number of boilers in or out of commission as may be required. The two steam headers are carried along over ground through the division wall and in a downward direction through the engine room floor to the engine room basement

and enter through valves placed in each pipe to the main 12-in. steam pipe, which is carried around the four sides of the basement forming a complete rectangular loop, so that the steam can be supplied to the loop in either direction from any one of the boilers, independently or collectively. The loop is supported on concrete piers with especially designed adjustable plates and rollers, which allow the pipe to expand and contract without bringing any undue strain on any of the joints, and to give further flexibility to the whole pipe

belted to eight General Electric 220 kw. generators. These units are numbered from 1 to 8 inclusive.

In one of the extensions to the plant as shown on the plan there is one direct connected unit, consisting of a Pennsylvania Iron Works cross compound 1,350-h. p. engine, 30-in. and 52-in. x 48-in. stroke, running at 80 r. p. m. and coupled to a General Electric 850-kw. generator. This is shown as unit No. 9. This unit was installed about six years ago, and has given such excellent satisfac-



BOILER ROOM, HARTFORD STREET RAILWAY CO.

system elbows were introduced where desirable. The flow of steam is upward to all of the engines, thereby reducing to a minimum the entrained water, which is otherwise unavoidable when steam pipes are placed above the engines without using separators or other devices. The drip water is taken to a receiver of the Holly gravity return system and from there to the boilers. The exhaust headers are placed in the engine room basement. The exhaust from each two of the group of eight high speed engines, Nos. 1 to 8, as numbered in the illustration, passes through the condensers and an outboard exhaust pipe. Each engine of this group is provided with valves so that either engine can be run condensing or non-condensing, or could be taken out of service without interfering with the other engines. Injection and outboard valve stems are carried

tion that when additional power generating machinery became necessary the Pennsylvania Iron Works Co. was called upon to furnish the new engine. The additional unit will be known as No. 10 and will comprise a Pennsylvania Iron Works cross compound 1,500-h. p. engine, 30-in. and 60-in. x 48-in. stroke, running at 80 r. p. m. and coupled to a General Electric 1,000-kw. generator.

The new engine is the latest improved type developed by the Pennsylvania Iron Works Co., and among other important features in the design may be mentioned the following: The bed frame and guide barrel are in one casting with a continuous bearing from the main pedestal to the end of the guide barrel where the cylinder is



CONCRETE ARCH OF POWER HOUSE EXTENSION

through the floor and are supported by stand located for the convenience of the engineer.

Engines and Generator

The equipment consists of eight Bal & Wood cross compound engines, 1,350-h. p. and 27-in. x 48-in. stroke, making 212 r. p. m., which are

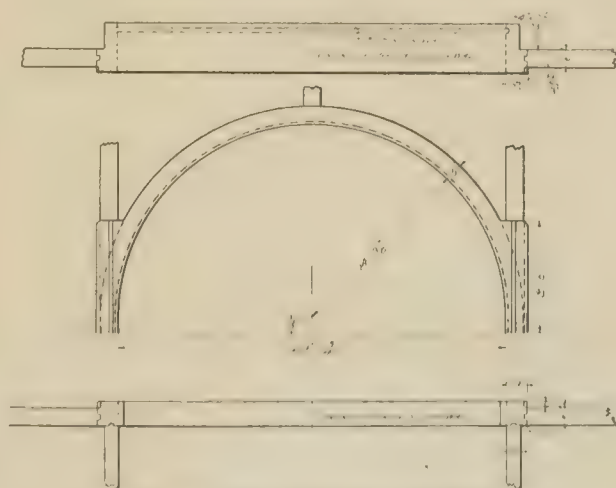


DIAGRAM OF CONCRETE ARCH IN WALLS.

bolted on, thus insuring positive alignment, the head end of the cylinder only having independent support with provision for longitudinal extension and vertical adjustment. The connecting rods are solid forgings provided with wedge and screw adjustment as are all other parts which require adjustment.

The valve gear, of the pendant type, the rock arms are hung from

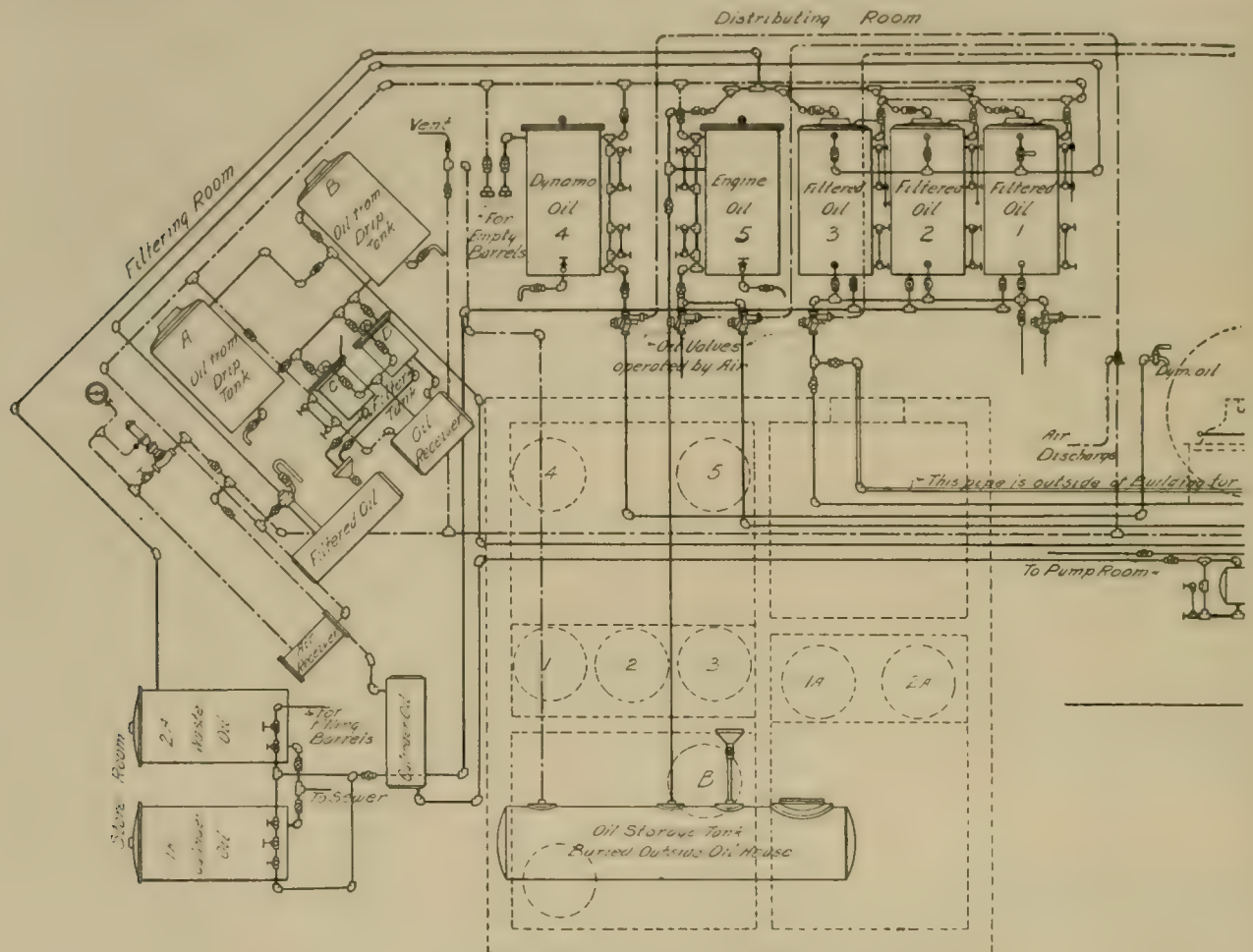
a rigid bracket which is attached to the guide portion of the engine bed. The skeleton wrist plates as well as the other parts of the gear are designed to give the greatest strength with the least weight, thus reducing the wear on all parts. There is engine room space for an additional 2,000-kv. unit.

Oiling System.

The oil storage, distributing, filtering and redistributing apparatus is the invention of Mr. Frank Caum, superintendent of the Hartford Street Ry. The oiling system is elaborate and somewhat complicated but is justified on the grounds that the system provides means for positively and automatically furnishing an abundant supply of oil to all engine and pump bearings in the station and at the same time provides adequate means for reclaiming the oil and resupplying it to the machinery, thereby enabling all the necessary oil to be used

A diagram setting forth the general features of the oiling system is herewith reproduced through the courtesy of Mr. Caum.

New oil is introduced into the system through an oil storage tank buried in the ground outside the oil house. From this tank it is forced by air pressure to the main supply tank in the oil house. It may be mentioned that the oil house is a brick and metal structure, located near the main power station, and divided by fire proof partitions into four separate rooms or compartments, as shown in the dotted plan. The four compartments do not interconnect, but the entrance to each is through a separate door from the outside. The oil house is built with a cellar so that in the event of fire in any compartment the burning contents would drop through into the cellar or vault below. Each compartment is lighted by means of incandescent lamps, placed on the outside of the building and arranged to shine through glass windows.



OILING SYSTEM IN POWER HOUSE

on every part of the station equipment without fear that this lavish use will result in a consequent large expense. The convenience secured and the freedom from trouble with improperly or insufficiently lubricated bearings are held to justify the cost of the system. Moreover, the apparatus provides means, whereby in case of fire or accident every particle of oil in the engine room or, for that matter, in the entire building can be immediately forced out of the oiling system and out of the building, a feature that has resulted in the fire underwriters making a marked reduction in the insurance rate on the power house property.

The oiling apparatus as devised by Mr. Caum is automatic in its operation and is operable either by compressed air or by gravity, or both combined, and by means of the system new oil can be supplied to the machinery in any desired quantity, and such oil collected and filtered and resupplied to the machinery either independently of, or mixed with, new oil; or entirely new oil can be supplied independently of the filtered oil.

It must be understood in reading the accompanying drawing that the various tanks are transposed onto the assembled drawing merely for convenience, but their proper positions and elevations can be traced easily by means of the designating figures and letters.

In the same compartment with the main supply tank for new oil are three tanks for receiving filtered oil from the return drip and filtering apparatus.

These four tanks are together designated the main supply tanks. There are two supplemental oil tanks, one for new oil and one for filtered oil, disposed in the engine room on a plane somewhat lower than the plane of the main oil tanks, but preferably above the plane at which the oil is supplied to the machinery, whereby the oil can be fed to the supplemental tanks and from said tanks to the machinery by gravity, if desired. By reference to the diagram it will be seen the supplemental tank for new oil in the engine room is connected with the main tank for new oil in the oil house, and the supplemental tank for filtered oil in the engine room is connected with

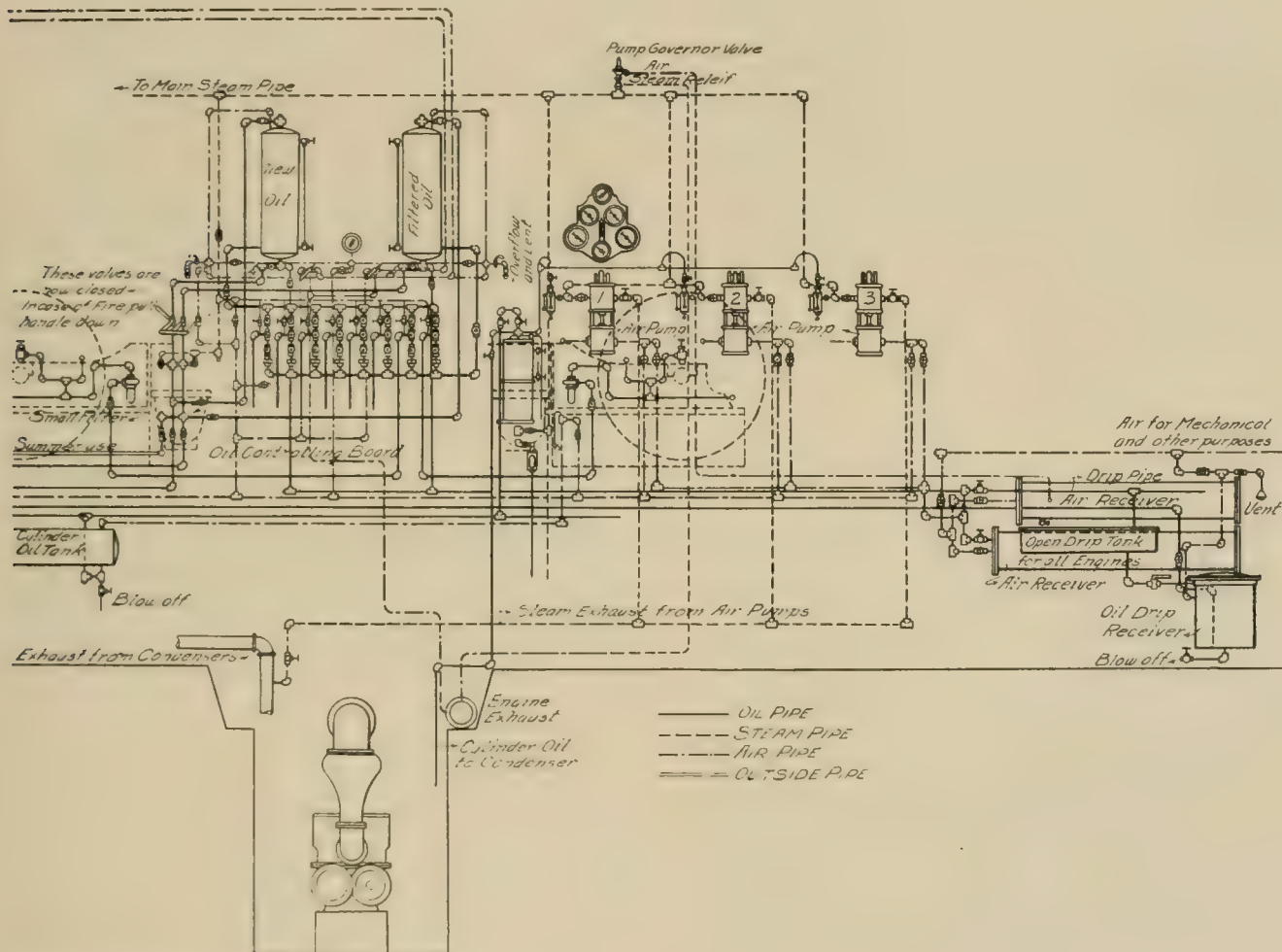
the three tanks for filtered oil in the oil house. The mixing of the new and filtered oil is done on the controlling board shown immediately beneath the two supplemental tanks, by means to be described later.

The supply of oil from the main tanks to the supplemental tanks in the engine room is regulated and controlled by valves of special construction placed in the outlet pipes from the main supply tanks in the oil house, but the operation of these valves is controlled from the controlling board in the engine room by means of compressed air in the following way.

Each of the special valves referred to comprises an oil valve normally held closed on its seat by means of a helical spring. As a means for actuating this valve, a small piston and cylinder is provided whereby when air is admitted to the cylinder under pressure sufficient to overcome the tension of the spring, the piston will oper-

is similar in operation to, and is virtually a branch of, the main oiling system of the station.)

The oil supply or distributing system for distributing oil to the various engine units properly begins at the supplemental tanks in the engine room. The outlet pipes from these tanks are brought to, and extend across, the oil controlling board as shown, the two outlet pipes, one for new oil and one for filtered oil, extending parallel to each other and some distance apart. The two pipes are connected together by a series of branch conductors corresponding in number to the number of engine units. It is in these cross conductors that the new and filtered oil is mixed, hence they are termed "mixing conductors." Coupled to each mixing conductor is a supply pipe leading to one of the engine units, these supply pipes, as indicated, being provided with a series of branches leading to the various oil cups on the engine unit.



OF THE HARTFORD STREET RAILWAY CO.

ate to lift the valve from its seat. The air supply conductors to these various valves as before stated lead to the controlling board in the engine room. When it is desired to draw oil from the main supply tanks to the supplemental tanks in the engine room, the attendant opens the cocks in the air supply conductors or pipes, thereby allowing compressed air to pass through the pipes and compress the pistons of the valves in the main supply pipes in the oil house, whereby the valves will be opened and oil will flow from the main oil tanks to the supplemental oil tanks. When the tanks have received the desired amount of oil the air cocks are closed, the air pressure is relieved from the main valves, thereby permitting the pistons, by means of the springs, to return the valves to their seats and thus cut off the flow of oil from the main tanks.

(In reading the drawing, wherever connections are designated "To No. 9 Engine," it will be understood that No. 9 Engine is the new 1,350-h. p. unit. The location of this unit was such as to require a separate oiling system of its own, but this separate system

Each of the mixing conductors is provided with a pair of cocks, one at each side of the engine unit supply take-off, whereby on turning one cock new oil alone will be permitted to flow to the oil cups, or by closing this cock and opening the other, filtered oil alone will flow, or by turning both cocks, both new and filtered oil will be permitted to flow, the two grades of oil thoroughly mixing as they enter the engine-unit supply pipe.

After having served its purpose of lubricating the machinery, the oil is caught in troughs, and flows by gravity to an open receiving tank in the basement. From this it is drawn into a closed receiving tank, which is under air pressure, and from which the oil is forced to the filtering apparatus in the oil house. The filtering material used is sawdust.

From the filtering apparatus the oil is forced to the three "filtered oil" main storage tanks previously mentioned, from which it is again drawn to the supplemental tank, and through the oil distributing system in the manner previously described.

Oil for cylinder lubricating is taken from the filtered oil tanks to a cylinder oil tank in the store room of the oil house, thence it passes to a second cylinder oil tank which is under air pressure; thence to the cylinder oil tank in the engine room, from which it is forced to Barclay lubricators mounted near the oil controlling board, and from which it is taken through suitable connections, to the

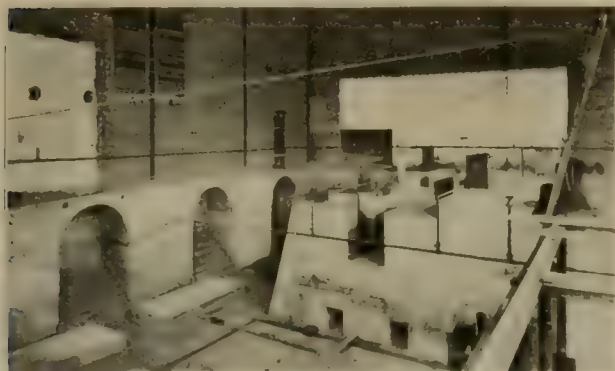


CONSTRUCTION OF ENGINE ROOM FLOOR.

cylinders of the air compressors, to the condensers, and to the engine cylinders.

Dynamo oil is handled from an independent tank in the oil house, from which it is forced by air pressure to a faucet conveniently located in the engine room where it is fed by hand to the oil cups of the dynamos as required.

When in case of fire or other accident, it is desired to force the oil from the supplemental tanks and out of the engine room, and out of the power house building, it is merely necessary to open one set of three valves as indicated. By opening these three valves, compressed air is admitted at the top of each of the supplemental tanks, and in addition the way is opened for the oil from each tank to flow back to the oil house through the main supply pipes, it being borne in mind that these pipes are normally empty. It will be understood, therefore, that when these emergency valves are opened the air forces all the oil that may be contained in the oiling system



CONCRETE FOUNDATION FOR UNIT NO. 10.

within the engine room either back to the main tanks or to the drip tank in the basement as may be desired.

Compressed air for the oiling system is secured from three Westinghouse steam driven air brake compressors, mounted on the wall near the oil controlling board. Air is provided at 90 lb. pressure, but this is reduced to 20 lb. pressure for use in the oiling system.

As installed in this plant, it requires about 17 barrels of oil to fill the entire system, but there is never over 5 barrels of oil within the engine room at any one time. The oil pipes throughout are of

brass with the exception of the main return drip pipe to the filter, this being iron.

Condensers.

The exhaust from the high speed units, Nos. 1 to 8, in the plant is condensed by four Worthington duplex jet condensers 10 in. x 16 in. x 10 in. Steam from the No. 9 engine is condensed by a duplex condenser 12 in. x 17 in. x 15 in. The steam from this engine and engine No. 10 is also condensed by a barometric condenser, built by the Alberger Condenser Co. of 95 Liberty St., New York City, having a capacity of 95,000 lb. of steam per hour; with this is used a rotatory dry vacuum pump 8 in. x 18 in. x 24 in. corliss type built by the same company, to remove the air that may be introduced into the system.

Circulating water is supplied to this condenser by two compound duplex pumps 9 in. and 14 in. x 16 in. x 15 in., located in the basement of the engine room. The jet condenser attached to engine No. 9 will also be used as a circulating pump when another 1,000-kw. unit is put in at some future day.

Stack.

This important adjunct to the power house is 191 ft. high from the floor level and was designed by the Coatesville Boiler Works



CONCRETE SUBWAY.

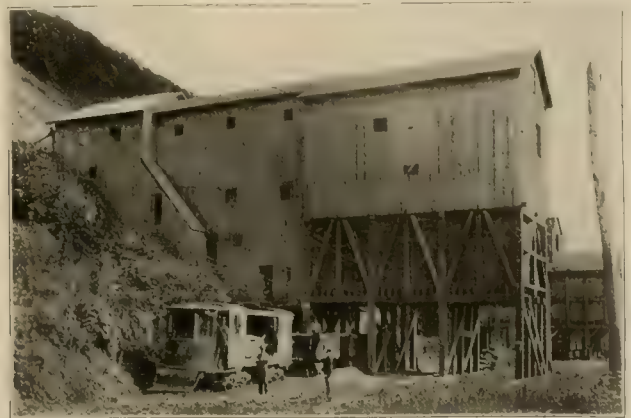
Co. The foundation for this stack is of Portland brown stone and cement, about 20 ft. square at the top and 26 ft. square at the bottom, and is 25 ft. above grade and 13 ft. below, making a height of 38 ft. of masonry which weighs 1,500 tons. On the top of this is a steel chimney 166 ft. high, 11 ft. inside diameter and built of plates, the first section being $\frac{5}{8}$ in. thick. This is riveted to a heavy cast iron foundation plate through which pass eight 4-in. anchor bolts, 19 ft. long, built into the masonry. The remaining three sections are built of $\frac{1}{2}$ in., $\frac{3}{4}$ in. and $\frac{1}{4}$ in. steel plates. The steel portion of the chimney is lined to the top with fire brick, making an inside diameter of 10 ft. The stack and lining weigh 350 tons. The two breechings entering the stack from the boilers are 8 ft. in diameter, the stack is self-supported.

Subway.

The steam and suction pipes being in the basement it became necessary to build a subway to connect the pipes to and from the condensers and circulating pumps with the river, and to pass under the Valley Division of the N. Y., N. H. & H. R. R. This subway is entirely of concrete cement. The floor of the subway is 12 ft. 2 in. below the floor level of the engine room and the pipes at this elevation make an easy lift of 17 ft. for the pumps at low water mark of the river, and the condensers being placed at 8 ft. below this level, places the injection and discharge pipes below the dangerous point of the engines from lifting the water from the condensers during the freshets which come in the spring of every year. The highest water since the power house was built was on Mar. 3, 1896, when the river rose to a level of 26.5 ft. and within 3 ft. of the engine

room floor, completely surrounding the building without interfering in the least with the running of the plant. The subway is 283 ft. long, 8 ft. wide and 7 ft. 2 in. high in the clear, with a semi-circular roof. It is provided with a bulkhead at the outer end 24 in. thick. The floor and side walls up to the springing line of the arch are 18 in. thick. The roof at the center is 14 in. thick. The subway is built of concrete of the following proportions: The floor and side walls are one of portland cement, three of sand, and six of 2-in. broken

be moved in their construction. Atlas portland cement was used exclusively, and the entire cost of the work was \$6,412.29 or \$6.68 per cubic yard. The foundations are underlaid by a bed of soft clay and quicksand into which the condenser bed penetrates and there are no piles or similar supports under the foundations, the stability of the foundations depending entirely upon the weight being properly distributed over the required area. The cement is a 1:3:6 mixture, and taking it throughout the mass there were used 21½



STONE QUARRIES NEAR HARTFORD, CONN.

stone, the roof is one of cement two of sand, and four of 1-in. broken stone. The facing is composed of one of cement, one of sand, and two of screenings. The floor was laid in alternate blocks 8 ft. long, and the edges of each block tarred for water proofing of the joints.

The subway was built during very cold weather with a temperature below freezing point and salt was mixed with the concrete to prevent freezing. This was accomplished with satisfactory results. The salt is now working to the surface of the concrete and comes off in scales, but no injurious results have been noted.

For carrying the heavy 30-in. exhaust trunk line piping, which passes through the subway there are nine hangers dropping from the subway roof and forming swinging cradles in which the pipe line is swung with no interference to expansion and contraction. Each of these hangers or cradles consists of two long 1¼ in. bolts, passing through the roof of the subway and having at their lower ends a cast iron cross bar which forms the cradle for the pipe line.

Engine Room Floors and Foundations.

The basement and floors of the latest extension, i. e., the extension for the No. 10 unit, are made of concrete 22 in. thick, composed of one part portland cement, three of sand and six of 2-in. broken stone and finished with one of cement, one of sand, and two of screenings, making a thickness of 24 in. The side walls are faced with 12 in. of concrete and finished same as floors. The floor beams of the engine room are old 6-in. girder rails. In this construction two rails are put back to back with a piece of Georgia pine 2 in. x 9 in. placed between the two rails and bolted together, forming a beam with a spiking piece for nailing the finished maple floor. The cross beams rest on columns made of 6-in. pipe, the flanges being of cast iron screwed to the pipe; the bottom flanges have a 1-in. set screw in each corner for leveling purposes. Beams of the same construction are then framed between the cross beams, 5 ft. 6 in. between centers, making panels about 10 ft x 5 ft with corrugated iron arch with 5 in. rise at the center, and then filled with concrete to within 1 in. of the top of the spiking piece leaving an air space between the concrete and the finished floor. The engine and generator foundations contain 376 cu. yd. of concrete made of one of cement, three of sand, and six of 2-in. broken stone and faced with one of cement and two of sand, and when the forms were removed the foundations were washed and rubbed with a thin solution of water and cement giving a very neat and handsome appearance.

The foundations for the first addition to the plant, that is the addition containing the No. 9 unit, were constructed by days' work and not by contract. The foundations consist of 960.3 cu. yd. of portland cement concrete, requiring 1,196 cu. yd. of excavation to

cu. ft. of concrete to each barrel of portland cement, including facings and all.

The foundation walls of the building are composed, in a part of the building, of all concrete, and in the front portion of the building of masonry faced with concrete 12 in. thick. These walls have been given very severe tests during the periods of high water but have thus far shown no leakage or signs of deterioration.

Another use of concrete in this station has been found in the substitution of concrete arches for columns for the purpose of carrying the old walls when building additions to the station. The construc-



PIERS FOR BROKEN STONE, STATE ST. CAR HOUSE.

tion and dimensions of this arch will be understood by reference to the half tone engraving and the working drawing reproduced in this connection.

Fire Department.

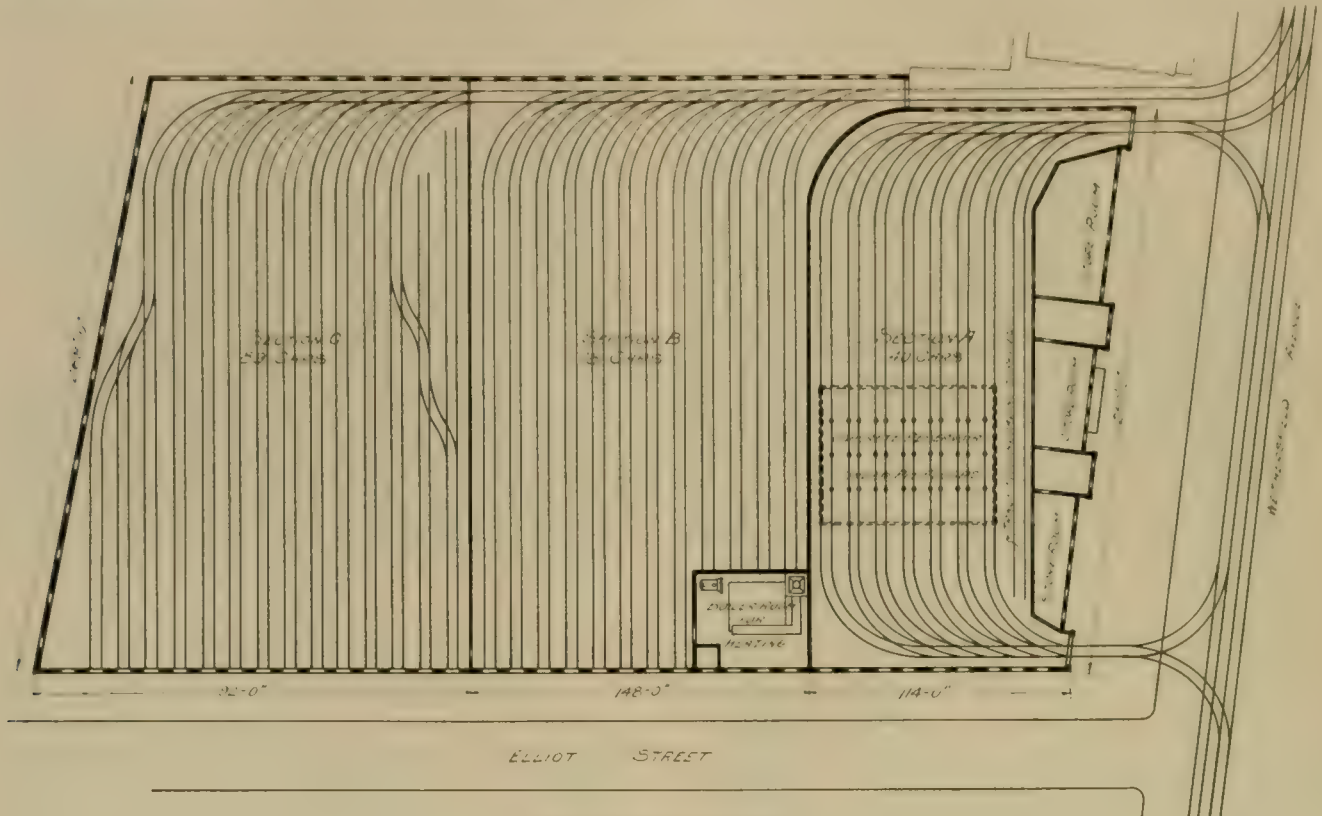
The fire apparatus at the station consists of a 16 in. x 19 in. x 12 in. duplex pump of 750 gallons per minute capacity.

Water from the Connecticut River is used in case of fire and in the boilers, and also for condensing purposes.

[In view of the extensive use of concrete by the Hartford Street Ry. in and about its power station and new car house, the paper on

Concrete by Mr. Crawford, secretary of the Hartford Paving & Construction Co., published elsewhere in this issue, will be of especial interest inasmuch as The Hartford Paving & Construction Co. has built most of the concrete work for the Hartford Street Ry., and

additional sections as indicated will be built as required. The building is of brick with concrete foundations for all walls. As will be seen from the front elevation and plan, the design provides for but one entrance and one exit track for eight storage tracks, and there



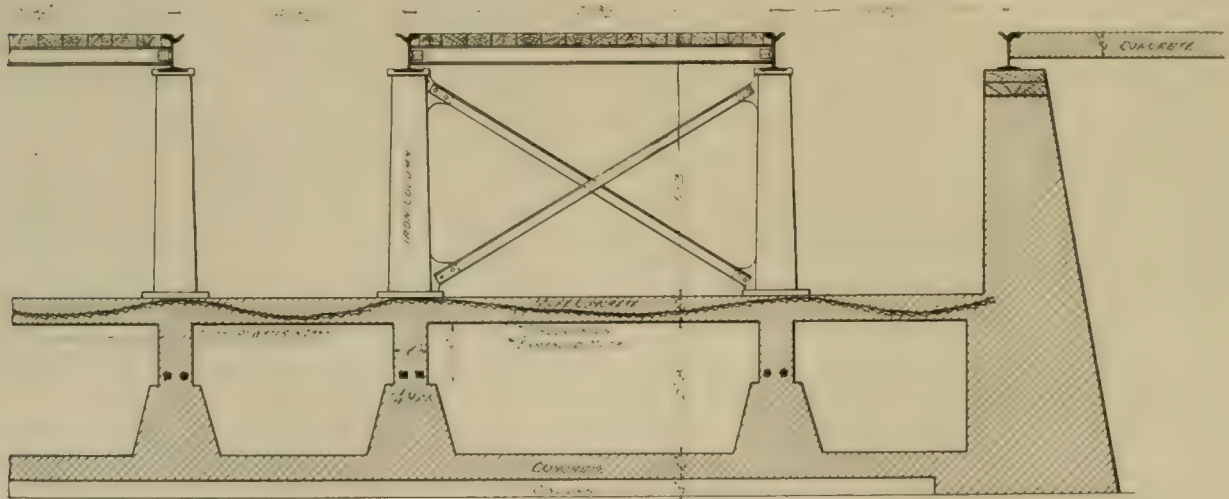
PLAN OF NEW CAR BARN.

Mr. Crawford's views have been followed largely throughout this work.—Ed.]

New Car House.

The Hartford Street Railway Co. is building a new operating and storage car house on Wethersfield Ave. As will be seen from the

is no multiplicity of entrance doors. The arrangement gives exceptional flexibility in the movement of cars, as all cars enter at one door, pass to the ladder tracks and out at the other door. All switches and special work are under cover and are therefore more easily kept clean and free from snow and ice in winter. This arrangement of putting the special work under the roof, occasions



CAR PITS AND RESERVOIR, HARTFORD STREET RAILWAY CO.

accompanying drawings, this house includes one or two features that are different from common practice, but which seem to possess a number of recommendations.

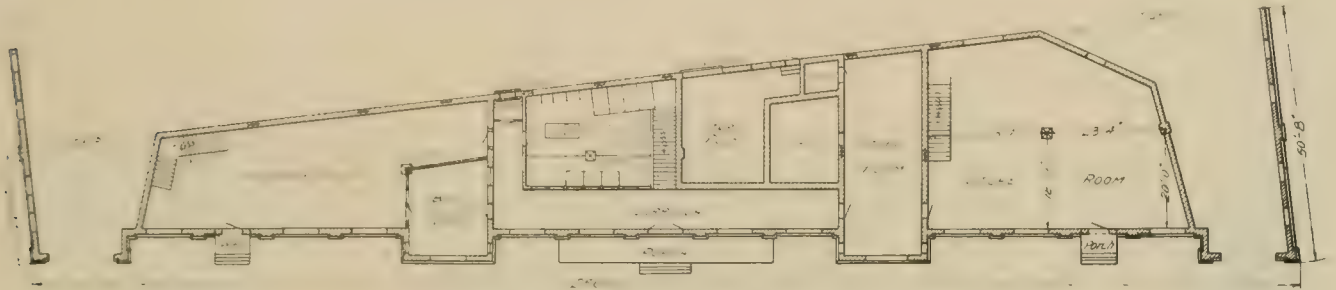
The car house has a frontage of 250 ft. and an ultimate depth on the side street of practically 500 ft. For the present, however, Section A, having a depth of 114 ft., will give sufficient capacity and the

some loss of space but this loss is not serious and is compensated to a great degree by the space secured along the front of the building for store room and office purposes. The car storage shed is not divided into floors, but the front part of the building is arranged with three full floors and additional rooms at the tops of the two towers.

A novel scheme was devised for storing water at this car house for fighting fire. After considering the advantages of elevated tanks for water storage purposes, it was decided better results could be secured for building a concrete reservoir underneath the bottom floor line of the repair and inspection pits. Accordingly, excavation was made for a square reservoir extending across the building under seven tracks. In the excavation was laid a bed of cinders to a depth of 4 in. and on this a bed of concrete to a depth of 9 in. The top of the reservoir consists of 6 in. of stone concrete, supported on concrete piers spaced as indicated and strengthened by expanded metal embedded in the concrete in the manner shown. This roof of concrete forms the floor for the repair pits. The rails of the car house tracks are supported on iron columns resting on the concrete piers. The reservoir has a storage capacity of 100,000 gallons of water. It is fed from the city mains and the supply is also augmented by the

TENNESSEE NOTES.

The Nashville Railway was sold at foreclosure sale on June 15th to Col. A. M. Shook, the only bidder, at the upset price of \$500,000. Colonel Shook represented the bondholders, Isidore Newman & Sons and Ladenburg, Thalmann & Co., of New York and New Orleans, and John L. Williams & Sons, Richmond, Va., to whom the property has since been transferred. Practically the only change made in the affairs of the Nashville Railway was to take it out of the hands of the receivers, Messrs. Percy Warner and E. C. Lewis, who had charge of the property and that of the Cumberland Electric Light & Power Co. during the past two years. A decree confirming the sale has been entered in the United States Circuit Court at Nashville, and on June 26th a meeting of the purchasers was held and the organization of the Nashville Railway & Light Co. effected,



PLAN OF OFFICES, STORE ROOMS, ETC., AT NEW CAR HOUSE.

drainage from the entire roof area of the building. Fire pumps of sufficient capacity are always connected with this reservoir storage and supply the automatic sprinkling system in the roof of the building and also stand pipes at convenient locations. When this scheme was submitted to the fire underwriters, they immediately granted a reduction in the fire insurance rate on this building, and also granted an additional reduction in consideration of permission to draw water from the storage reservoir when fighting fire in the vicinity of the car house property. The entire building is heated by hot water.

GAINS IN CHICAGO ELEVATED TRAFFIC.

The largest comparative gains in elevated traffic in Chicago during June was that of the South Side Elevated Railroad Co., which showed a daily average gain of 8,813 passengers, or 11.53 per cent. The daily average for the month of June was 85,262, as against 76,449 for June, 1902. Next in point of gain was the Metropolitan West Side Elevated Ry., which showed an average daily increase of 9,870 passengers, or 9.7 per cent. The daily average was 111,613, compared with 101,743 a year ago. The Northwestern Elevated Railroad Co. gained 9.47 per cent, or an average of 5,758 passengers daily. The daily average for the month was 66,571, compared with 60,813 in June, 1902.

MANHATTAN RAILWAY SHOPS BURNED.

Three shops of the Manhattan Railway Co., New York City, with their contents, were destroyed by fire on the afternoon of July 4th. The loss is estimated at \$150,000. The shops were situated in the block bounded by Lexington and Park Aves., 98th and 99th Sts. Shop No. 1 was 15 feet wide and 40 feet long, and 20 feet high; it was built of brick and was used for the repair of cars. Shop No. 2 was 10,000 ft. of lumber. Shop No. 3 was known as the workshop. The cause of the fire is unknown.

The Dunedin Tramways Co., of Dunedin, New Zealand, will build a power house for electrical transmission about 20 miles from the city on the banks of the river, where three-phase current will be generated by turbo-motors driven by steam and transformed up to 15,000 volts. Near the city the line will branch to various sub-stations equipped with Westinghouse motors, converters, and storage batteries. Noyes Brothers, Sydney, Australia, designed the plant, the British Westinghouse Electric & Manufacturing Co., Ltd., will furnish the electrical apparatus, and the J. G. Brill Co. the cars.

this being practically a consolidation of the Nashville Railway and Cumberland Electric Light & Power Co., both of which have heretofore been operated as separate corporations, although the Nashville Railway controlled practically all of the capital stock of the Light company. Percy Warner was elected president of the new company, J. H. Fall, of Nashville, vice-president, and N. P. Yeatman, secretary and treasurer. The following directors were elected to serve until the first Thursday in next February; Col. A. M. Shook, Percy Warner, James C. Bradford, Joseph H. Thompson and J. H. Fall, of Nashville; R. Lancaster Williams, of Richmond, Va., and S. H. March, E. C. Hoyt and W. B. Brockway, of New York, N. Y. Messrs. Hoyt and Brockway were elected only as temporary directors in order to complete the organization at this time. The financial plan of the reorganization was set forth in the June number of the "Review." The new company commenced business July 1st.

Mr. Warner has announced that the work of reconstruction which the receivers, acting for the bondholders, had commenced in Nashville, would be pressed forward with the same determination as in the past, and that the money set aside for permanent improvements would certainly not be used for any other purpose. The company is contemplating nothing further than the improvement of its lines in Nashville, and the statement that the \$2,000,000 reserve might probably be turned to the purchase of proposed interurban roads from Nashville is not authentic, as the company has all it can undertake at present to make the improvements contemplated in the city limits and immediate vicinity.

The reconstruction work at Nashville is progressing satisfactorily on Broad St., West End Ave., Woodland St. and Deaderick St., no track having heretofore been on the last named street. The double track on the south side of the Public Square is also nearing completion, which will materially shorten the schedule of the East Nashville cars. The West Nashville line, about three miles, which has heretofore been only a single track line, will be entirely reconstructed and an additional track put down. Travel is very heavy on this line, so heavy, in fact, that a single track cannot accommodate it.

Early in the spring Ford, Bacon & Davis, who have charge of the reconstruction work at Nashville, ordered from the J. G. Brill Co. 10 semi-convertible single truck and fifteen 42-ft. semi-convertible double truck cars. These cars are being rapidly completed and some of them are now in transit to Nashville, and upon their arrival will be put in service on the recently reconstructed Broad Street line and the Glendale line, these two lines having the best roadbed and heaviest rails, therefore being most suitable for the use of the large new cars; however, on completion of the work on the West Nashville

in within the next month, or in six weeks a full quota will also be placed on that line.

A suit has been instituted by the Nashville Gas Co. against the Nashville Railway to recover \$25,000 which the plaintiff claims has been the damage inflicted upon its gas pipes by reason of electrolysis. If the Gas Company wins the suit, the city may also claim damages from the street railway company for damages to the water main pipes.

Mr. Charles H. Fisk, the Detroit promoter, and his Detroit associates have, it is understood, arranged to buy the present Great Falls Power Co., which is composed entirely of Nashville men. This company was recently given an extension of time by the city council of Nashville in which to commence its work to comply with the franchise granted it for supplying electric power at Nashville. The price to be paid is \$125,000, and the property includes some 200 acres along the Caney Fork River, a \$60,000 cotton mill, the charter of the corporation, plans and surveys. Power is to be furnished for the Nashville and also for the Chattanooga street railway and electric light systems. It is rumored that Isidore Newman & Sons, who are largely interested in the holdings in both cities, will also have prominent connection with the Great Falls Power Co. It is probable that a dam will be erected to increase the power of the falls, although it is understood that Mr. Newman favors the use of only the natural



SPECIAL WORK AT EAST NASHVILLE.

power produced by the falls, which it is contemplated would be sufficient for the railway and electric light systems of both Nashville and Chattanooga. Caney Fork Falls, from which it is proposed to derive the power, is located near McMinnville, Tenn., about midway between Nashville and Chattanooga. The Great Falls Power Co., as now constituted, is capitalized at \$20,000, with A. J. Dyer, president; George Jungerman, vice-president, and Robert B. Goodrich, secretary and treasurer.

The city council of Chattanooga has completed the passage of an ordinance granting the Rapid Transit company a right of way on Newby St. in order that the line will not be "bottled up" at the expiration of the present lease of the Belt Railroad. It was stated in the open meeting that this was only a part of the consolidation of the two street railway companies, which it was then understood was soon to be effected, but as nothing further has been heard for quite awhile of the proposed consolidation of the two companies, it is not known just what is the status of the deal at present.

The postmaster of Chattanooga has been authorized to place in operation a new mail collection by means of boxes to be carried on the cars of the Chattanooga Electric Railway Co. The system will go into operation about October 1st, it being necessary to delay the service several months in order to secure the boxes and to perfect the various arrangements for the service. The Chattanooga Electric Railway Co. will place a box upon every one of its cars somewhat similar to the street collection boxes. The contract with the government provides that the cars must stop anywhere for a person desiring to mail a letter that it would stop for a passenger. In other words, people living along the street railway lines will mail

their letters on these cars in the same manner as they would drop a letter in the postoffice. As stated, every car will be equipped with the boxes, which will give the people of all parts of the city and suburbs a 15 minute service. The boxes will remain the property of the government and no one but postoffice employees will have access to them. As the various cars pass through Station A of the Chattanooga postoffice, located in the transfer station, the mail will be taken out and immediately transmitted to the main postoffice in time to be sent out on the various trains.

It is also probable that a complete carrier system will be put in operation in connection with the Chattanooga transfer station. Special delivery service will be installed by which a person may have a note delivered within the space of a very few minutes. At present this service is in operation in only three cities of the United States, Des Moines, Ia.; Grand Rapids, Mich., and Lowell, Mass., it having been tried first in Des Moines. All of these cities have large suburban populations and it has proven successful.

BROOKLYN RAPID TRANSIT EMPLOYEES' CLUBHOUSE.

The Brooklyn Rapid Transit Co.'s clubhouse for employes at East New York was formally opened Tuesday, July 7th. The building, which cost \$40,000, is handsomely fitted up and affords a pleasant recreation place for the men. It contains a well-selected library, four pool tables, four bowling alleys, 200 lockers, tub and shower baths, and a well-equipped gymnasium, which will be in charge of a competent instructor. Rooms have also been fitted up as class rooms, where employes may receive a thorough course of instruction evenings in electricity, mechanical drawing, music, penmanship, English and arithmetic.

The Benefit Association will have headquarters in the building; its meetings and entertainments will be held in the hall, and the members will have annual bowling tournaments. Bowling alleys, pool tables, reading rooms and library are open to all employes of the Brooklyn Rapid Transit Co. Those who join the educational classes have the privileges of baths, entertainments during the winter, and the gymnasium, with the services of an instructor, for a small yearly sum, presumably not to exceed \$2 per annum. In the B. R. T. Benefit Association there are 3,100 members and the membership is rapidly increasing. There is a sub-station of the Public Library in the new building, the books numbering 1,000.

Among the speakers at the opening were: John F. Calderwood, vice-president and general manager of the Brooklyn Rapid Transit Co.; T. J. Nicholl, vice-president and general manager of the Rochester Railway Co., and E. P. Bryan, of the Interurban Street Railway Co. J. M. Dudley, secretary, has charge of the new building.

ELECTRIC ROADS IN INDIANA COAL FIELDS.

The Indianapolis & Martinsville Rapid Transit Co. will extend its line from Martinsville, Ind., to the coal fields of Greene and Sullivan Counties and will ship coal to Indianapolis, a distance of 90 miles. The coal will be hauled on standard cars by electric locomotives and the cars will be turned over to the Belt railroad at Indianapolis for distribution to factories. The company will also build several power houses in the coal fields to generate electricity to be sold in Indianapolis and other cities. It is also planned to build a line from Martinsville through Bloomington to Bedford to tap the Indiana oolitic stone district.

F. M. Fauvre, the head of the Indianapolis, Danville & Rockville Traction Co., which has just begun the construction of an electric line from Indianapolis via Danville, Bainbridge, Rockville and Clinton to Terre Haute, announces that his road is essentially to be a coal carrier and that standard cars will be hauled with electric locomotives and delivered to the Indianapolis Belt railroad. Spurs will be built into the Parke, Clay and Vigo County coal fields.

J. J. Appel, of the Indianapolis & Plainfield Electric Railroad Co.'s line, which is being extended through Greencastle to Brazil and Terre Haute, says that his company will rely on coal carrying for a large part of its revenue.

The Consolidated Traction Co., which is building a line from Indianapolis to Crawfordsville, is also building a branch line into the Parke County coal fields and will carry coal into Indianapolis.

Power Stations of the Olean, N. Y., Street Ry.

The Olean and the New Ceres Generating Plant, Using Natural Gas as Fuel.

The Olean Street Railway Co. operates 25 miles of track, including 2 miles in the city of Olean; a 19-mile single track line to Boliver and a 4-mile line to Allegany. Power for the system is generated in two stations, one located in the city of Olean, and one at Ceres, Allegany County, 13 miles from Olean. Both stations generate direct current at 550 volts, and the two stations are tied together by feeders and operate in multiple. The load equalizes on the line, the point of equalization of course fluctuating back and forth somewhere between the two stations in accordance with the variations in the load on each station. By operating the two stations in this manner the fluctuations in the load on the machines have been reduced and the average line drop decreased.

furnished from the Olean Street Railway Co.'s own gas wells. The special feature in regard to this boiler which was of advantage in the use of natural gas is the method of directing the flames by the means of tiles on the lower tubes whereby the flame is conducted horizontally from the point of entrance through the fronts over a bridge wall into a combustion chamber and from thence up among the tubes and forward the full length of the boiler under another set of baffle plates on the upper row of tubes and finally making a second turn and passing under the boiler drum to the uptake at the rear end. This has resulted in the thorough combustion of the incoming gas and an excellent application of the heat to the thin tube surface, so that the heat of the gases is thoroughly absorbed in the boilers

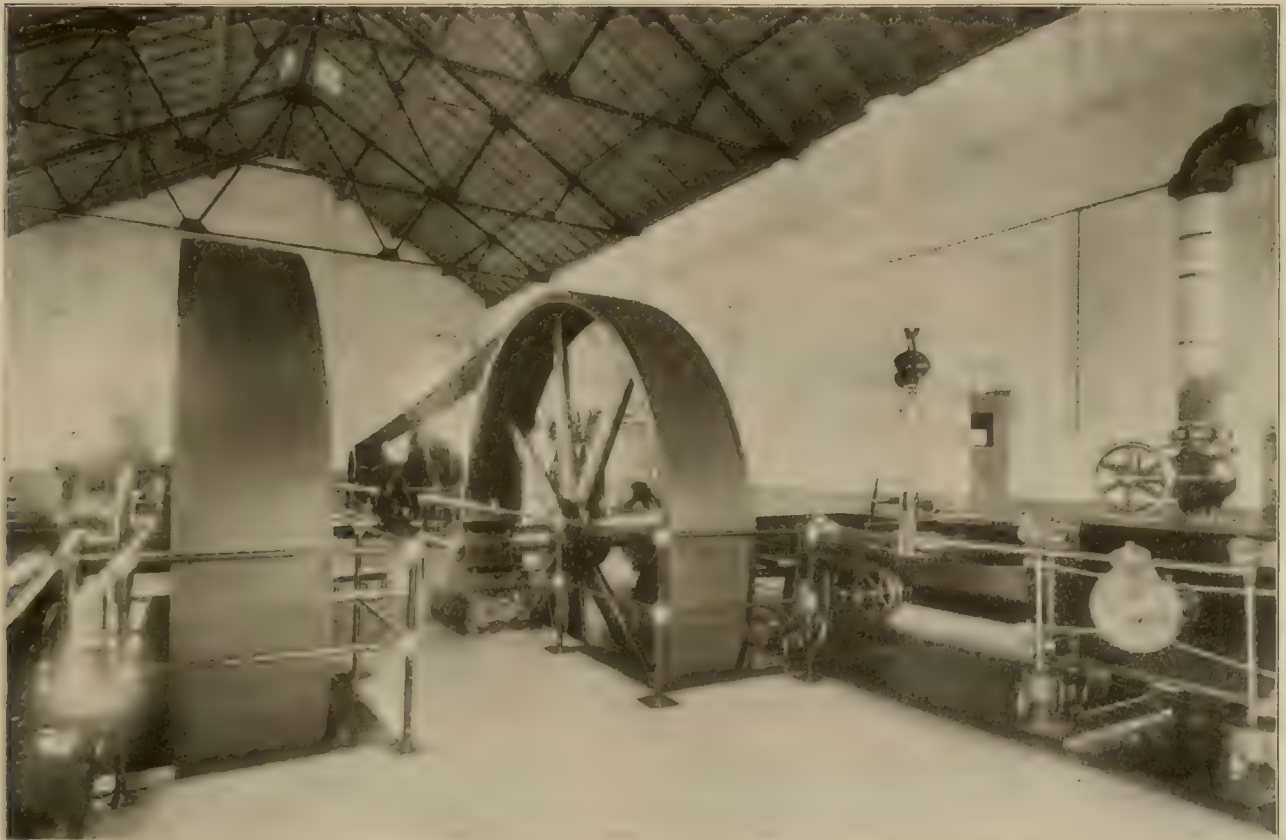


FIG. 1. CERES POWER STATION. TWO 20 X 42-IN. HAMILTON CORLISS ENGINES.

The Olean city station contains two 125-kw. General Electric generators, belted to Lane & Bodley engines, taking steam from two 200 h. p. National water tube boilers.

The new power house at Ceres was recently built to operate the extension to Boliver, and also a branch now building to Shingle House, Pa., which will run from the Ceres power house to Shingle House, a distance of about 4 miles.

The Ceres station is equipped as follows: Two simple non-condensing Hamilton-Corliss engines of the girder frame type, one right and one left hand, with cylinders 20 in. x 42 in. and operated at 90 r. p. m. Each engine is belted to a 200-kw. General Electric generator. These machines are arranged so that they can be run separately or together. The beds are 26 in. wide x 68 ft. long, made by the Bedford Belting Co.

The boiler room is equipped with two Franklin water tube boilers, 204 h. p. each, working under steam pressure of 150 lb.

The boilers are of the straight tube, water leg type construction. Each boiler has a 42-in. tall and 204 sq. ft. of heating surface and the boilers are set in one battery arranged for the use of natural gas

and the result is that the products of combustion pass out at a comparatively low temperature. Owing to the intense heat of the natural gas furnace, it is very important that the boilers used with natural gas should have a very thorough circulation of the water in order to have the cooler water protect the thin surfaces of the tubes, and this is obtained in the Franklin water tube boiler by large circulation openings at each end where the water legs are connected to the drums. These boilers have been forced very much beyond their rated capacity without showing any bad effects. The boilers are constructed of wrought steel throughout and are built for a working pressure of 160 lb.

There are two boiler feed pumps of the Stillwell-Bierce & Smith-Vaile Co. duplex plunger type; size 8 in. x 4½ in. x 10 in. There is also installed a No. 4 open heater made by the same company whereby the feed water is heated by the exhaust steam to about 200° F. before passing to the boiler. To the right and above the boilers is an iron tank with a capacity of 75 barrels, which is used as a water supply to the boilers, the water passes through a 2-in. line by gravity to the heater and from there to the hot water pump, and is then

pumped into the boiler. The pipe to the feed pump is so arranged that either pump will take water from the creek and from the heater, and can also be used for the purpose. The stack is made from No. 8 and No. 9 steel and is 46 in. in diameter and 95 ft. high and rests on a 20-ft. brick base.

about two acres of good natural gas land in the vicinity upon which have been drilled four gas wells, two of which are now supplying the necessary fuel for the Ceres station. More wells can be drilled on this property whenever it may become desirable to increase the supply of gas.

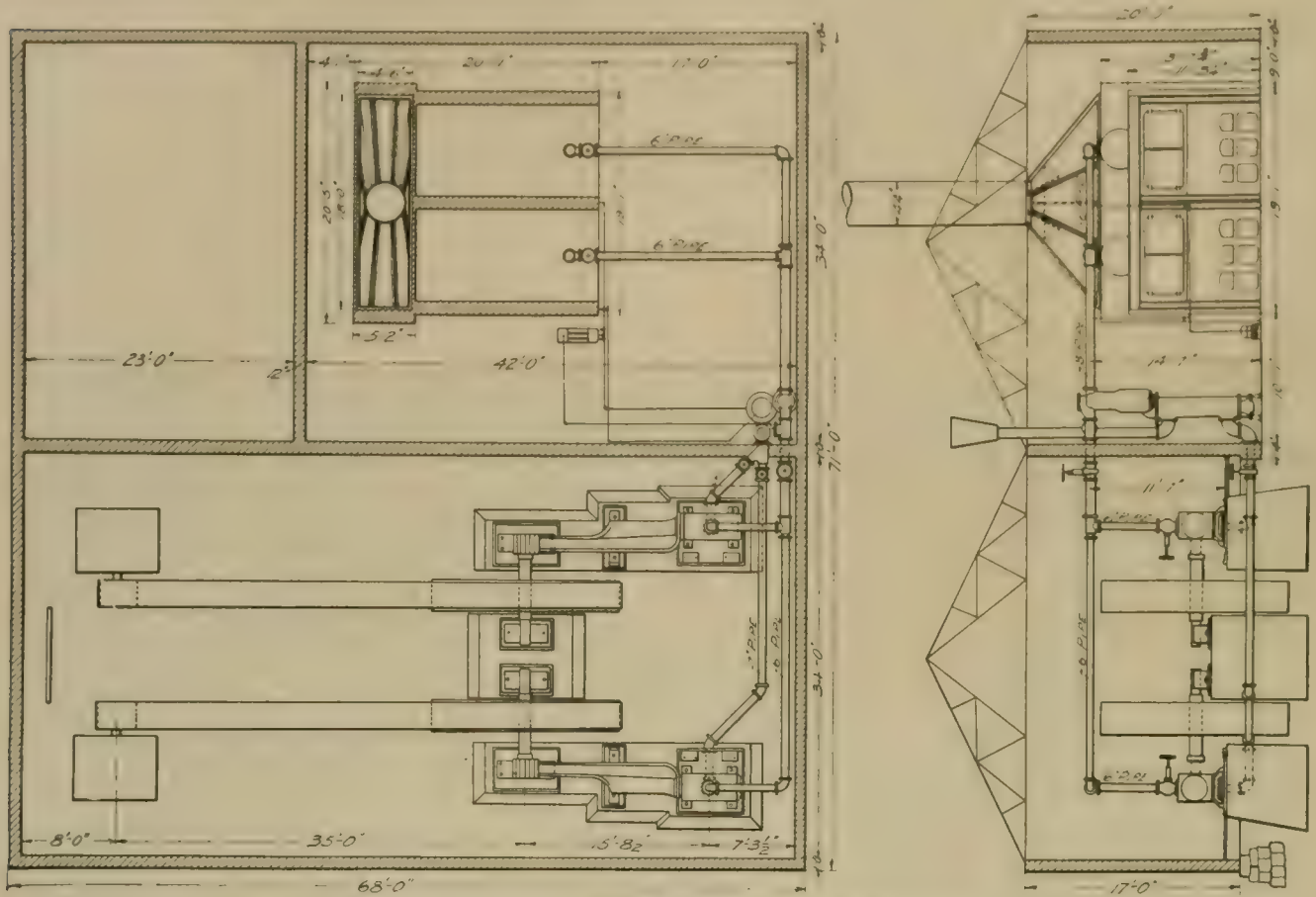


FIG. 2—PLAN AND TRANSVERSE SECTION OF CERES STATION.

At the present time but one engine, one generator, and one boiler are in operation; these are furnishing sufficient power for the company's present needs, allowing the other engine and generator to be held in reserve.

The wells are ordinary driven wells and go down to what is known as the gas sand beds about 1000 or 1200 ft. below the surface. The gas rises at a natural pressure of something over 300 lb. per sq. in. It is piped to the station and there passed through a gas regulator,



FIG. 3—ANOTHER VIEW IN THE ENGINE ROOM.

The fuel used at both plants is natural gas. The supply of gas for the city station is purchased from the Keystone Gas Co., but for the Ceres power house gas is taken from the company's own wells located within 2000 ft. of the power house. The company has leased

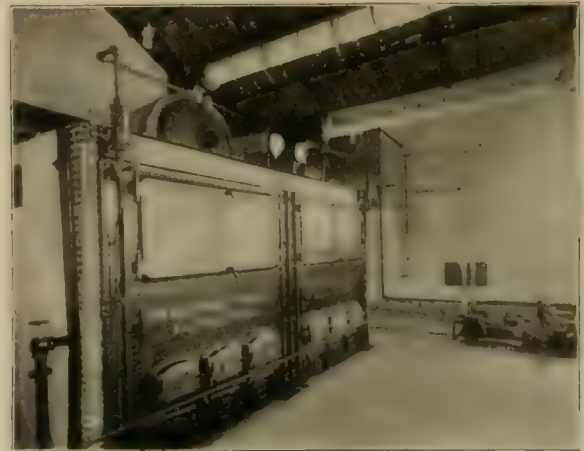


FIG. 4—TWO 204-H. P. FRANKLIN WATER-TUBE BOILERS.

reducing the pressure to about 9 ounces per sq. in., at which pressure it is fed directly under the boilers.

There is no smoke or dirt from the gas fuel and it is necessary to have but one engineer in the plant during the day, and one at night.

The Ceres plant of the Olean Street Railway Co. was designed by the Washington Co., of 39 Cortlandt St., N. Y., which company had full charge of the details of the power house, boilers, engines and piping system. The engines were furnished by the Hooven, Owens & Rentschler Co., of Hamilton, O., and the boilers by the Franklin Boiler Works of Troy, N. Y., the Washington Co. being sole sales agent for this boiler.

The Olean Street Railway Co. owns 5 double truck cars and 14 single truck cars. The long cars and their trucks were built by the John Stephenson Co., and are equipped with four G. E. No. 54 motors to each car. The company has placed a recent order with the J. G. Brill Co. for two 28-ft. cars of the Brill semi-convertible type. These will be mounted on Brill 27 G trucks and will be equipped with four G. E. 54 motors to each car. The company states that it



FIG. 5—ONE OF THE GAS WELLS AT CERES.

expects to place an order with the Brill company for one additional semi-convertible car and for one combination double truck freight car and snow plow which will be used for hauling freight and in winter will be fitted with an adjustable plow for fighting snow.

DETROIT UNITED RY. ADVERTISING CONTEST.

Some time ago the Detroit United Ry. inaugurated an advertising contest offering a reward of \$50 for the best idea to be used in advertising its street car service. The result of this competition is shown in the following extracts taken from the Detroit United Weekly of June 18th:

THE WINNERS, FOR THERE ARE TWO.

Admittedly the judges of the advertising idea competition have deliberated long to reach their decision. But the verdict has been reached. The idea, or rather the ideas to arouse interest in inter-urban travel, have been secured. There are two winners of the prize and each will receive a \$50 premium. They are Mr. H. S. Bullock, of 112 Butternut St., and Miss Helen C. Ahlberg, of 155 Elizabeth St. east. Originally it was the intention to award but one prize, but the reasons for this change in the program are readily explained. The winning suggestions, numbers 99 and 109, were selected from the hundreds of contributions submitted, because in combination they offered exactly that of which this company has been in search—thought, simplicity, strength and suggestiveness. The company wants them both and is sufficiently liberal in recognizing actual worth to pay the piper. Hence two prizes of \$50 each, instead of one.

The combination of these two ideas will soon appear on cards in the interurban cars. It will take the form of clever little verses, built upon the nursery rhyme idea, but broadened in application to include the many incidents, sights and impressions of a ride into the country upon any one of the many interurban lines. They will take one's memories back to one's childhood, but they embody amusing sentiment that is quite as diverting to the mature sense of humor. Each verse will be illustrated by quaint little drawings in silhouette. Indeed the clever silhouettes are a very important component part of

this whimsical idea. The judges feel little doubt that when these clever conceits are shown to the public their judgment will be fully confirmed. New verses and new pictures coming at regular inter-



"To market, to market, to buy a fat pig,

Home again, home again, dancing a jig,"

But, going or coming, for work play or rest,

CARS INTERURBAN are safest and best.

From "Mother Goose up to date"

vals will arouse universal interest in the quaint little stories they have to tell.

For all those who with their drawings and general ideas, offered their time and exertions, the company expresses its sincere gratitude.

Through the courtesy of Mr. J. H. Fry, assistant general passenger agent, we are enabled to reproduce two of the posters embodying the ideas of the successful contestants. These posters are printed in black on sheets 11 x 21 in. in size. One of these is placed in the cars for a week and is then exchanged for a new one, thus offering something new every week. The company also intends to reproduce the same ideas in its weekly simultaneously with the placing of



"There was a little girl who wore a little hood,
And a curl down the middle of her forehead,"

When she took the **INTERURBAN** she was very good,
But when she had to walk she was horrid.

From "Mother Goose up to date"

them in the cars. The combination of the silhouettes with poetry or prose admits of almost indefinite extension so that this style of advertising may be continued for as long a time as desired.

MORE STREET CAR ROBBERIES.

Three masked men stopped a W. 20th St. car of the Denver City (Col.) Tramway Co. on its last night trip June 20th and robbed the conductor of \$20.

Two men robbed the conductor and passengers on a Woodlawn car about three miles from Portland, Ore., June 22d and secured a gold watch and \$40, the latter being taken from the conductor, at whom one of the robbers shot. Owing to the large number of street car robberies on the suburban lines the Oregon Water Power & Railway Co. has armed all of its conductors and motormen.

Three negroes robbed the conductor of a car in Knoxville, Tenn., June 23d and were later arrested and held in \$1,500 bonds each for the grand jury.

Three men robbed the car men and four passengers on a South Tacoma (Wash.) street car July 5th, obtaining \$100 and three watches.

The Chambersburg (Pa.), Greencastle & Waynesboro Electric Railway Co. has purchased the electric light plant of the Waynesboro Electric Light & Power Co. It recently filed a mortgage of \$300,000 against its railroad property and will issue bonds to the amount of \$250,000. Jackson & Sharpe Co., of Wilmington, Del., was awarded the contract for electric cars; the power house is ready for the machinery, and the company expects to run cars between Pen Mar and Waynesboro this month.



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Victoria, Melbourne—Gordon & Cotch, Limited, Queen Street.

The publisher of the STREET RAILWAY REVIEW issues each year on the occasion of the meeting of the American Street Railway Association four or more numbers of the *Daily Street Railway Review*, which is published in the convention city and contains the convention reports. The *Daily Street Railway Review* is separate from the STREET RAILWAY REVIEW, but is in its nature supplementary thereto.

SUBSCRIPTION RATES:

In the United States, Canada or Mexico:
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Daily Street Railway Review (four or more issues)50
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CORRESPONDENCE.

We cordially invite correspondence on all subjects of interest to those engaged in any branch of street railway work, and will gratefully appreciate any marked copies of papers or news items our street railway friends may send us, pertaining either to companies or officers.

DOES THE MANAGER WANT ANYTHING?

If you contemplate the purchase of any supplies or material, we can save you much time and trouble. Drop a line to THE REVIEW, stating what you are in the market for, and you will promptly receive bids and estimates from all the best dealers in that line. We make no charge for publishing such notices in our Bulletin of Advance News, which is sent to all manufacturers.

This paper is a member of the Chicago Trade Press Association.

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VOL. XIII. JULY 20, 1903. NO. 7

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THE NEW ASSOCIATION.

Although it is only two months since the youngest of the electric railway associations, the American Railway Mechanical and Electrical Association, was organized the officers are able to report a total membership of 79 companies of the three honorary members chosen at the General meeting. There are 20 street railway companies now members, these constituting the so-called "active" membership; and the fact that while these 20 companies comprise only a little over one per cent of the total number of operating railways, the mileage represented by them amount to 15 per cent of the total of street and interurban track in the United States, is indicative of the attitude of the most important companies toward associations of this character.

This association has two classes of members not to be found in the American or the Accountants' Association, associate members and junior members, there being now 23 associates and 34 juniors. These grades were established in order to increase the interest of employees other than the heads of departments in the work of the association, and to make the papers and discussions before it of greater educational value. The opportunity thus afforded younger men in the mechanical and electrical departments has evidently been appreciated.

We feel that President Farmer and Secretary Mower, upon whom lies the principal burden of extending the membership and influence of the association, deserve to be heartily congratulated on the success which has attended their efforts.

SPECIAL PRIVILEGE TICKETS.

The public is always restive under restrictions, and street railway patrons in particular are inclined to complain of ill usage when asked to conform to regulations established for the general good, but from which they believe they should be exempt for this or that special reason. Thus during the bicycle craze, while a man would willingly admit that street railways should not be called upon to carry bicycles to the exclusion of passengers, yet when caught in a rain storm he was quite sure that a rule of the street railway company requiring conductors to refuse to transport his wheel was unreasonable—and he was right. Before the popularity of the "wheel" waned nearly all progressive companies had revised their rules and allowed a limited number of bicycles on each car, providing special devices for carrying them safely, and the result was good, patrons were accommodated and the charge for carrying wheels paid for the holders. It is amusing to recall that the president of one prominent road could not see the wisdom of helping the bicycle rider in trouble until his daughter had to ride home in the rain.

A matter similar to this is the dog question. As a general proposition street cars are not intended for the transportation of dogs, but there is occasionally a patron who is very desirous of taking his dog with him. An excellent solution of the difficulty and one that avoids leaving too much to the discretion of the train men is afforded by the plan adopted in Hartford, Conn., and Birmingham, Ala., where "dog permits" are provided. Such a special ticket is often a substantial accommodation to the passenger, it removes a cause of irritation, and the company collects the regular fare for the dog that would otherwise be carried free.

SLEEPING CARS ON ELECTRIC LINES.

It is now a little more than three years ago since we recorded in the "Review" (April, 1900) the plans of a syndicate which proposed to close the then existing gaps in the electric railway route between Boston and New York and this being done to put in operation through dining and sleeping cars to run between the two cities, a distance of 262 miles. At that time there were three breaks in the through line aggregating 52 miles or 20 per cent of the total distance, although the fact that 80 per cent of the distance could be traversed in electric cars was scarcely known when the trip made by Mr. Derrah was first described in the "Review" for June, 1899. Those breaks are not yet closed, although franchises covering the last of them have been granted.

Three years ago the suggested plan for sleeping cars on electric railways was regarded as only a possibility of the not remote future. Today two companies have decided to make a practical trial of such a service, and several others have the question under consideration. Nothing could be more significant of the rapid development of interurban lines than the fact that when electric sleeping cars were

first suggested it was considered that New England offered the only field for their application, while the first two roads to contract for this equipment are both in the middle west, one in Ohio and one in Indiana.

In our issue for last month we described the plans of the Columbus, London & Springfield Railway Co., to which belongs the honor of being the first to introduce sleeping car service—cars to operate between Columbus and Cincinnati. The Indiana Union Traction Co., successor to the Union Traction Co. of Indiana, has arranged for sleeping cars, and for buffet cars as well, which it is expected will be in operation within 60 days.

There would seem to be just at present a broader field for the buffet car on electric railways than for the sleeping car, particularly on Ohio and Indiana lines which are much patronized by commercial travelers to whom the electric interurban has been a veritable boon. The frequent service given on electric lines permits a salesman to cover his territory with the loss of far less time than formerly, and the buffet car will prove to be a further time saver.

CHICAGO RAILWAY FRANCHISES.

The time has at last come when the city of Chicago must abandon its position on the street railway franchise question and withdraw its ultimatum that the waiving of existing rights is a condition precedent to negotiations for an extension ordinance. This happy condition is a direct consequence of the financial embarrassment of the Union Traction Company, which placed it in charge of receivers appointed by the United States Circuit Court. The latest instructions to the receivers clearly show the necessity for the city to cease its bluster and seek to adjust differences on a basis that shall recognize existing contract rights.

Were we not familiar with the possibilities of a carefully planned and executed campaign for the dissemination of misinformation it would be difficult to understand the attitude taken by the municipality and the press of the city in this matter. In ordinary business affairs the parties concerned are always willing to give each other a hearing, and discuss differences, but the city having assumed the position that the law under which the street railways claim valuable rights is void because unconstitutional, that if valid it would be of little value, and that if the companies ever had any rights under the act, they were waived twenty years ago, has declined to further consider it. Continual reiteration of this position has blinded the general public to the fact that but one lawyer of repute is known to have seriously given the opinion that the so-called 99-year act is not valid and effective today; and it may be added that this one man is believed to have held the opposite opinion until very recently.

The claims of the Union Traction Co., and the laws and ordinances on which they are based were presented to the court in a petition of the receivers for the company, and a public hearing was given June 18th, at which, however, the arguments were all on one side, the city declining to appear. These claims may be briefly stated as follows: 1. Under the act of 1859 the company received a grant for the term of 25 years with authority to build and operate such lines within the city limits as the city by ordinance should authorize, and without the city limits such lines as the supervisors of townships should authorize. 2. Under the act of 1865 the term of 25 years was extended to 99 years, with authority to build and operate such lines "within the present or future limits of the south and west divisions of the city of Chicago as the common council of said city have authorized said corporations, or shall from time to time authorize" them. 3. Under the act of 1861 (incorporating the North Chicago City Railway Co.) as amended by the act of 1865 similar rights were secured in the north division of the city. 4. That later ordinances are definitions of the old grant and not new grants.

The letter of Judge Grosscup in answer to the petition of the receivers is published on page 413 of this issue, and from this it will be seen that the court dismisses with contempt the contention that the 99-year act is unconstitutional, and is sufficiently convinced of the justice of the railway's claim to authorize the expenditure of large sums in improvements. Coupled with the order for improvements and an offer to co-operate in any attempt at amicable adjustment, Judge Grosscup instructs the receivers:

"To suffer no interference with your possession of any of the streets named in the legislative grants, or occupied by the companies named in the legislative grants, or their successors, under ordinances of the city, which, in the view I have outlined, are to be treated

as subservient to the legislative grants. Any attempted interference you will report promptly to me."

This view of the legislative grants and the rights under them will doubtless affect the negotiations now pending between the city and the Chicago City Railway Co.

July 14th the court appointed an attorney to represent it in future negotiations between the Union Traction company and the city.

STREET RAILWAY LAW.

We wish to say a few words regarding our efforts to solve for street railway men one of the serious practical problems that for years has confronted members of the legal profession, that of keeping in touch with the current decisions of the many courts which, even more than the legislatures, "make the law" by their interpretation of statutes and the extension of old principles so that they may apply to new conditions. It is perhaps not too much to say that the printed reports of the decisions of American supreme and appellate courts each year equal or exceed the bulk of that ancient law library which it was said "formed a load for seven camels." To meet this condition and assist the lawyer in his work there have been published many digests and encyclopedias, but these works are of themselves too voluminous, as well as too technical to be of much assistance to the layman, who quite as much as lawyers should have a general knowledge of that branch of the law which most closely affects his business.

Street railway officials in particular have special need of pertinent legal information, because they are brought, through their subordinates, into relations with more persons than is any other class of business men, and also by reason of the rapid development of their industry, the problems, calling for some general knowledge of law, with which they have to deal, are constantly increasing both in number and variety. One has only to enumerate a few subjects such as franchises, transfers, personal injuries, stock issues, consolidations, eminent domain, rights of way, freight, interchange of traffic, change of motive power, etc., to suggest the advantages of law reports for street railway men.

When the "Review" was founded, January, 1891, one of its features was a Legal Department, a department that has been continued ever since. In the compilation of this matter the aim is to cover all of the courts of last resort in the country and also the inferior courts, such as state appellate courts and federal circuit courts, the decisions of which are regularly reported, and abstract the new points affecting street railways, whether of law or fact that are involved. The increasing importance of the questions arising in the street railway field led us in 1896 to begin the publication of this series of decisions in book form under the title "Street Railway Law," the fourth volume of which has just made its appearance. These books, supplemented by the "Recent Decisions" published in the current numbers of the "Review," constitute far more than a digest, being a compendium of the decisions and not a mere reprint of head notes.

OIL FOR DUSTY ROADBEDS.

The Boston & Worcester Street Railway Co. has made arrangements to sprinkle its roadbed with crude petroleum to obviate the dust nuisance, and keep down vegetable growths, and will be, we believe, the first street railway to make use of oil for the purpose. In 1900 considerable attention was directed to the experience of highway supervisors in the southern part of California who had sprinkled the roads in their care with oil, and the data then available placed the cost at \$150 per mile per annum for strips 12 ft. to 18 ft. in width; steam railroads also reported the cost of the oil treatment to be about \$150 per mile per annum. This is not above twice the cost of water sprinkling which on city lines may be estimated at from \$10 to \$20 per mile of track per month, for 20 ft strips.

GROWTH OF STREET RAILWAYS.

The Census Bureau has issued a preliminary report on the street railways of the country, which contains statistics for 817 operating companies and 170 leased lines; the total track (single) in 1902 is given as 22,577 miles for the United States, owned by 849 companies, an increase of 178 per cent in track mileage and of 11.6 per cent in the number of companies, as compared with 1890; the average number of employes for the year 1902 was 133,640, who received wages

aggregating \$80,770,000, the number of passengers carried was about 5,872,000,000. The average length of track operated per company was 11 1/2 miles in 1890 and 27.23 miles in 1902, the average number of rides per inhabitant, including the entire country, is given as 32 in 1890 and as 63 in 1902, the increase in this figure being greatest in the South Atlantic States and least in the Western States, and with these exceptions practically uniform in all parts of the country.

The results of recent consolidations are very well shown by a table in which companies are classified according to the length of line operated. Thus in 1890, 557 out of 694 companies operated less than 10 miles of line, and only 35 operated more than 20 miles, 2 of these having over 100 miles; in 1902, 394 companies had less than 10 miles of line, 219 between 10 and 20 miles, 179 between 20 and 100 miles, and 25 operated more than 100 miles. In 1890 the 10-mile roads operated 40 per cent of the total mileage, and the 100-mile roads 4 per cent; in 1902 the 10-mile roads had about 11 per cent of the total and the 100-mile roads 26 per cent.

SOMETHING FOR NOTHING.

Under this heading we described in the May "Review" the scheme of a concern known as the American Street Car Transportation Co. engaged in selling street car tickets by means of an "endless chain" of coupons. It is gratifying to note that early this month the Post Office Department issued a fraud order against the company, which will hereafter be deprived of the use of the mails in the conduct of its illegitimate business.

INDIANA UNION TRACTION CO.

A mortgage securing a bond issue for \$5,000,000 given by the Indiana Union Traction Co., lessee of the Union Traction Co. of Indiana, to the Girard Trust Co., of Philadelphia, was filed at Anderson, Ind., July 7th. This gives the company ample funds to complete the lines proposed and for improvements, which include the power house, car barns and shops, to be built at Anderson. The bonds are payable in 30 years from July 1, 1903, and bear interest at 5 per cent payable semi-annually. The mortgage names 80 of the 92 counties of the state as those in which the company proposes to operate, and more than 250 towns through which its lines will run. In leasing the Union Traction Co. the new company guaranteed dividends increasing from 1 1/2 per cent this year to 6 per cent in 1909, after which the latter rate will be maintained.

The company will have in operation before 1904 over 360 miles of electric road. It proposes to run sleeping cars between Indianapolis and Columbus in the near future. The route will be through Richmond, Dayton and Springfield, over the lines of six different companies. Several sleeping cars of the type described in the "Review" for June have been ordered for this service and will be delivered to the Holland Palace Car Co. in August. They will cost \$20,000 each. The sleeper charge will be \$2 per berth, or \$3 for a compartment. The interurban fare between Indianapolis and Columbus is about one-half the railroad tariff, and the sleeper and fare combined will be less than the steam road fare of \$5.50. Sleeping cars will also be operated between Indianapolis and Chicago when the Logansport line is completed to that city, in 1904.

The company has also ordered several buffet cars from the St. Louis Car Co., for "limited" train service between Indianapolis and Muncie, and Indianapolis and Marion. Each run is about 60 miles and will be made in two hours. The fare will be two cents per mile and the charges for a la carte service will be moderate.

The company has been experimenting with cars equipped with four 110-h. p. motors, and in a recent trial between Muncie and Indianapolis a speed of 65 miles an hour was obtained on a slight down grade.

NEW WAGE SCHEDULES FOR STREET RAILWAY EMPLOYEES.

The award of the board of arbitration, made on the demands of employees of the Metropolitan West Side Elevated Railway Co., Chicago, provides for an increase in wages amounting to about 10 per cent. The principal features of the award are as follows: All future grievances to be submitted to arbitration; the union agrees not to engage in sympathetic strike; motormen and conductors have

10 hours' work within 13 consecutive hours a day; the company does not oppose or object to employees becoming members of the union.

Motormen, 25 to 28 1/4 cents an hour; acting motormen, 25 cents after 60 days' employment. Conductors, 21 cents an hour. Regular guards, \$1.65 a day of nine hours, 18 1/4 cents for overtime; extra guards, 17 1/4 cents an hour. Switchmen, 25 to 28 1/2 cents an hour. Couplers, 22 cents. Towermen, 30 cents. Agents, day or night, 12 cents a day. Porters, 24 1/2 cents a month. Trackmen, \$87.35 a month. Telephone and signal wiremen, 25 cents an hour. Switch and signal repair men, \$66 and \$59.40 a month. Lamp boys, \$50 a month. Helpers, 12 1/2 cents an hour. Carpenters, 27 1/2 cents an hour. Plumbers, \$75 a month. Tinnerns, 27 1/2 cents an hour. Watchmen, \$1.50 a day. Bridgemen, \$75 a month. Car cleaner foremen, \$66 a month; car cleaners, \$51 a month. Shop men who have received no increase in pay since Jan. 1, 1902, 10 per cent increase; those advanced lesser amount, raise equal to 10 per cent.

A new wage scale has been agreed upon between the Union Elevated R. R., Chicago, and the elevated trainmen's union. The new rates follow: Towermen, 31 1/4 cents an hour; track repair men, \$72 a month; trackmen, \$67 a month; electrical repair men, \$65 a month; station agents, \$1.70 a day; ticket choppers, \$1.70; platform men, \$1.70, and porters, \$1.60. The last four become effective October 1st.

The car men of the Shamokin & Mt. Carmel Electric Railway Co., Shamokin, Pa., were granted an increase last month from 15 to 16 1/2 cents. They had asked 17 1/2 cents.

The conductors and motormen of the Meriden, Southington & Compounce Tramway Co., Meriden, Conn., were advanced beginning June 1st to 19 cents per hour for the first year; 20 cents for the second and third years, and 21 cents thereafter. This schedule is the same as paid upon all the other divisions of the Connecticut Railway & Lighting Co.

The Wheeling (W. Va.) Traction Co. has notified its conductors and motormen that beginning July 1st they will receive 21 cents an hour.

The Rapid Transit Co. of Chattanooga, Tenn., adopted a new wage scale June 29th. Conductors and motormen who have been in the company's employ two years will receive 16 cents per hour; three years, 17 cents; four years, 18 cents. The old rate is 15 cents per hour.

Tri City Railway Co., of Davenport, Ia., has agreed that the crews shall work 10 instead of 11 hours and has increased wages from 16 and 17 1/2 cents an hour to 18 and 20 cents.

The motormen and conductors on the local street car lines in St. Louis have been voluntarily granted a raise, as follows: One-year service men, 16 1/2 cents an hour; two-year men, 17 1/2 cents; three-year men, 18 1/2 cents.

The conductors and motormen of the Williamsport (Pa.) Passenger Railway Co. have been granted an increase of a little more than 5 per cent. The regular men will receive 18 1/2 cents; extra crews, 17 1/2 cents an hour.

The employees of the Springfield Railway & Light Co., Springfield, Ill., have received a wage increase. For one year's service, or less, the rate is 16 1/2 cents, an increase of 1 1/2 cents per hour; two years, 17 1/2 cents; three years, 18 1/2 cents.

The Bay City (Mich.) Consolidated Street Railway Co. has granted its employees an increase in wages.

The Michigan Traction Co., of Kalamazoo, Mich., increased the pay of all employees, the increase averaging 25 cents per day. One-year men get 17 cents an hour; two-year men, 18 cents; three-year and interurban men, 19 cents. The men work straight 12 hours without losing time between runs.

The Tacoma Railway & Power Co. has advanced its employees' wages beginning July 1st. Regular men get 20 cents per hour; extras, 18 cents.

The Public Service Corporation of New Jersey has granted an increase, beginning July 1st, to motormen and conductors of about 11 per cent, 10 hours to constitute a day's labor.

The Wheeling Traction Co., Wheeling, W. Va., increased the wages of its motormen and conductors to 20 cents an hour, taking effect July 1st.

The Aurora, Elgin & Chicago Railway Co. has increased the wages of its motormen and conductors of the city lines of Elgin, Aurora, Yorkville and Carpentersville according to length of service, the average increase being about 10 per cent.

Rockford & Interurban Railway Co.—II.

Rockford & Freeport Electric Ry.—Park System of the Rockford & Interurban Railway Co.—Financial Statistics—Personnel.

ROCKFORD & FREEPORT DIVISION.

The Rockford & Freeport Electric Ry. which is now under construction is at present a separate organization from the Rockford & Interurban but is being built by practically the same interests. The road will be operated under the management of the Rockford & Interurban for one year after its completion and the properties will then be consolidated on the basis of their earning capacities. The new line starts in the West End in Rockford and runs west parallel to the State road on a private right of way for a distance of five miles to a point $1\frac{1}{4}$ miles northeast of Winnebago. It then runs straight through Winnebago on Bluff St. until it reaches the Chicago & Northwestern Ry. tracks which it parallels on its private right of way to Pecatonica. Here the road diverges slightly from the Northwestern tracks running through Pecatonica on Second St. after which it again approaches the Northwestern tracks, passes

outs. Span construction is used for the overhead work, a double trolley wire No. 000 grooved section will be erected over the whole line. About 12 miles of the road is already graded and at points it has been found necessary to do considerable cutting in rock. The maximum cut was 15 ft. in depth and 800 ft. long. About 400,000 yards of material will be handled in grading the 28 miles of road.

An interesting feature of this work is the changing of the course of the Pecatonica River in two places. In one of these places the river has a U-shaped channel, the bend washing the edge of the Chicago & Northwestern right of way. This bend in the river crosses the Rockford & Freeport right of way twice and in order to do away with the construction of two trestles it was decided to dig a new bed for the river, cutting out the curve and filling in the old river bed where it crossed the company's right of way. The new channel to be dug at this point is 1,250 ft. in length. Nearly a



CHAUTAUQUA IN SESSION, HARLEM PARK, ROCKFORD.

through Rockford to a point east of Freeport, here the line curves into Taylor Ave. opposite the Fair Grounds where it connects with the local street railway line over whose tracks it runs to the Stephenson St. terminal. The total length of the line is 28 miles, all of which is single track with turnouts. The line is being very substantially built with the idea of attaining high speed and with a view to handling car load freight. Its maximum curvature is 6° and the maximum grade is 2 per cent for 2,000 ft. The track is laid with 70-lb. T-rail of A. S. C. E. standard section on cedar ties spaced 2 ft. between centers. The joints were furnished by the Weber Railway Joint Manufacturing Co.

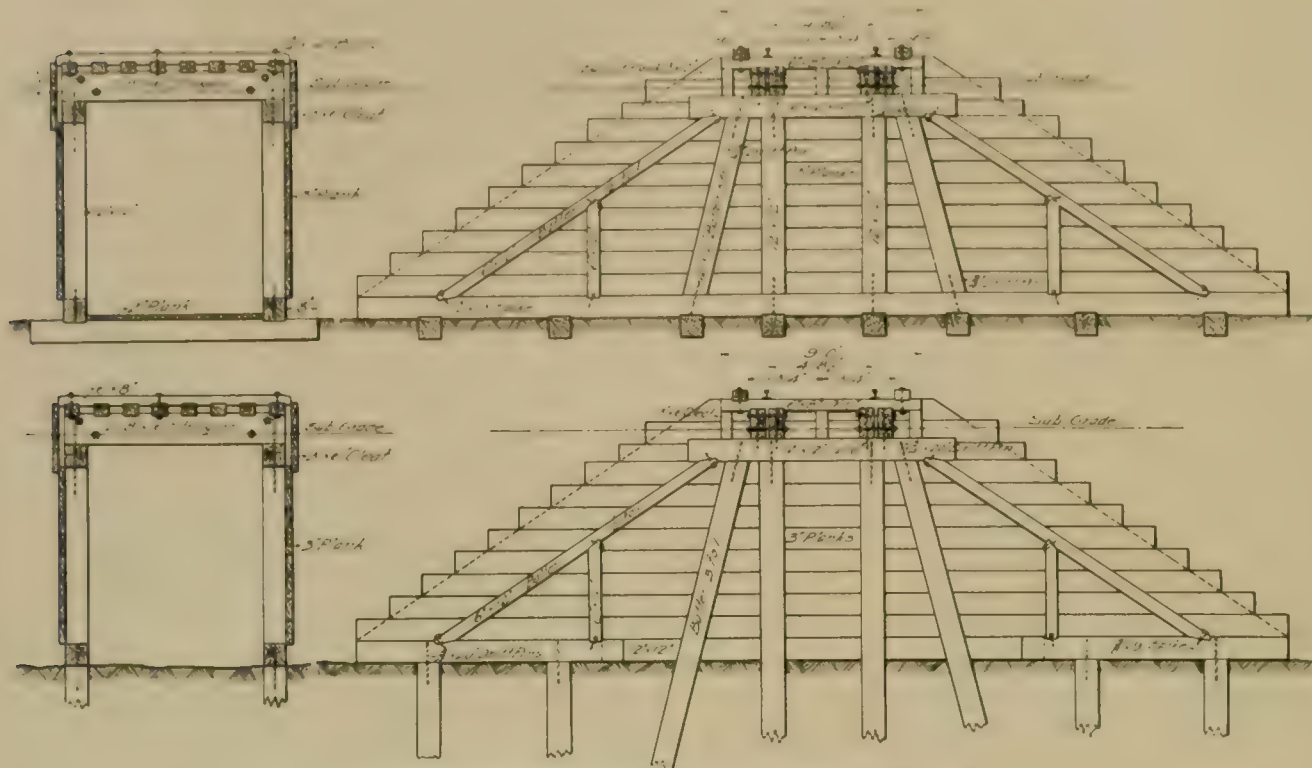
There are ten turnouts in addition to the terminals and semaphores made by the Page Iron Works are to be installed at all turn-

similar condition exists at another point along the line and at this place a new channel about 600 ft. long will be dredged and the old channel filled in. The Pecatonica River is about 125 ft. wide and 10 ft. deep at these points and has a current of about one mile an hour. The company's right of way has a minimum width of 50 ft. and a maximum width of 100 ft. at places where it was found necessary to barrow considerable material. The road will require one bridge at a place called Nevada. This bridge will contain one steel truss span 127 ft. long and girder spans making the total length of the bridge 300 ft. The standard cuts have a 20-ft. base and the fills a 14-ft. base. The poles are set with a considerable rake away from the center, those on one side containing a short cross-arm on which the company's private telephone circuit runs and the poles

on the opposite side contain two cross arms for the three phase system. The triangle formed by the three-phase insulators lies on the side of the poles away from the track and the sides of the triangle measure 40 in. The standard arrangement of circles and

SUB STATIONS

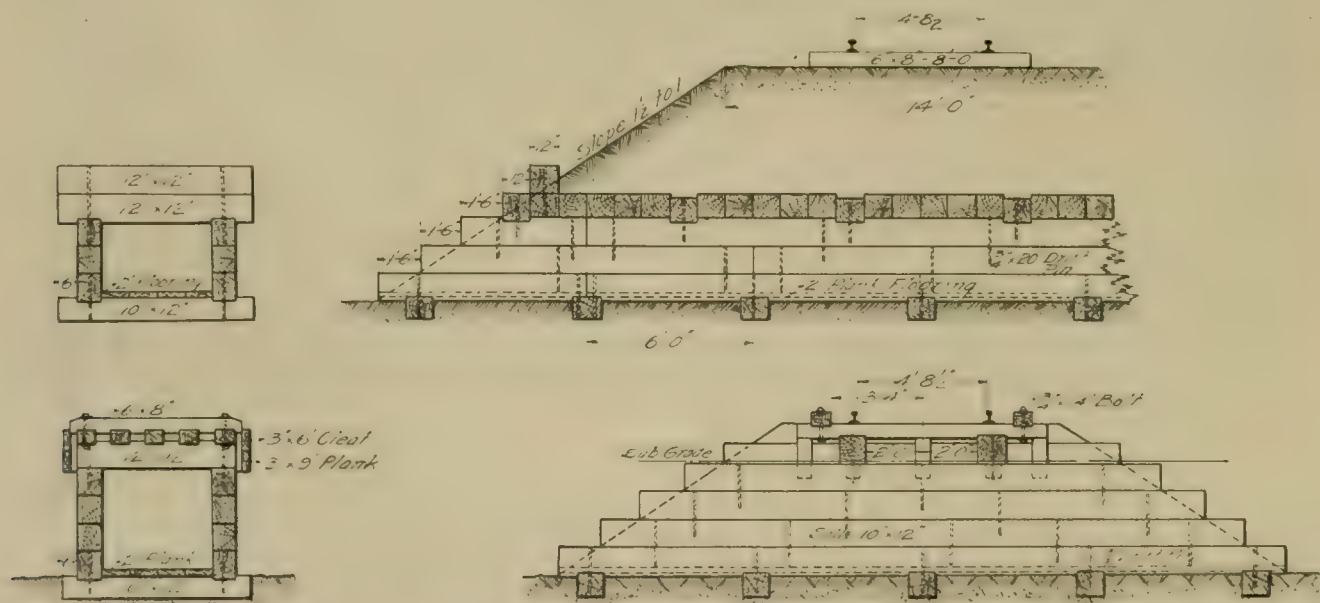
There will be three sub-stations along the line located at Winnebago, Pecatonica and Ridott. These sub-stations are located only about 7 miles apart so that with the exception of the one at



STANDARD OPEN DRAIN, ROCKFORD & FREEPORT ELECTRIC RY.

culverts for this line are shown in the accompanying illustration. The power for this road will be furnished by the Edison Co. of Rockford which will supply a 13,200-volt alternating current which

Ridott they will feed only about $3\frac{1}{2}$ miles to either side. This current is carried by the double trolley circuit without feeders except between Ridott and Freeport where, owing to the greater dis-



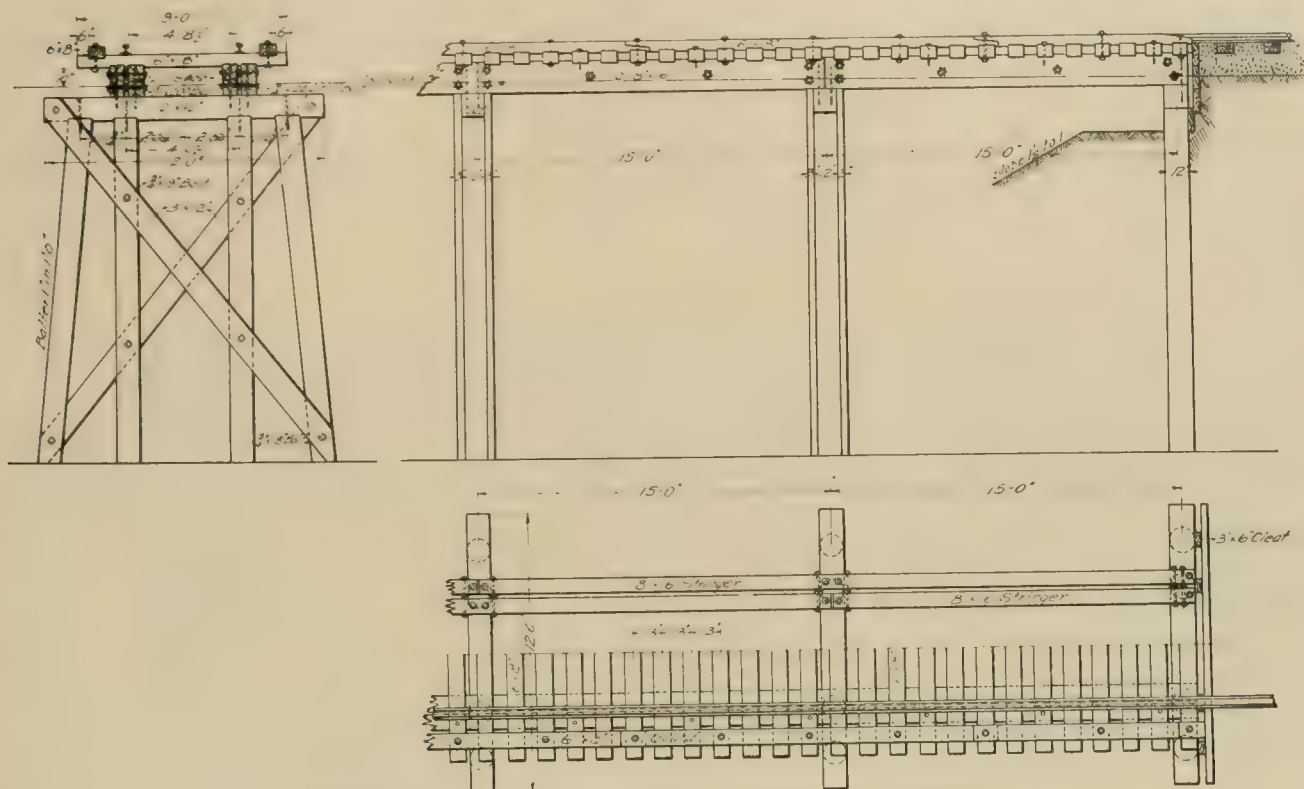
STANDARD BOX CULVERT, ROCKFORD & FREEPORT ELECTRIC RY.

will be carried to three sub-stations. The transmission lines will consist of No. 4 B. & S. gage copper carried on porcelain insulators 7 in. in diameter, $5\frac{1}{2}$ in. high and with a top groove of $\frac{3}{4}$ in. These are carried on locust pins $1\frac{3}{4}$ in. in diameter, $11\frac{1}{2}$ in. long.

tance the trolley wires will be supplemented by No. 0000 feeder. While it is recognized that these sub-stations are considerably closer together than is necessary from an engineering standpoint these three places will form passenger and express stations for the line

and by locating the sub-stations at these points the cost of additional feeders would be saved and by making them regular passenger stations the cost of sub-station attendance would also be reduced, as one man will be able to attend to all the business of

port line from the St. Louis Car Co. These cars will be 46 ft. 4 in. over all in length with 34-ft. bodies. The width over the panels is 8 ft. 8 in. and the distance between the truck centers 32 ft. The truck wheel base is 6 ft. 1 in. and the height of the sills above the



STANDARD PILE TREESTLE, ROCKFORD & FREEPORT ELECTRIC RY.

each station. These buildings will be one story high built of brick with stone trimmings and will contain a passenger waiting room, an express room and a ticket office in addition to the transformer room where the machinery is located. These buildings are surrounded on three sides by a platform which just sufficiently clears the track to allow standard steam road box cars to clear them and a branch track will be run on the opposite side of the sub-station where freight cars may be sidetracked and unloaded directly into the express room. A wagon road is provided on two sides of the house where trucks may drive up to load and unload. The three-phase circuit will be delta connected in starting the line giving the feeders a voltage of 13,200 but arrangements have been made throughout the line and sub-stations for subsequently making Y-connections and raising the voltage to 22,000. The transformers in the sub-stations will be of 75 kw. capacity, one to each phase and 25 cycles. The line current will be stepped down to 370 volts for the rotaries. The rotary converters will be 4-pole General Electric machines of 200-kw. capacity running at 750 r. p. m. and converting to 600 volt direct current. The reaction coil for the transformers will be mounted directly in front of each set of transformers and on top of the reaction coil there will be mounted the alternating current rotary converter starting panel. The switchboard will be located on the side of the room opposite the transformers and will contain one 200-kw. 13,200-volt alternating current rotary converter panel, one alternating current volt meter on swinging bracket and potential transformer, one 200-kw. 600-volt direct current rotary converter panel, two 600-ampere, 600-volt direct current feeder panels, one 750-volt station volt meter, one 13,200 outgoing line panel, and six 13,200-volt lightning arrester switches. The Chicago Engineering & Constructing Co., formerly Weston Bros., is in charge of the construction work on the road. This work is under the direct supervision of Mr. George Weston, under whose direction Mr. J. L. Dornell is in charge as resident engineer.

ROLLING STOCK.

Six interurban cars have been ordered for the Rockford & Free-

port line from the St. Louis Car Co. These cars will be 46 ft. 4 in. over all in length with 34-ft. bodies. The width over the panels is 8 ft. 8 in. and the distance between the truck centers 32 ft. The truck wheel base is 6 ft. 1 in. and the height of the sills above the



VIEW IN WASHINGTON PARK.

port line from the St. Louis Car Co. These cars will be 46 ft. 4 in. over all in length with 34-ft. bodies. The width over the panels is 8 ft. 8 in. and the distance between the truck centers 32 ft. The truck wheel base is 6 ft. 1 in. and the height of the sills above the

PARKS

There are two parks called Harlem Park and Washington Park. Washington Park is situated on the Belvidere River near Cherry Valley and is a beautifully wooded grove used very largely for church and society picnics and outings. The company offers this park free of charge to Sunday schools, lodges, etc. It contains good water, tables, ample seating capacity and its natural beauty has made landscape gardening and artificial attractions unnecessary. Harlem Park is situated on the Rock River at the outskirts of the city of Rockford and unlike Washington Park contains a large Chautauqua auditorium, a theater, dancing pavilion, ice cream pavilion, lunch room, bathing houses, steamboat wharf, shooting galleries, merry-go-rounds, bowling alleys and a small collection of animals. The park covers a tract of 27 acres lying along the river bank and boating is one of the principal attractions of the park. A new amusement fea-

ture the accompanying illustrations is a view of the park taken from the opposite side of the river during a Chautauqua session, showing the park lined with tents along the banks of the river. During this meeting on one Sunday evening in August, 1902, there were 7,500 people in the park during the day and 1,000 on the grounds at one time. The auditorium contained 4,800 people on this occasion and there were carried on the cars to the park 6,200 passengers. This large number of passengers was handled without crowding in trains of one motor car and two trail cars which were run on two minutes headway, fifteen trains being in service. The crowd was handled by Mr. Groneman, who announced the arrival and departure of the trains by means of a megaphone. Mr. Groneman has been very successful in organizing outings, large picnics, etc., at both of the company's parks and has succeeded in booking a large number of attractions which have added very largely to the pleasure traffic of the road. The company constantly distributes a



INTERIOR OF CHAUTAUQUA AUDITORIUM, HARLEM PARK.

ture is being erected this season which consists of a water merry-go-round. This consists of a number of boats connected to a central shaft after the fashion of the ordinary merry-go-round, the whole being driven by an electric motor. The season at Harlem Park was opened May 23d with a concert by the Thomas Orchestra, at which Campanari, and other prominent soloists appeared. The auditorium building in which Chautauqua meetings are held each year is a circular structure seating 5,000 people and containing a stage 100 x 50 ft. in area. The design of the building is unusual from the fact that it contains no columns whatever, the roof being supported by trusses as shown in one of the illustrations. The arrangement of the seats is also shown and the building contains no flooring. It also contains no windows in the side walls except those behind the stage and the openings are built with sliding doors which when opened, give a free circulation of air through the building in all directions. The acoustic properties of this building are excellent as a conversation can be carried on in an ordinary tone of voice between the stage and the furthest extremity of the building. The building is in great demand for Chautauqua assemblies, religious, political meetings and gatherings of all kinds. One of

large amount of advertising matter and owing to its cordial relations with the local newspapers its resorts are kept well before the public. Since the building of the Belvidere division the feeling of rivalry which had heretofore existed between these towns has given way to more amicable relations and the increased intercourse between these places has added very largely to the company's inter-urban receipts.

FINANCIAL.

The Rockford & Interurban Railway Co. was incorporated October 1, 1902, and is a consolidation of the Rockford & Belvidere Electric Railway Co. and the Rockford Railway, Light & Power Co. It has an authorized capital stock of \$1,000,000 of which \$750,000 has been issued. This stock has been placed on a permanent dividend-paying basis of 1 per cent quarterly. It has an authorized bonded indebtedness of \$800,000 of which \$150,000 was reserved to retire a like amount of consolidated 5 per cent bonds of the Rockford Railway, Light & Power Co. The remaining amount of the bonds was reserved for extensions and additions to the property to be used in the proportion of 85 per cent of the cost of extensions and improvements to the property.

The earnings of the company for the first four months of this year, the operating expenses, net earnings, etc., are shown in the accompanying table:

| Month. | Total earnings | Operating expenses | Net earnings | Deductions from income | Net income—Amount available for dividend. |
|--------------|----------------|--------------------|--------------|------------------------|---|
| Jan. | \$14,078.10 | \$ 8,082.08 | \$ 5,390.11 | \$ 2,017.12 | \$ 2,478.99 |
| Feb. | 12,501.43 | 8,280.51 | 4,301.92 | 2,001.88 | 1,400.04 |
| Mar. | 14,400.04 | 8,322.37 | 6,087.57 | 3,000.05 | 3,081.52 |
| Apr. | 14,026.00 | 9,055.01 | 4,971.35 | 3,034.95 | 1,936.40 |
| | \$55,106.52 | \$34,349.57 | \$20,756.95 | \$11,860.00 | \$ 8,896.95 |

The gross earnings from Jan. 1 to Apr. 30, 1903, inclusive were \$55,106.52. The earnings of the two consolidated companies for the corresponding period in 1902 were \$42,318.48, showing an in-

crease for the four months of \$12,788.04, or an average increase per day of \$106.56. The number of cars operated each year were 16, 14 being city and 2 interurban cars. The report of earnings for Wednesday, June 4, 1902, which was a specially heavy day, being the occasion of the Woodman's picnic in Harlem Park, was given in part 1 of this article. The total receipts for the day and the description of the receipts were shown in this table.

first contract ever closed by the Thomson-Houston Co. for installing an electric railway. In 1889 this road was sold to the present Des Moines Street Railway Co. Judge Baylies was then made president of the Springfield (Ill.) City Railway Co., where he remained until 1893. In 1889 he bought and electrically equipped the system at Rockford. He also, about the same time, built an electric railway in Brazil, Ind., which he subsequently sold to Stone & Webster, who consolidated it with the Terre Haute system. Judge Baylies has been president of the Rockford system for 14 years.

Mr. T. M. Ellis, general manager of the company, is a New Yorker, having been born in Whitestone in 1861. At the age of 18 he started in the street railway business as a conductor and steadily advanced until he was made assistant superintendent of the Utica Belt Line. He was next employed in a responsible capacity by the Edison General Electric Co. of New York, from which place he came to Rockford in July, 1892, as general manager of the Rockford City Railway Co. Under his management the Rockford system has been almost entirely rebuilt, new lines have been extended to cover all parts of the city, the service has been greatly improved and larger cars have been put in use, and the system in general has been put into a first class condition. Mr. Ellis enjoys



EXTERIOR OF CHAUTAUQUA AUDITORIUM, HARLEM PARK.

crease for the four months of \$12,788.04, or an average increase per day of \$106.56. The number of cars operated each year were 16, 14 being city and 2 interurban cars. The report of earnings for Wednesday, June 4, 1902, which was a specially heavy day, being the occasion of the Woodman's picnic in Harlem Park, was given in part 1 of this article. The total receipts for the day and the description of the receipts were shown in this table.

PERSONNEL.

The officers and operating staff of the Rockford & Interurban Railway Co. are as follows: President, R. N. Baylies; vice-president, John Farson; secretary, G. G. Olmsted; treasurer, W. F. Woodruff; general manager, T. M. Ellis; auditor, F. W. McAssey; superintendent of transportation, Charles C. Lines; express and passenger agent, J. H. Groneman; superintendent of track and lines, C. J. McCarty.

Judge R. N. Baylies, president of the company, is a native of Louisiana and was educated at the State University at Iowa City, Ia. After practicing law in Des Moines, Ia., for several years he was elected judge of the circuit court. He subsequently became president of the Board Gate Street Railway Co. of Des Moines, which was at that time a horse railway, and on July 5, 1888, he contracted with the Thomson-Houston Company to equip the road with electricity. This contract is of special interest as being the

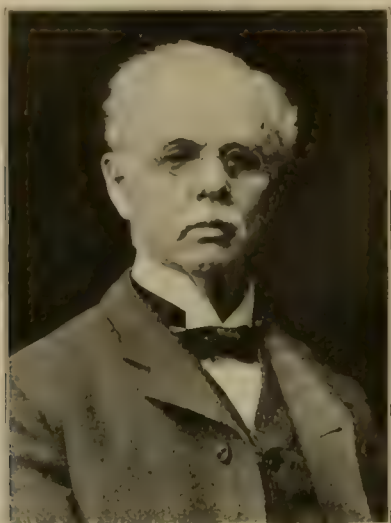
utmost confidence not only of the directors but of his employes as well with whom he has established the most friendly relations. Although a strict disciplinarian no one is quicker to appreciate and reward faithful service. He is a hard worker and keeps in touch with the smallest detail of every department under his management.

Mr. McAssey, auditor of the company, was born in Ripon, Wis., and educated at Ripon College. After graduating from college he took a bookkeeping course and in 1892 was made cashier and bookkeeper of the Rockford Railway, Light & Power Co. He has been continuously connected with the Rockford system since that time and was advanced to the position of auditor of the Rockford & Interurban Railway Co. in 1902.

Mr. Lines, superintendent of transportation, was born and educated in Monroe, Ill., and at the age of 18 entered the business college in Rockford. He was first employed by the Rockford Railway, Light & Power Co. in 1895 as motorman and advanced by successive promotions to the position of superintendent of transportation, in which capacity he has served the company since 1898.

Mr. Groneman, general passenger and express agent, is a native of Rockford, where he was for 3½ years water works inspector for the city. He then went into newspaper work and for 8 years was connected with the Register Gazette, of Rockford, a circulation

manager. In this capacity he became widely acquainted in Rockford and the surrounding territory. He has also acted at different times as manager for various shows and entertainments. In June, 1902, he was appointed to his present position with the railway company and much of the success of the express department is due to his active and able management.



R. N. BAYLIES.

Mr. C. J. McCarty, superintendent of track and overhead lines, was born in Logansport, Ind., in 1875, and was educated in the University of Illinois. He started in business in 1899 in the electrical department of the Chicago, Burlington & Quincy Ry. and in 1898 was made superintendent of the electric lighting plant at Rock Falls, Ill. In 1900 he was employed by the engineering department

point for fruit, grain and other produce, and $4\frac{1}{2}$ miles beyond Jewell is Defiance, the county seat of Defiance County, with a population exceeding 7,000, several large industries and a popular pleasure island in the Maumee River.

Passing through the town of Emmett the road will reach Paulding, the county seat of Paulding County, which like Florida has no



T. M. ELLIS.

railroad connections; its population is 5,000. Leaving Paulding the line passes through Latty, Haviland and Cavett, which are three miles apart; then comes Van Wert, the county seat of Van Wert County, with its extensive manufactures and oil industries. Next in order come Ohio City, whose population is rapidly increasing; then Rockford, which has a large farming trade; Mercer, an enter-



F. W. McASSEY.



C. C. LINES.



J. H. GRONEMAN.

of the Aurora, Elgin & Chicago Ry. and was appointed to his present position early in 1903.

PEOPLE'S RAPID TRANSIT RAILWAY CO.

The route of the People's Rapid Transit Railway Co., of Toledo, which is building an electric interurban system between Toledo and Cincinnati, as mentioned in the "Review" for June, lies through a thrifty section that is calculated to make the enterprise profitable, combining as it will passenger, express and freight services. Leaving Toledo from the west side, the road will pass in proximity to the state hospital and on through Monclova, Whitehouse, Neapolis, Colton and Liberty Center to Napoleon, the county seat of Henry County, noted for its manufactures. West of Napoleon $2\frac{1}{2}$ miles is Okolona, and $2\frac{3}{4}$ miles further on is Florida, which has no rail road, and with its mills and elevators its only outlet will be the new road. Next to Florida is Jewell, which is a large shipping

prising village; Celina, the county seat of Mercer County, and the center of the oil operation of Ohio; Carthage, also without railroad connections; St. Henry, New Weston, Rossville, Ansonia, and Greenville, the last-named being the county seat of Darke County.

Leaving Greenville, passing south through Ft. Jefferson, Eaton, the county seat of Preble County, is reached; then after touching several small towns, Hamilton, the chief manufacturing city in the state. The rest of the distance to Cincinnati is through a continuous chain of flourishing villages. Sleepers and through express cars will be run regularly between Toledo and Cincinnati.

The main office of the company is at No. 410 Spitzer Building, Toledo, O. The board of directors is composed of representative men chosen from each county seat through which the road will pass.

A summer session was opened July 8th at the Thomas S. Clarkson Memorial School of Technology, Postdam, N. Y. Electricity and electrical engineering are among the courses offered. The fourth annual commencement of the college was held June 19th.

CORRESPONDENCE

TERMINAL FACILITIES.

Editor "Review": Your valuable article on "Terminal Track Facilities," in the May number of the "Review," has just reached me. It is suggestive in many ways, and particularly useful because among the plans are several that embody the fundamental principles of correct station design. Terminals for both steam and street railways are in general badly designed. Possibly this is because so little has been written upon the subject. Among their chief faults are: Lack of capacity, inconvenience and unnecessarily long distances over which people must walk. As a rule they cannot handle people fast enough during the rush hours. Storage and the passenger terminal facilities are made to occupy the same ground. In many cases, crowds are of necessity too large for the space actually used, yet in nearly all stations there are immense areas that are not properly utilized. The following ideas for a terminal station are logical deductions from the fundamental principles which you state:

The designs are for the standard type of 25 ft. body double truck car, occupying, when the fender is down, about 40 ft. of track.

To give the easiest and quickest loading, the car should stand with its platform openings toward the passageway. The station ought to be of the "through" type so that all switching may be done at the storage or ladder tracks. With a few exceptions in the East, terminal stations are laid out with "stub" or "dead end" terminal tracks, these wasting both time and space. Cars discharging from them must be started by a headway at least twice the length of the stub track plus the time taken for loading and switching.

On a through track cars can be within 3 ft. of each other on the stand and separated in headway only by the time required for loading.

With four tracks arranged as loops, cars can be started on a headway of five seconds. At the Brooklyn Bridge, where there is not always an ample supply of cars, the headway going out is 11 seconds.

By the arrangement illustrated, cars may be started as quickly as they can be loaded. If this time can be reduced inside of 40 seconds, the headway could be made 5 seconds; if it can be 32 seconds, the headway might be 4 seconds. Practically, it seems that loops of this sort, with conveniently arranged storage tracks, can discharge cars as rapidly as a single line of rails can take them. The surface loops at the Brooklyn Bridge are essentially defective. In spite of that fact, they are handling a greater number of cars than are sent out from a similar terminal space anywhere in the world. Some of the defects are most palpable. The passengers are obliged to cross the tracks at the grades and in front of moving cars. This is dangerous. Many accidents happen, and at times these cause delay in getting the cars upon their stands. Unloading and loading are done at the same stations and at the same time. This stops all loading at one door until the unloading is finished. The crowds waiting to get in and pressing about the steps of the car delay those trying to alight. Accidents arise from this. A large force is necessary to keep the crowd in order, guide them to their proper cars and prevent them from being run over. The grades at the Brooklyn Bridge loops exactly reverse the ideal conditions. There is a steep down-grade toward the entrance and a sharp up-grade on the outgoing side. This makes it necessary to start a loaded car on a curve and a rising grade at the same time. The cars have to stand on the curves, as the tangents are too short. But this makes the construction compact, the whole space occupied by the loops being but a trifle over 90 ft. square.

In connection with the engraving shown, the essential features of the plan I suggest are easily stated. Several tracks are laid parallel, separated by platforms. They are connected at one end by curve and switch with the incoming track. At the opposite end, curves connect them to the outgoing track. Just before reaching the parallel tracks or loops, an unloading platform of suitable length is provided. This is shown in the plan Figure 1.

As will be seen from Fig. 2, nearly all of this track is placed on

a low trestle with barely room beneath it for a tall man. The clearance under the sleepers need not be more than 7 ft. In many parts of the country there would be but few kickers who would object to a clearance of 6 ft. 6 in. Probably the total elevation need not exceed 10 ft. at the outgoing platforms. This is divided into two flights of 5 ft. each with a broad landing between. From the unloading platform, a ramp or slope can be used to advantage. No one alighting from the incoming cars would consider the elevation. Under certain conditions, if stairways are considered objectionable, inclines of easy grade may be used for reaching the unloading platforms.

Glancing again at the plan, it will be seen that the exits from the park are directly opposite a series of eight stairways or entrances to the station. Where there are several lines to be served, each one may have a separate platform and the platforms can be divided from

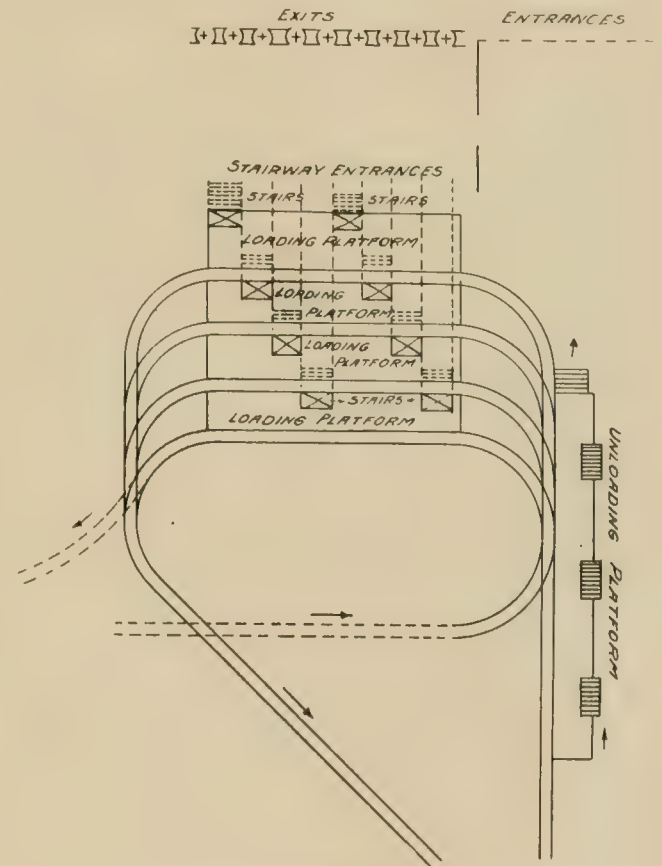


FIG. 1.

each other not only by the tracks but by cross fences. Although not made exactly to scale, the plan gives an idea of the relative sizes for two cars on the tangents of the loops and platforms about 15 ft. in width. The stairways and entrances would be divided from each other by fences. This arrangement has the advantage of dividing the crowds into very small units which are entirely isolated from each other. There are fences along the platforms at the side opposite the car entrances. When used for a single line, the cars may be arranged to leave in such order that those who wish to obtain seats and those who wish to take the first car regardless of ability to get seats can be easily accommodated and the order of leaving indicated.

When a park has an elevation at the entrance, the tracks may be placed upon the surface instead of on the trestle. The unloading track will discharge passengers on the ground. The exits from the park will be elevated and stairways or inclines will lead down to the loading platforms. This is a cheaper arrangement than the other. However, the stairways have to be longer and must be placed at right angles to the line of progress from the exit of the car unless perhaps the loops are placed like dead end tracks endwise to the exit. This, however, involves the undesirable feature of increasing the distance which the passengers have to walk.

The arrangement shown gives a greater capacity for handling passengers than any other with which I am acquainted. The passen-

get has the least distance to walk. It gives a separate terminal of necessity for eight different lines. The passengers for each are not intermingled in the station. In other words, the crowd is not attempting to pass through itself, as it were. When once collected, the individual units are small, consequently are easily handled and the number of attendants reduced to a minimum.

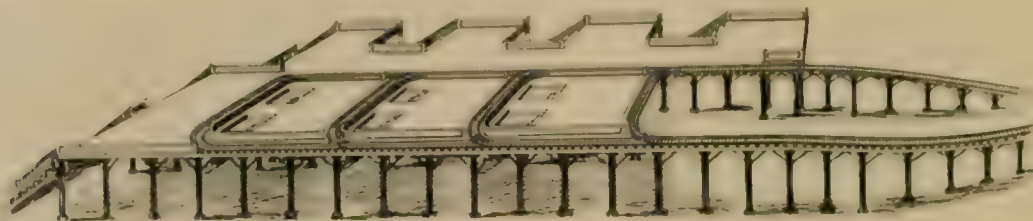


FIG. 2.

One of the small details is that the unloading track has a sharp grade placed in front of it so that the car drifts to its position without the use of brakes. The outgoing curves are all arranged so as to have a down grade as soon as the loading station is past.

The space occupied by these tracks and loops is comparatively small. As shown in the plans there are three unloading stations, occupying a tangent 120 feet long. The dotted lines show how this can be doubled up and made parallel with the loading tracks. The

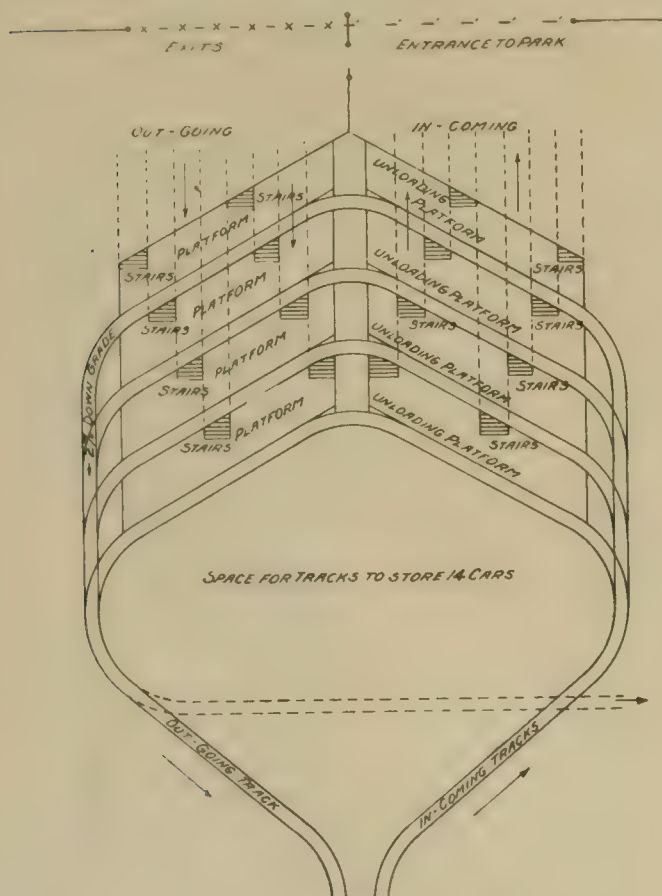


FIG. 3.

curves are all drawn with 40 ft. radius. All the storage tracks can be conveniently packed into any convenient space. The station itself, however, is entirely independent of the storage and the switching and is part of the main line. It is to be understood that all but one loop may be used for storage through the day. The inner loop, however, would be considered part of the main line both day and evening in cases where the main line extends beyond the park. Even at the rush hours it would only take a minute and four seconds for any car to go through the loops, if they happen to form a part of a main line and not a terminal.

It may be added that railway men who have had the longest experience and who have considered the problem from the financial as well as the operating point, are more and more inclined to look favorably upon the loop lines. They are also favorably inclined toward cars built to suit such lines. There is a saving of the first cost, a saving in weight carried, a gain in convenience, and a further

gain in strength and durability. There is also a simplification of the switching and a reduction in the cost of the special work. Of course, there are some theoretical difficulties, but it is notable that those who are operating along loop lines never seem to encounter them. The real difficulty seems to be that it is not always easy to obtain a right of way for a loop. This is perhaps due to the want of appreciation of its value when the lines are projected.

I should add that the only portion of this terminal which needs to be actually trestled is that part covering the stairway or loading platform. All the remainder is more profitably and economically placed on an embankment. The loading platforms, of course, need a light covering. These may be of sheds 15 ft. wide and extending the length of the loading stations.

The plan is elastic and capable of being modified to suit almost any imaginable conditions. It provides a greater capacity on a given area of ground than others I have seen. It is, however, intended to handle a maximum outgoing traffic only. It supposes that at the rush hours there are practically no passengers going toward the park, and hence, the three car-stands at the unloading platform will be sufficient. Given passengers and rolling stock, and allowing each car 40 seconds for taking on 45 passengers, the station can send out 540 persons per minute. This could only be done on the supposition that the station served a single line. Where many diverging lines reach it, the number would probably be lessened, because the passengers would have an unequal distribution and it would hardly be possible that all the cars going out would be filled. Supposing, however, that there were no passengers standing, the capacity amounts to 380 per minute, or theoretically 22,000 per hour, a greater number probably than any steam road station in the world could handle. Where crowds of moderate size arrive and leave at the same time, as in the early part of the evening, the unloading platform may be abandoned and the loops divided into two parts for four cars each. The incoming side of these can be used for unloading and the other for loading. This doubles the headway and reduces by one-half the number of passengers that can be handled per minute. It would, undoubtedly, be ample for all but the largest crowds. Thus reduced, a larger number of passengers can be sent out than most of our terminals ever encounter in a given time. In one-half hour 6,000 people could be handled.

Fig. 3 is a development of the principle which is illustrated in Figs. 4 and 6 on pages 273 and 274 of the May number of the "Review." By the addition of loops it may be made capable of handling almost an unlimited number of people. The stands for the cars are on tangents. They hold two cars each, eight on the incoming and eight on the outgoing side. Each platform has two stairways and a straight run from the platform to park entrances and exits. Unloading and loading stations are of the same size, the traffic being assumed to be of equal density both in and out.

Where space is limited, the tangents in the loops can be reduced to 60 ft. or less each. This reduces the total width taken up by the tracks by 35 ft. It shortens the platforms, however. The approaches to the station and a considerable portion of the platforms can be placed on an embankment. The only trestle needed is that over the stairways and the entrances.

There is no need of having four or any particular number of loops. They can be made as many or as few as are needed for the service. Here, as in other cases, the passengers have a minimum distance to

walk. If there are several lines, the passengers for each may be kept entirely distinct. Where the capacity of the main line is exceeded, the loops may be and would probably have to be divided in pairs and connected by switches to separate outgoing tracks. In such a case the crossings can be kept at different grades, some coming to the ground and passing under others. This would reduce the delay caused by switching.

Supposing a large number of passengers are arriving while a crowd is to be carried away from the park after the performance, we should have the following figures: Headway 5 seconds; cars stand in place 40 seconds; take a loading of say 45 persons (seating capacity supposed to be about 32); 12 cars per minute sent out, taking care of 540 persons. Under such conditions the audience from the largest summer theater in the country could be dispatched without crowding, and as fast as it could reach the station. Those who know how many persons stay away from evening performances because they hate the jam and rush and "crowd coming home," will appreciate what an advantage such a station would be, and it does not take much experience to understand its tremendous advertising value. But there is another side to this case, sixty cars are required every five minutes. Extensive storage tracks would be necessary, or else cars would have to be run up the main line in blocks or trains. Storage tracks ought to deliver cars on the incoming track so that the trolley poles do not have to be turned. Few roads in the country have heavy traffic in both directions at the same time and probably single loops with room for three cars on each would answer every purpose. In rush hours in either direction, one stand could be used for the light traffic and the two remaining could be added to those for the outgoing traffic.

W. E. PARTRIDGE.

CLOSING DOWN.

Editor "Review": Our method of closing down at night will doubtless be new to many. As I have visited many plants and factories and it is not in use in any of them I will here explain it for the benefit of those readers of the "Review" who are so situated that they may want to try it. This method has been in use three years and has given the best of satisfaction and makes a saving of 500 lb. of coal each day over our old way of leaving steam in all the pipes each night and having practically no steam left the next morning. It also saves a whole lot of unnecessary boiler contraction and expansion where steam has to be raised each morning from zero to the working pressure, whatever that may be.

About fifteen minutes before shutting down time if the feed pump is not running it is tested and boilers filled to three gages, the pump running very slowly. Next the fires are banked by pushing live coals against the bridge wall and covering with fresh coal, and the furnace, ash-pit doors and damper are closed. By this time we are ready to shut down and proceed to do so by closing water column valves, pump line valves—both steam and water—also the main stop valve in each boiler. We now have all the steam confined in the boilers at about 90 lb. and we are ready to leave for the night. Of course we are always sure to have the safety valves in good order, but seldom does the pressure reach the bow point which is 115 lb.

We always cover our fires quite heavily and they hardly ever burn through which, of course, makes a little more work than pulling down a bank which is burned through nicely, but we always have a good fire to start with and from 80 to 100 lb. of steam. About half an hour before starting up we open the stop valve just enough to allow steam to pass to warm pipes and expansion takes place gradually.

In using this method it is important to open all valves in the morning that were closed the night before.

Our boilers are insured by the Hartford Steam Boiler Inspection & Insurance Co. and this method has been approved by its inspectors.

Lord N. Y.

A. K. Vanderburg

The stockholders of the Morgantown (W. Va.) Traction Co. and the Union Gas & Water Co. have transferred their holdings to the Union Utility Co., capital \$1,000,000, of which S. B. Elkins is president, I. C. White vice-president, G. C. Sturgis secretary, and E. M. Grant treasurer.

POWER STATION FOR THE UNDERGROUND ELECTRIC RAILWAYS CO., OF LONDON.

By courtesy of Mr. J. R. Chapman, electrical engineer of the company, we have received the following outline description of the Chelsea generating station, which is now under construction for the Underground Electric Railways Co. of London, Ltd.

The site comprises 3.67 acres of land with a water frontage on the Thames and on Chelsea Creek of 1,100 feet and a frontage on Lots Road, Chelsea, of 824 feet.

The building is 453.5 ft. by 175 ft. and 140 ft. in height from the ground floor to the peak of the roof. The office building adjoining on the east measures 81 ft. by 25 ft., and will have three floors, the lower of which forms the machine shops. The main building will have a self-supporting steel frame weighing about 5,800 tons. There will be four chimneys, each 19 ft. internal diameter and 275 ft. high; the foundations for these chimneys are 42 ft. square and 34 ft. 6 in.



CHELSEA STATION.

below the ground floor level. There are 2,200 cu. yd. of concrete in each foundation.

The capacity of the building at normal load is 57,000 kw. On this basis the cubic feet per kw. (including office building) is 139 and the sq. ft. per kw. is 1.36.

The steel frame of the building will be closed in with brick and terra cotta; the roof and most of the floors will be concrete. In general details the building will be considered as a factory for the production of a commodity, and there will be no ornamental features.

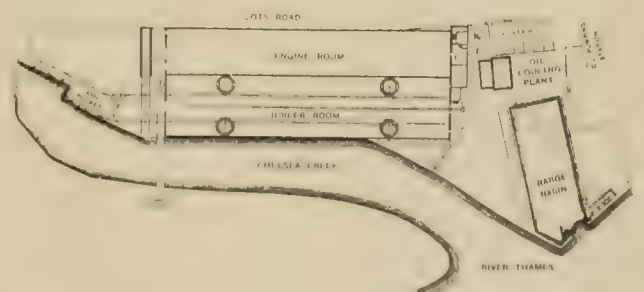


DIAGRAM OF PROPERTY, CHELSEA STATION.

The south side of the building will contain 80 water-tube boilers arranged two stories high and carried directly on the steel frame of the building. Each boiler has 5,212 sq. ft. of heating surface and 672 sq. ft. of superheating surface. The boilers will be piped in groups of eight, each group supplying the steam for one electric generating set and one feed pump, there being no steam connections between the several groups except that a supplemental header at the east end of the building is connected to two groups. This header supplies the exciter engines, air compressors, house pump, etc. Chain grate stokers under each boiler have 83 sq. ft. of surface.

Economizers with tubes 10 ft. long and placed wider apart than the usual practice are grouped behind the boilers, with the customary bye-pass flues; 1,540 sq. ft. of heating surface is provided for each boiler.

Boiler feeders are placed on the ground floor and supply ring mains on both the boiler room floors.

The main generating sets consist of a horizontal turbine engine running at 1,000 r. p. m., and a three-phase generator wound for 11,000 volts 33 $\frac{1}{3}$ cycles; there will be ten such sets, with floor space for one of half the size. The normal rating of each generator is 5,500 kw., but they will carry an overload of 50 per cent for two hours at practically the same steam consumption per k.w.h. There will be four 125-kw. 125-volt steam-driven exciter sets running at 375 r. p. m.

The condensing system consists of vertical condensers each with 15,000 sq. ft. of cooling surface; these are located in pits between the

64 ducts is being constructed to carry these feeders to the nearest point on the District Railway at Earl's Court.

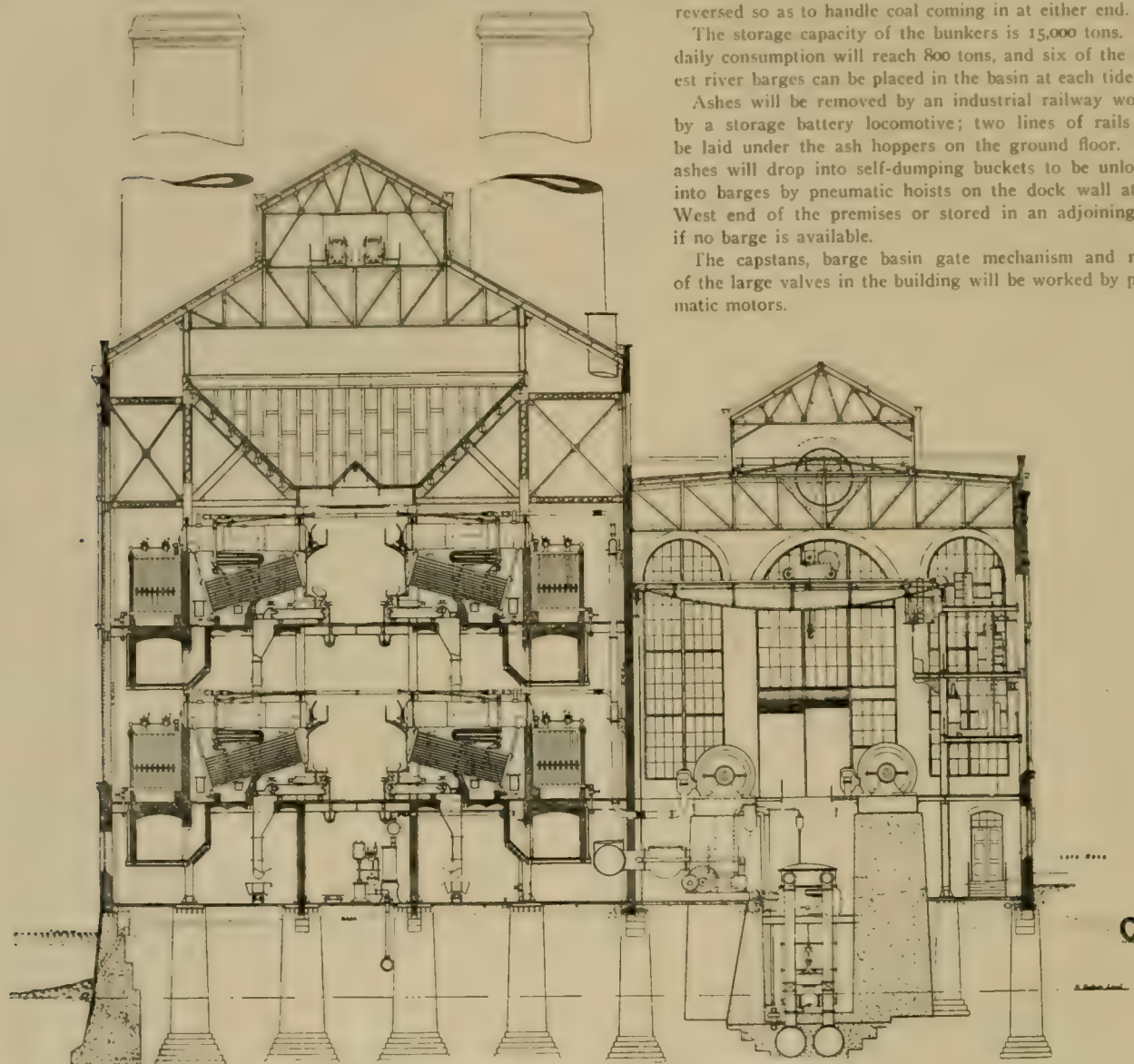
Coal will be received on lighters in a tidal basin at the east end of the station, or by rail at an unloading point of the West London Extension Railway on the opposite side of Chelsea Creek. For unloading barge coal the basin is spanned by two travelling cranes each working a one-ton grab; the coal is weighed in the tower at one end of each of these cranes and dropped on to a belt conveyor, thence by duplicate inclined elevators 140 ft. high to the top of the building.

Rail coal will be taken from a hopper under the coal wagons by an inclined elevator to the top of the building at the opposite end. The distribution over the bunkers is by duplicate belt conveyors so arranged that the direction of travel of both belts can be reversed so as to handle coal coming in at either end.

The storage capacity of the bunkers is 15,000 tons. The daily consumption will reach 800 tons, and six of the largest river barges can be placed in the basin at each tide.

Ashes will be removed by an industrial railway worked by a storage battery locomotive; two lines of rails will be laid under the ash hoppers on the ground floor. The ashes will drop into self-dumping buckets to be unloaded into barges by pneumatic hoists on the dock wall at the West end of the premises or stored in an adjoining bin if no barge is available.

The capstans, barge basin gate mechanism and many of the large valves in the building will be worked by pneumatic motors.



SECTION THROUGH ENGINE AND BOILER ROOM, CHELSEA STATION.

engine foundations. The circulating water is supplied by 66-inch pipes laid to the edges of the channel of the Thames. Each condenser has a 20-in. centrifugal pump; the duty of this pump is simply to overcome the friction of the pipes, as the system is arranged on the syphonic principle, the top of the condensers being within 29 ft. of minimum low tide, and the circuit is closed.

The intake and discharge mains are arranged for reversible flow.

The condensers are designed to work on the dry vacuum principle, the air pump and the water pump being separate. All the condenser pumps are electrically driven.

The switchboard is carried on three gallery floors extending across the north side of the engine room with returns across the east end. All high tension switches will be motor operated, and the feeder system extending to the 23 sub-stations will be in duplicate. A line of

The electric motors on the traveling cranes over the engines, as well as those on the oil switches, will be d.c. 125 volts. All other motors will be three-phase 220 volts; most of the lighting will be on the latter circuit.

It is expected that a portion of the plant will be in working order by the latter part of 1904.

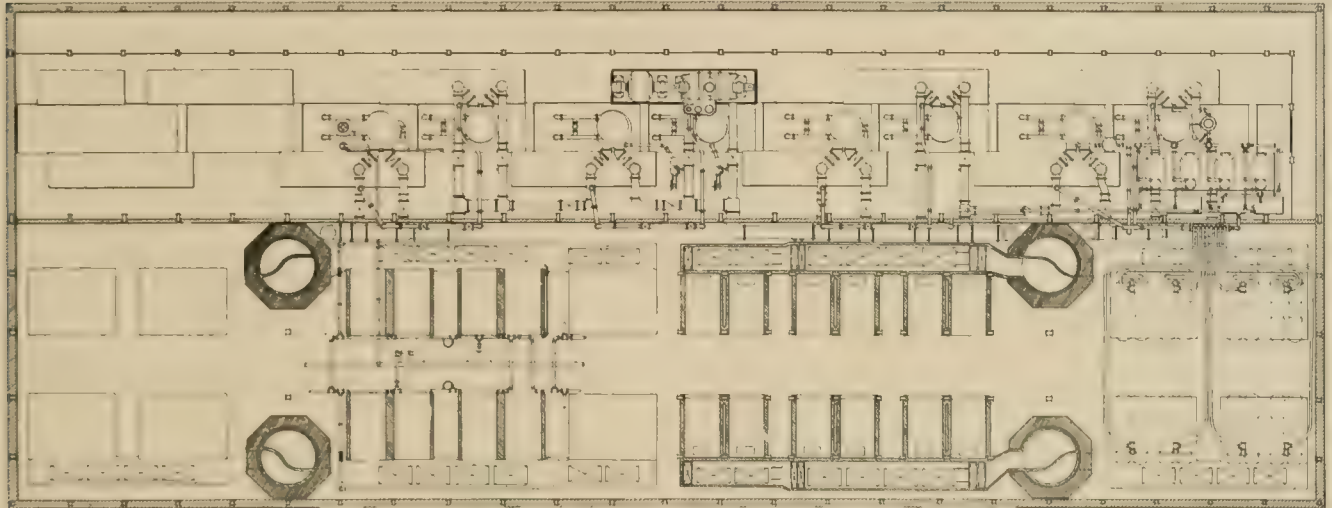
The Syracuse, Lakeside & Baldwinsville Ry., Syracuse, N. Y., is suing the Delaware, Lackawanna & Western R. R. for \$50,000 damages and obtained an injunction restraining it from continuing its proposed summer schedule of trains between the Onondaga Lake resorts and Baldwinsville. It is stated that the two roads entered into a contract by which the trolley road was to have the lake traffic.

SPOKANE SOUTHERN TRACTION CO.

The Spokane Southern Traction Co., of Spokane, Wash., has been organized with a capital of \$300,000, and projects an extensive interurban system to cover the territory lying southeast of Spokane. The franchises and rights of way have been secured by the Moran Prairie Co., Mr. Mark F. Mendenhall, of Spokane, as counsel for this company, having been active in the work. The Moran Prairie

SYSTEMATIC ROBBERY OF PACIFIC ELECTRIC CO.

By means of false entries on the pay rolls the Pacific Electric Railway Co., of Los Angeles, had been systematically robbed for some time and on June 6th the company caused the arrest of 10 men for obtaining money by false pretenses. Warrants were issued for several more, some of them trusted employees. Between \$1,000 and



ARRANGEMENT OF STEAM AND EXHAUST PIPING, CHELSEA STATION.

Co. has also made surveys and taken cash subscriptions and land donations aggregating \$40,000 in value. All these assets and grants are to be transferred to the Traction company.

The Spokane terminus of the line is to be in the business district, from which there will be two separate routes, each about $2\frac{1}{2}$ miles long, to the city limits; thence the route will be in a southeasterly direction through Moran and Richland prairies to Shea's prairie, a distance of about 11 miles. It is expected to have this much of the line completed by autumn in time to handle the fall apple crop in the region served. The plans include a city terminal in connection with warehouses and a market house, a pleasure resort with pavilions, etc., and future extensions to Waverly, in the beet sugar district of Palouse county, a distance of 12 miles, and to Lake Cœur d'Alene, 28 miles from Spokane.

The company plans to do an extensive freight and express business, especially in handling fruit and other crops of the territory, the market for which is Spokane.

ELECTRIC RAILWAYS IN THE UNITED KINGDOM.

The Electrical Review, of London, issued under date of June 26th its annual supplement containing the list of the electric tramways and railways in the United Kingdom. This list shows 111 tramways with an aggregate length of 1,558 miles, and operating 6,538 motor cars and trailers. Of these 111 lines 57 are operated by municipalities or other public authorities. The municipally operated roads aggregate in length 994 miles. The number of third rail electric railways in the United Kingdom is 14, of which 5 are in London. The list for 1902 showed 77 tramways with an aggregate length of 1,039 miles, 39 of which, aggregating 676 miles, were operated by the municipalities. In 1902 the list showed 12 third-rail electric railways, the new ones added this year being the Mersey Tunnel Ry. and the Metropolitan District Ry.

TO ADVERTISE WHALOM PARK.

The "Whalom Breeze" is a 4-page paper published daily except Sunday for free distribution at Whalom Park, Fitchburg, Mass., which is owned and operated by the Fitchburg & Leominster Street Railway Co. The pages of the "Breeze," which made its third annual bow the week of June 15 to 1903, are 8 $\frac{1}{4}$ x 11 $\frac{1}{4}$ in. in size and, besides a view of one of the attractive features of the park, contain the program of the prevailing theater entertainment, announcements, small talk and advertisements of local merchants.

\$2,000 was fraudulently obtained, most of the parties to the theft being Mexican laborers, of whom the company recently hired between 200 and 300.

Numbered tags are used to identify the laborers, under direction of a few trusted employees, including the time keepers. A number of these tags were given to laborers not employees, who presented them on pay day and received the amounts charged against the numbers on the tags. The money so obtained was turned over to the ringleaders with the exception of a small commission. When it was noticed that considerably more laborers were getting pay than were actually employed detectives were set to work and the fraud unearthed.

Among those arrested was one of the time keepers, who had in his pocket a number of time slips signed in blank by the foreman and which it would have been possible for him to fill out for any amount. He also had a slip containing the names of a number of Mexicans, supposedly those who could be trusted to make collections.

WHERE WHISTLE IS TO BE BLOWN.

In the "Review" for Jan. 20, 1903, were described a number of safety precautions used on the Middleboro (Mass.), Wareham & Buzzards Bay Street Railway. In line with the ideas of Mr. Charles H. Cox, general manager of this road, who believes that too great attention cannot be given to details which make for greater safety in the operation of high-speed interurban lines, there has recently been applied to this road the common practice in force on steam railroads of placing a "whistle" sign before each sharp curve, blind crossing or crossroad, and motormen will hereafter sound their whistles only at these signs and at no other places except in cases of emergency. It is believed the signs will make the motormen more careful in the matter of sounding the whistle at dangerous points, and it will also keep them from blowing the signal uselessly and at points where there is no need of so doing.

The sign adopted is of wood, 12 x 15 in., painted white with a large "W" painted in black. The sign is placed from 500 to 900 ft. in advance of all curves, blind crossings, crossroads and wherever the view of the track is obstructed for any distance.

A Cincinnati, Dayton & Toledo Traction Co. car jumped the track on a 15-ft. trestle in Covington, Ky., June 6th, and the front trucks were torn loose and rolled into the ravine. The rear wheels clung to the tracks.

USES OF LUBRICANTS AND THEIR MANUFACTURE.

At the April meeting of the New England Street Railway Club the use of lubricants and their manufacture was the subject of a paper presented by William F. Parish, Jr., chief of the technical department of the Vacuum Oil Co. After giving a historical sketch of the use of oil and its discovery in various places Mr. Parish stated that the foundation of the petroleum business of the world was commenced in 1850 when a well was sunk in Titusville, Pa., to a depth of 169½ ft. and oil was struck.

Petroleum consists of about 85 per cent carbon and 15 per cent hydrogen with a small percentage of oxygen, nitrogen, sulphur and other impurities. In refining, crude petroleum yields three classes of distillates. The first class distills off below 150° C. and comprises rhigolene, gasoline, naphtha, benzine, etc. The second class distills off between 150° and 300° C. and comprises the various burning oils. The third class distills off at over 300° C. and comprises residuum from which is made all the various lubricating oils, greases, wax, aniline dyes, perfumes, medicines, etc. In the early days of the industry refined or burning oil only was sought for. There are three general methods of distilling petroleum: 1. Distillative distillation, or "cracking." The crude is placed in a still with a large dome and heated to a certain temperature when the fires are slacked and the distilling allowed to proceed slowly. The distillate passing off condenses on the cooler dome and falls back into the hotter liquid below and is further broken up. This is termed "cracking" and is the general method used for manufacturing burning oils. By this method a large amount of product can be obtained. The residuum is used for the manufacture of lubricating oils, etc. This when simply distilled and purified by chemical treatment, after the removal of the paraffine, is known as paraffine oil in this country. 2. Distillation by the introduction of superheated steam. This is done to prevent the overheating of the oil. 3. Distillation in a vacuum. In this process a partial vacuum in the still is maintained by a pump and a higher temperature may be used without danger of destroying any of the parts of the crude. The last two processes are the ones used by the manufacturer who regards the lubricating oil as of first importance.

A lubricating oil which is intended for a certain class of work should have within limits certain characteristics such as gravity, viscosity, fire test, etc., which experience has demonstrated to be best for that particular work. These readings do not indicate the lubricating properties of the oil. To know what value to attach to these various physical readings knowledge is required of the crude oil and entire method of distillation and subsequent handling, with a wide experience with that particular lubricant under actual work. These readings may be secured by careful manipulation of proper crudes, by mixing oils of different characters and by adulteration. If dependence is placed upon these physical characteristics the selection is apt to be one which will not give the most effective service. Manufacturers have gained knowledge from many sources and when they are allowed to exercise their judgment they can in nearly every case give a lubricant that will exactly fill the requirements. But they are very often limited by the desires of those purchasing. In textile mills where the frictional item is a very large per cent of the whole work a change of one set of oils for another very often results in a reduction of the total power from 5 to 15 per cent. A reduction of 7 per cent in power in an average textile mill will offset by cost of coal alone the entire money expended for oil. Very elaborate and painstaking tests have been made upon textile mills and plants where the load is steady. Owing to the varying loads upon electric power and street railway stations a frictional test such as made upon a textile mill cannot be conducted. The pressures and friction under light load have no apparent relation to the pressures and friction under ordinary work and lubricants that would be suited to one condition would not necessarily be adapted to the other. For generator bearings and pillow blocks of engines a temperature test is probably the most ready method of determining the adaptability of the oil. This test is made by placing a thermometer in a mercury cup or in the oil or against the bearing and taking readings which are compared to room readings. A comparative test can be made in this way in a very short time. Cylinder oil tests are made by carefully examining the inside appearance of the cylinder in conjunction with a careful inspection of various conditions shown by the engine under operation. In every case the me-

chanical condition of the engine is noted. A cylinder oil test is interesting as it shows how effective the proper kind of oil can be even when the cylinder oil is apparently giving good satisfaction. The following case illustrated this: A direct connected cross-compound engine 20 and 40 x 42 in. in cylinder dimensions, 94 r. p. m., 160 lb. steam pressure, superheated to 470° F. running with 75 per cent overload almost continuously was examined after having operated for some time with a certain cylinder oil and was found to be dry. The walls presented a scratched, dull appearance and there was a considerable deposit of a fine substance in the clearances. The steam valves closed sluggishly with a chattering noise and under light load did not close with ease. The low pressure cylinder showed no internal signs of lubrication. The amount of cylinder oil fed was 15 quarts of oil per day of 20 hours to each cylinder. This oil was changed to oils made by a different process but with the same general readings and the amount fed was exactly one-third, or four quarts to the high pressure and six quarts to the low pressure per day. The test covered nine days. When the high pressure cylinder was examined it was found to be in a very satisfactory state of lubrication with an entire absence of deposit or foreign substance of any kind. The cylinder in this time had smoothed up like glass, dark brown in color and the scratched appearance had nearly disappeared. The steam valves worked in a smooth and active manner and under light loads closed with ease. The low pressure cylinder, when examined was found to be in a perfect state of lubrication, oil hanging in drops from the valves and from the top of the cylinder, showing the engine was perfectly lubricated.

Engine oil that is properly made can be filtered and used over indefinitely. It is always advisable to have automatic lubricating systems in power plants, the cylinder oil should be fed by automatic pumps and the engine oil should be handled by a gravity system having an overhead tank. No oil is wasted by this system and a lighter oil can be used and fed in a stream to the main bearing producing bath lubrication which is the most efficient method. Motor bearings should be lubricated with oil instead of grease as the latter in any form is not an efficient lubricant when compared to oil on a power basis. In order that a continuous feed of oil may be supplied to the bearing a cup should be used fitted with a spindle which rests on the shaft, or with wicking which carries the oil over into the oil passage and from there to the journal. In oiling journal boxes of cars good wool waste should be soaked for at least 48 hours before being used, with the proper kind of oil. The surplus oil should be drained off allowing sufficient oil in the waste so that it will show under slight pressure. The first waste should be moderately dry and packed tightly around the back end of the box to make a guard for retaining the oil and excluding the dust. The box should then be packed with the drained waste firmly enough so that it will not fall away from the journal when the car runs over crossings, etc., but not so tightly as to squeeze out the oil. Keep the waste even with the line of journal and an inch below the line of the brass. This is important as waste packed too hard will be caught and carried around causing a hot box. The waste in the front end of the box should be as high as the opening and have no connection with a waste underneath the journal. This should be placed in the box by hand after the box has been packed. It has no other function except to prevent the waste that is doing the work of lubrication from working forward.

THE CHAUTAUQUA TRACTION CO.

June 24th the Chautauqua Traction Co. began construction work on its system from Lakewood, N. Y., the terminus of the Jamestown Street Railway Co., to Mayville at the head of Chautauqua Lake, a distance of 18.70 miles. One thousand men were put to work and it is thought the line will be in operation by the middle of the resort season. The road runs through Ashville, Victoria, Stowe and the Chautauqua Assembly Grounds, and most of the route will parallel the west shore of the lake, where the scenery is very attractive. At present there is a boat line connecting these points and a steam road, the Jamestown & Chautauqua, runs between Chautauqua and Mayville, paralleling the new road. It is a good farming country. The J. G. Brill Co. is building two cars for the traction company; the double trolley wire system will be adopted, and 80-lb. rail used. The road will be operated the year around. A. N. Broadhead, president of the Jamestown Street Railway Co., and G. E. Maltby, its superintendent, are president and general manager.

RECENT STREET RAILWAY DECISIONS.

EDITED BY J. L. ROSENBERGER, ATTORNEY AT LAW, CHICAGO.

STREET RAILWAY WITHIN RAILROAD FELLOW-SERVANT ACT.

Savannah, Thunderbolt & Isle of Hope Railway v. Williams (Ga.), 43 S. E. Rep. 751. March 17, 1903.

A chartered street railroad, the supreme court of Georgia holds, is a railroad company within the meaning of sections 2297 and 2323 of the Civil Code of that state of 1895, making railroad companies liable to one servant for injuries inflicted by a fellow-servant, and therefore is liable to one servant for injuries inflicted by the negligence of a fellow-servant.

MORTGAGE COVERING AFTER-ACQUIRED PROPERTY A PRIOR LIEN ON POLES AND WIRES ERECTED ON ANOTHER'S LAND.

Monmouth County Electric Co. v. Central Railroad Co. of New Jersey (N. J. Ch.), 54 Atl. Rep. 140. Feb. 13, 1903.

Where a company gave a mortgage covering all of its existing and after-acquired property, which was duly recorded, and thereafter poles and wires were erected on another's land under an agreement with the owner of such land therefor, under which they were the property of the mortgagor company, the court of chancery of New Jersey holds that the mortgage was, in equity, a lien upon these poles and wires afterwards acquired, which was prior to a mortgagee or judgment creditors subsequent in date to the mortgage, or to any claim of the owner of the land.

STREET RAILWAY WITHIN RAILROAD LIABILITY LAW.

Cordray v. Savannah, Thunderbolt & Isle of Hope Railway (Ga.), 43 S. E. Rep. 755. March 18, 1903.

A chartered street railroad company, the supreme court of Georgia holds, is a railroad company within the meaning of section 2321 of the Civil Code of 1895, making railroad companies liable for damages done by the running of the locomotives or cars or other machinery of such company, the presumption in all cases being against the company; and that the presumption is against such street railroad company where damage is done to person or property by the running of the cars or machinery thereof.

CONDEMNATION PROCEEDINGS NOT AFFECTED BY CONVEYANCE OF LAND.

Houston v. Paterson State Line Traction Co. (N. J. Sup.), 54 Atl. Rep. 403. Feb. 24, 1903.

The supreme court of New Jersey holds that, in proceedings brought to condemn lands within the filed route of a traction railway company under and pursuant to the traction act of 1893 (P. L. p. 302; Gen. St. p. 3235), a conveyance of the lands by the owner, at any time after the application is made and notice given to the owner as directed by the order of the justice, will not defeat the proceedings nor require notice thereof to be given to the grantee.

OPENING OF FRONT GATE BY MOTORMAN NOT INVITATION TO ALIGHT FROM MOVING CAR AND NOT OF ITSELF NEGLIGENCE PASSENGERS TAKE OBVIOUS RISKS.

Paglini v. North Jersey Street Railway Co. (N. J. Sup.), 54 Atl. Rep. 218. Feb. 24, 1903.

It is not negligence per se (by itself), the supreme court of New Jersey holds, for a motorman to open the gate on the front platform of a trolley car before the car has come to a full stop. Nor can it be said that the opening of a gate by a motorman while the car is moving is an invitation to a passenger to alight from a moving car. This would no more be true than would the act of the conductor in opening the rear door of the car, as it was about to come to a stop and stop, be an invitation for a passenger to get up and step off the car by the rear platform while the car was still in motion. Passengers take obvious risks. Because a motorman opens a gate

before a car comes to a stop, that will not excuse a person in jumping off a car before it comes to a stop. The mere opening of the gate will not raise a presumption of actionable negligence against the company.

CONDEMNATION NOT AUTHORIZED TO SECURE WATER POWER TO GENERATE ELECTRICITY TO BE FURNISHED RAILROAD.

Avery v. Vermont Electric Co. (Vt.), 54 Atl. Rep. 179. March 6, 1903.

The application of water power to the generation of electricity for use by another company in the operation of a railroad, the supreme court of Vermont holds, is not such a public use as will justify an exercise of the right of eminent domain under the provision of chapter 159 of the Vermont Statutes that one who desires to set up or continue a mill or manufactory on his land, and to erect or continue or raise a dam to obtain water therefor, and thereby flow the lands of another person, may secure the right to do so in the manner there provided, if commissioners appointed for that purpose, or the court itself, shall find "that the flowing of the land as proposed will be of public benefit." It says that it is true that the railroad must serve the public, but there is nothing binding the petitioner in such a case to serve the railroad; and if we look to some direct service of the general public, there is nothing binding the petitioner to give equal advantages to all.

INJURY TO BOY WHO, BEING ORDERED OFF CAR, JUMPS ON PILE OF SAND THAT GIVES WAY, CAUSING HIM TO SLIDE UNDER CAR.

Richmond Traction Co. v. Wilkinson (Va.), 43 S. E. Rep. 622. March 19, 1903.

The supreme court of appeals of Virginia holds that a requested instruction was properly refused which told the jury that if they believed the plaintiff jumped from the company's car while it was in motion because he was frightened into doing so by the conductor calling to him to get off, and that he landed on a pile of sand or dirt, and was uninjured by jumping on the pile of sand, and that his injury was received by reason of the sand giving way under him and causing him to slide down under the car, then they must find for the company. It says that the proposition set forth therein that a conductor may frighten a little child 7 years of age into jumping from a moving car, and because, under the impulse of the peril confronting him, he lands in a dangerous place rather than a safe one, there can be no recovery, is at war with the settled law of that state, whatever view of the subject may be taken elsewhere.

ABUTTERS CANNOT ENJOIN CONSTRUCTION OF ROAD ON PORTION OF STREET NOT DESIGNATED IN CHARTER—REMEDY IN DAMAGES FOR IMPROPER CONSTRUCTION OR OPERATION OF ROAD.

Baker v. Selma Street & Suburban Railway Co. (Ala.), 33 So. Rep. 685. Feb. 12, 1903.

To entitle the complainants, abutting owners, to an injunction against the construction and operation of this road, it was incumbent on them, the supreme court of Alabama holds, to show by averments that it would be a nuisance in fact, and that they would suffer special injury different in kind from that sustained by the general public. The bill showed that the company had the consent and authority of the municipality of the city to construct its line and operate its cars on a certain street; and if it be conceded that the charter of the company did not designate that portion of said street upon which they proposed to lay their track, erect poles and operate their line of road, the complainants suffered no injury of which they could complain. If complainants suffered damage caused by improper construction or negligent or unskillful operation of the road, they had their remedy, and the company would be liable in damages.

CARE REQUIRED WHEN HORSE FRIGHTENED AND TO PREVENT COLLISION.

Danville Railway & Electric Co. v. Hodnett (Va.), 43 S. E. Rep. 606. March 12, 1903.

Street car companies, the supreme court of appeals of Virginia holds, are not required to stop their cars upon the discovery of the fright of a horse on the street, occasioned by the usual and ordinary noises of the car, and are only required to keep the car under control, so that it can prevent damage when occasion arises; and, while it is a recognized fact that travelers should give the right of way to the street car, it does not relieve the company from exercising due care to prevent a collision. It cannot wantonly, maliciously, recklessly, or negligently inflict injury upon a traveler on the street by running its car upon him, when the servants of the company in charge of the car knew, or by the exercise of reasonable care and caution should have known, of his inability to prevent a collision with the car. Whether the company in such a case has been guilty of wanton, malicious, reckless, or negligent conduct is a question for the jury, under proper instructions from the court.

GETTING ON OR OFF MOVING ELECTRIC CAR—SLOWING UP ON SIGNAL NOT INVITATION TO BOARD CAR BEFORE IT STOPS—DUTY TO PERSON ONCE ON STARTING UP WITH JERK.

Powelson v. United Traction Co. (Pa.), 54 Atl. Rep. 282. Jan. 5, 1903.

To step on or off a moving car, whether the power which propels the car be steam or electricity, the supreme court of Pennsylvania says, is per se (by itself) negligence, and, if injury results to the passenger, he cannot recover damages. To this rule, as in all rules, there are some rare exceptions. The exceptional cases as to electrical cars, on one ground and another, are perhaps more numerous than those as to steam cars on account of the entirely different use made of them.

To argue that slowing up on a person's signal was an invitation to him to get on while in that condition of motion, the court says was a mistake. It at most was an invitation to get on when the car stopped, not sooner. Having once got on the moving car, it was the duty of the company to exercise care in carrying him. If it negligently started up the car with a jerk, that negligence was not excused by his, and the company would be answerable.

ALLOWING PLATFORM TO BECOME SO CROWDED AS TO RENDER PASSENGER LIABLE TO BE PUSHED OFF IN OPERATING CAR.

Cattano v. Metropolitan Street Railway Co. (N. Y.), 66 N. E. Rep. 563. Feb. 24, 1903.

It was the duty of the company, when it allowed passengers to ride on the platform, the court of appeals of New York holds, to use a high degree of care to protect them from injury. As it did not provide railings to keep them from being crowded off in case of a sudden movement in the crowd, it was bound, as the jury at least might have found, to see that the crowd did not become so dense that the driver could not put on the brake without pushing some passenger off. If there had been vacant seats, or even standing room, inside, the case would be different, for then the passenger voluntarily standing on the platform might be held to run his own risk. When a carrier of passengers fails to provide either seats or standing room inside its cars, so that a passenger must stand on the platform in order to ride at all, and the company permits him to ride there, it cannot allow the platform to become so crowded that he is liable to be pushed off in operating the car, without presenting a question of fact for the jury as to its negligence in the premises.

FAILURE TO SOUND GONG FOR PERSON WORKING NEAR TRACK—LATTER NOT BOUND TO LOOK CONTINUOUSLY FOR CAR.

Damm v. North Jersey Street Railway Co. (N. J. Sup.), 54 Atl. Rep. 221. Feb. 24, 1903.

Assuming, but not admitting, that it cannot be said, as a matter of law, that it is the duty of a street railway company to give notice to persons working in a public highway, in dangerous proximity to its tracks, of the approach of its cars, the supreme court of New

Jersey holds that it is at least a question for the jury, and not the court, whether, when the company assumes such a duty, its failure to perform it in a given instance is not negligence. It further holds that although the party injured in this case was bound to use reasonable care for his own safety, this did not require him to look continuously for the approach of a car. To have done this, it says, would have made it impossible for him to perform his work. He knew that he was in a place where he was safe, except when a car was passing. He knew, too, that it was the custom, when a car was approaching, for the motorman to ring his gong as a warning, and he had a right to expect that this warning would be given to him. Having looked, when he knelt down near the track, for the purpose of ascertaining whether a car was approaching, it was a question for the jury to determine whether it was negligent in him, under the existing circumstances, not to make another observation during the minute which elapsed before the accident occurred.

CASE FOR INJUNCTION AGAINST TRANSFER OF PROPERTY TO CORPORATION OF ANOTHER STATE.

Coler v. Tacoma Railway & Power Co. (N. J.), 54 Atl. Rep. 413. March 2, 1903.

An arrangement having been made between the Tacoma Railway & Power Company, a New Jersey corporation, and the Seattle-Tacoma Interurban Railway, a corporation of the state of Washington, by which the New Jersey company should transfer all its property and franchises, except the franchise of being a corporation, to the Washington company, and the latter should issue therefor to the New Jersey company 20,000 shares of fully-paid stock of the par value of \$100 per share, or, in case any stockholder in the New Jersey company refused to accept such stock in exchange for his own stock share for share, then the Washington company should pay \$35 in cash in lieu of each share so refused, the court of errors and appeals of New Jersey holds that, on bill filed by a stockholder in the New Jersey company, that the consummation of the arrangement ought to be restrained, because (1) It was tantamount to a dissolution of the New Jersey corporation, within the meaning of the New Jersey statute, and therefore could be legally carried out only by such proceedings as the New Jersey statute prescribed for dissolution. (2) Under the constitution and judicial decisions in Washington, it is unlawful to issue corporate stock as fully paid for less than its par value, and the above arrangement shows on its face a purpose to issue such stock for 35 per cent. of its par value. (3) Under the constitution and judicial decisions in Washington it is unlawful for any corporation to hold stock and exercise the usual rights of stockholders in a corporation of that state.

NO CONSIDERATION FOR NEW CONDITIONS AFTER CONTRACTING TO FURNISH TRANSPORTATION—INSUFFICIENT RELEASE TO COVER NEGLIGENCE.

Dow v. Syracuse, Lakeside & Baldwinsville Railway (N. Y. Sup.), 80 N. Y. Supp. 941. March 10, 1903.

A street surface railroad company in consideration of a conveyance to it of a right of way over a strip of land having agreed to provide one of the grantors with transportation upon its railroad during her natural life, upon the sole condition that such right should be forfeited if her passbook of tickets should be presented for fare by any person other than herself, the fourth appellate division of the supreme court of New York holds that the company obligated itself to furnish her with transportation, relieved from any other condition; and that when it assumed to attach to the fulfillment of such obligation an additional condition, and one which was never within the contemplation of the parties [as that she released the company from all liability for personal injuries], it foisted upon her a new contract, for which no consideration passed. In other words, when the company undertook to make for itself what was, in effect, a new contract, by imposing a condition which was not contained in the original contract, it furnished no consideration therefor, and consequently was in no position to enforce the same. Nor did the acceptance of the passbook with the new condition printed upon its cover indicate any intention upon her part to assent to the terms thereof. Besides, the new condition imposed being that the company should be released "from all claims for damages for personal injuries from whatever cause," the court does not consider that this would release it from liability for the conse-

quences of its own negligence, under the rule that, where such a limitation is intended, it must be expressed in language so plain and unequivocal that it may be readily comprehended by every one.

MEASURE OF DAMAGES FOR BREACH OF CONTRACT BY REFUSAL TO ACCEPT RIGHT OF WAY.

Hays v. Wilksburg & East Pittsburg Street Railway Co. (Pa.), 54 Atl. Rep. 322. Jan. 5, 1903.

In this case the company procured from certain parties an agreement for a right of way across their premises. As part of the consideration therefor, it agreed to grade and pave and curb, for the use of the owners and occupants of the premises, a roadway on the right of way, outside of and along its tracks. But, in order to carry out the contract, it was necessary to obtain the consent of the municipal authorities of the borough to lay a track upon a street leading to a point opposite the property of these parties. The borough councils refused consent; and the company refused to accept the grant of the right of way, relinquishing all claim thereto.

The breach of contract upon the part of the company, the supreme court of Pennsylvania says, consisted in its refusal to accept, or enter into possession of, the right of way for which it had contracted. Such a breach is analogous to that of the vendee in a contract for the conveyance of land. In such case the damages which may be recovered are not the whole amount of the purchase money, as that would be to enforce specific performance. The damages should only equal the loss sustained by nonfulfillment of the contract. The loss of the bargain is the measure of damages. The trial court here, however, adopted as the measure the equivalent of the full amount of the purchase money, or the cost of grading, paving, curbing, and sewerage the street through these parties' land. If the street railway company had accepted from the parties the grant of the right of way, and had entered thereon, laid its tracks, erected its poles, strung its wires, and constructed and operated its railway over their property, and had then refused to make payment of the compensation as stipulated in the contract, the measure of damages applied by the trial court would have been correct. But as it was, the parties had given up nothing to the street railway company. Clearly they were not entitled to have their property intact, and at the same time recover the full amount of the compensation to which they would have been entitled had the street railway company been built upon their premises. Under the circumstances, the measure of damages could be nothing more than the actual loss sustained by the parties, which, in so far as the evidence showed, was merely nominal.

CARE REQUIRED OF LINEMAN IN REMOVAL OF WIRES FROM WOODEN TO IRON POLES—DUTY OF COMPANY—INSPECTION.

Walsh v. New York & Queens County Railway Co. (N. Y. Sup.), 80 N. Y. Supp. 767. March 6, 1903.

One of the linemen employed in the work of removing the cables and wires used in the operation of an electric street railway from wooden poles on one side of the street to new iron poles on the other side, the second appellate division of the supreme court of New York holds, was not bound to exercise the highest possible degree of care; he was not bound to fasten the pole with guy ropes, braces, etc., which would make it impossible for the pole to fall, unless the danger of proceeding otherwise was known and obvious upon a reasonable inspection consistent with the discharge of his duties. He had the right to assume that the master had discharged its duty in so far as a reasonable use of his faculties would not disclose to the contrary, and he had a right to use such of the appliances furnished him by the master as appeared to be reasonably adapted to the performance of the rude task before him. It was not his duty to make an inspection of the pole where the defect was not obvious. That duty the law imposed upon the master, and if he was injured while performing a duty imposed upon him by the master, and while in the exercise of reasonable care, he was entitled to recover damages.

The evidence in this case showed conclusively that the pole was rotten and deteriorated, so that it was liable to fall whenever it was called upon to bear any additional strain. The company knew that in sending the lineman to the top of the pole for the purpose of removing the heavy cables and wires the pole would be subjected to

additional strain, and it was the duty of the company to inspect the pole in order to know whether it was safe for the lineman to climb it. The mere fact that the lineman did not use all of the precautions which would have been demanded in the exercise of due care, had he known the condition of the pole, did not deprive him of the right to recover for his injuries where it appeared that he used all of the precautions which were demanded under the circumstances as they appeared upon the surface, and where there was no obvious reason for believing that the pole was in a different state of preservation from those about it. There was evidence that the work of inspection of poles was usually undertaken by men employed for that purpose, and there was no evidence that the company had made any proper inspection of the pole where the lineman was injured, and the court holds that this defect in the defense was not met by the fact that the purpose of the work—the removal of the cables from wooden to iron poles—was intended to give notice that the wooden poles were defective. This was only one of the reasons that might have operated to induce the change, and it did not relieve the company from the duty of providing a reasonably safe place for the lineman to work.

RIDING ON FRONT PLATFORM OF CAR CONTAINING NOTICE THAT PASSENGERS DO SO AT THEIR OWN RISK—REASONABLENESS OF RULE—TAKING PASSENGERS ON CROWDED CAR—NO EVIDENCE OF WAIVER OF RULE.

Burns v. Boston Elevated Railway Co. (Mass.), 66 N. E. Rep. 418. Feb. 27, 1903.

The plaintiff was riding on the front platform of a car and as it rounded a sharp curve at a street corner was thrown off by a sharp jerk. There was testimony tending to show that the speed was unusual and excessive, that the car was crowded, and that there were six or seven others on the platform. On cross-examination, he testified that he knew there was a sign on the car that "Passengers riding on the front platform do so at their own risk." The supreme judicial court of Massachusetts holds that a verdict was properly directed for the company.

The rule in respect to passengers riding on the front platform must be regarded, it seems to the court, as a reasonable rule, and such a rule as the company had a right to adopt. It would have had the right to prohibit absolutely passengers from riding on the front platform, and a passenger who, without sufficient excuse, knowingly violated the rule, and was injured in consequence thereof, would have been guilty of contributory negligence, and would not have been entitled to recover, even though the company had also been negligent. The court does not think that the only alternatives open to the company were those of absolute prohibition or unqualified permission. The notice contained a fair warning that the front platform was regarded by the company as a place of exposure to danger, and that it was unwilling that passengers should ride there, unless they were content to take the risks of doing so; and it is not unreasonable, it seems to the court, to say that a passenger who knew the rule, as the plaintiff did, and rode upon the front platform, accepted the risk, in the absence of anything to show that the rule had been waived by the company, or that it was not in force. The rule was to be regarded as designed to promote the safety of passengers, by warning them that the front platform was or might be a place of danger, and that they rode there at their own risk, rather than as designed to protect the company from the results of its own negligence, or that of its servants or agents. And the court thinks that, upon the undisputed testimony, the plaintiff must be held to have accepted the risk.

The fact that the car was crowded, the court further declares, was immaterial. The plaintiff was not obliged to get onto a crowded car, and it was not negligence on the part of the company to take him on as a passenger, because the car was crowded. The fact that there were other passengers on the platform did not show that the rule had been waived by the company or was not in force. Their presence there was as consistent with the fact that the rule was still in force as that it was not. The case was very different from that of *Sweetland v. Lynn & Boston R. R.*, 177 Mass. 574, 59 N. E. 443, in which there was abundant evidence of a custom to use the front platform, and that the rule notifying passengers not to stand on the front platform was not in force.

PERMITTING PERMANENT OBSTRUCTIONS NEAR
TRACK RIDING ON FOOTBOARD LEANING BACK
CROSSING BRIDGE ABSENCE OF ACCIDENTS
FOR 11 YEARS OVERLOADING CARS.

*Anderson v. City & Suburban Railway Co. (Or.), 71 Pac. Rep. 659.
March 9, 1903.*

Where a street railway company invites or expects passengers to ride on the footboard of its cars, and carries them, at a rapid rate of speed, in close proximity to dangerous obstructions, of which they have no knowledge, without warning them of the risk, the supreme court of Oregon holds that the question of negligence is for the jury. The authorities all agree, it says, that it is negligence for a street railway company to permit permanent obstructions to stand so near its tracks that passengers getting off or on its cars, or riding thereon, are in danger of coming in contact therewith, and it is generally considered a question for the jury as to whether a given obstruction is so situated.

Nor could it be said that the passenger who in this case was killed by striking his head on one of the timbers of a bridge of which there was only 18 inches of space between its framework and the footboard of open cars was guilty of contributory negligence in riding on the footboard of the car, which, by the way, was crowded. He was there by the invitation and consent of the company, and, while he was, perhaps, required to exercise extra care and caution, on account of the increased danger attending his position, it was nevertheless the duty of the company to furnish him a reasonably safe place in which to ride, and not expose him to injury from permanent obstructions unreasonably near its tracks.

It is the duty of a common carrier of passengers by street cars to foresee the possible danger to which passengers riding on the footboards of its cars might be exposed by a slight movement of the body in consequence of the proximity of its tracks to permanent structures, and it is not negligence on the part of the passenger to omit to look out for such structures unless he has reason to anticipate some such danger. He has a right to assume that the company has performed its duty to carry him safely, and that it will not expose him to unnecessary hazard, and to act accordingly. It is not negligence per se (by itself), either on the part of a passenger or a street railway company, that a passenger, reasonably competent to take care of himself, should ride on the platform or footboard of a crowded car. It is, however, obviously more dangerous to occupy such a position than a seat in the car, and therefore the law imposes upon both the passenger and the railway company the duty of extra caution to prevent injury, and a railway company which accepts such a person as a passenger, and permits him so to ride, is bound to carry him with a degree of skill, prudence, and care proportionate to the danger to be apprehended, but it is not negligent in permitting him to do so.

The fact that the road had been operated for about 11 years, and no accident had occurred from a like cause was not conclusive evidence of the absence of negligence on its part, either in the construction of the road or the operation of the cars. Nor was the passenger necessarily guilty of contributory negligence because he leaned back while in the act of returning his money to his pocket, or in looking after a friend. Conduct of that kind on the part of passengers was such as might reasonably be anticipated by the railway company.

With regard to the company permitting its cars to be so overloaded that passengers were required to stand on the footboard, the court says that, under the law, such an act on the part of a street railway company is not negligence per se (by itself) as to a passenger who voluntarily boards a crowded car, and assumes to ride on its footboard.

SEIZING OF RUNNING BOARD BY ONE THROWN DOWN
BY STARTING OF CAR.

Indiana Railway Co. v. Manner (Ind.), 66 N. E. Rep. 156 Feb. 3, 1903.

The supreme court of Indiana says that here the plaintiff was old, infirm and with but one leg, and as he stood by the side of the car, necessarily leaning upon his crutch, or holding to the car, while he reached for his grip bag, by the untimely and negligent starting of the car he was thrown to the ground, and near to the revolving wheels of the car. Having been thus suddenly and unexpectedly

cast into a situation that might reasonably appear to him to be one of imminent danger of losing his life or of suffering great bodily harm, the seizing of the running board, which would at least stay him from passing under the wheels, could not be accounted contributory negligence per se (of itself), even though it was clear to one not imperiled that the safer course would have been not to have seized the running board. And the jury, whose duty it was to characterize the act, determined by their general verdict that he was free from contributory fault.

STARTING OF CAR BY MOTORMAN WITHOUT SIGNAL.
OR LOOKING TO SEE IF ANY ONE IS GETTING
ON OR OFF.

*Bessenger vs. Metropolitan Street Railway Co. (N. Y. Sup.), 79
N. Y. Supp. 1017 Jan. 23, 1903.*

The conductor having cried out "Transfer!" and the car come to a full stop at a street intersection, the second appellate division of the supreme court of New York holds that the question of negligence on the part of the company in starting the car while a passenger who had been riding on the rear platform and received a transfer was in the act of alighting was for the determination of the jury. It says that the jury might very properly have found that it was negligence on the part of the motorman to again start his car without looking around to discover whether there was any one in the act of alighting, if, indeed, it was not his duty to refrain from starting the car until he had received a signal from the conductor. It is one thing to slacken and increase the speed of a car in the ordinary work of operating the same with reference to the safety of vehicles and persons in the highway, where no notice is given to the operator of the desire of a person to leave or enter the car and quite another thing to hold that a passenger may not, with a car at a standstill, rely upon the motorman to exercise a reasonable degree of care in starting the car. Whatever may be the rule in respect to steam railroads, the court is of opinion that, when a street surface car has come to a full standstill, reasonable care in its operation demands that it shall not be started without some effort on the part of the conductor or motorman to determine whether this may be done with safety to passengers or intending passengers, and that the question of negligence is one for the jury. This is in accord with the almost universal rule which is witnessed in the everyday operation of these cars, where the motorman starts only on a signal from the conductor, and it is the only one consistent with the safety of passengers and the rights of the public.

"VIGILANT WATCH ORDINANCE." A POLICE REGULA-
TION WHICH CONFERS RIGHT OF ACTION—PRO-
VISION AS TO STOPPING IN SHORTEST TIME
AND SPACE POSSIBLE BAD IN IN-
STRUCTION.

*Gebhardt v. St. Louis Transit Co. (Mo. App.), 71 S. W. Rep. 448.
Dec. 16, 1902.*

A city ordinance providing that "The conductor, motorman, gripman, driver, or any other person in charge of each car shall keep a vigilant watch for all vehicles and persons on foot, especially children, either on the track or moving towards it, and on the first appearance of danger to such persons or vehicles, the car shall be stopped in the shortest time and space possible," the court of appeals at St. Louis, Mo., holds is a police regulation, and that an injury due to its violation affords the injured party a right of action. But, on account of the uncertainty in the language of the last clause, "the car shall be stopped in the shortest time and space possible," the court thinks that it is misleading to incorporate the ordinance bodily in an instruction to the jury.

The Springfield (Ill.) Railway & Light Co. plans the expenditure of \$242,000 for new electrical equipment, a new power house, 10 new cars, new car barn, new road equipment, etc. Work will begin at once.

The Chattanooga Electric Railway Co. cars are to be equipped with mail collection boxes. At present this service is in operation in only three cities of the United States: Des Moines, Ia.; Grand Rapids, Mich., and Lowell, Mass.

CONCRETE.

As described elsewhere in this issue, the Hartford Street Railway Co. has made extensive use of concrete in and about its power station and car houses, for building and engine foundations; for subways in which to house exhaust piping; in reservoir work for water storage, and in other applications. Most of this concrete work has been installed by the Hartford Paving & Construction Co., and in this connection the paper on "Concrete" read some months ago before the Society of Engineers of Connecticut, by Mr. Charles M. Crawford, secretary of that company, will be doubly interesting.

Mr. Crawford said in part:

The fact that different engineers attempt to produce the same result by widely differing mixtures has repeatedly been brought to my attention, in reading the various specifications for concrete, that I have been called upon to examine during the past few years, some for work on which I have submitted estimates, and some which I have only read as a matter of interest.

The derivation of the word concrete—"concretere"—to grow together, expresses the whole matter to me in a nutshell. If your concrete "grows together" in good shape, all is well, but if not, look out for trouble.

Prof. Ira C. Baker in his "Treatise on Masonry Construction" states: "The voids in the aggregate should be filled with mortar. If there is not enough mortar to fill the voids, the concrete will be weak and porous. On the other hand, more mortar than enough to fill the voids of the aggregate increases the cost of the concrete and also decreases its strength. The decrease in strength due to an excess of mortar is usually greater than would be produced by substituting the same amount of aggregate, since ordinarily the sand and the aggregate have approximately the same per cent of voids, while the sand has the greater, and also the smoother surface. A correctly proportioned concrete is always stronger than the mortar alone."

He then gives the crushing strength per square inch for portland cement mortar and concrete, each twenty-eight days old, as follows:

One to two mortar, 2,158 lb.; with three parts of pebbles, 2,783 lb.; with five parts of pebbles, 2,414 lb.

One to three mortar, 1,406 lb.; with five parts of pebbles, 1,661 lb.; with six and one-half parts of pebbles, 1,534 lb.

One to four mortar, 1,068 lb.; with five parts of pebbles, 1,291 lb.; with eight and one-half parts of pebbles, 1,221 lb.

Prof. Baker also states: "For the strongest and densest concrete, the voids of the aggregate should be filled with a rich strong mortar; but if a cheaper concrete is desired, fill the voids of the aggregate with sand and add as much cement as the cost will justify. In other words, to make a cheap concrete use as lean a mortar as the circumstances warrant, but use enough of it to fill the voids in the aggregate. Sand is so cheap that there is no appreciable saving by omitting it; and the use of it makes the concrete more dense."

In the specification of a concrete dam recently built in this state (Connecticut), and described in the proceedings of the Society of Engineers of Connecticut for 1900, page 163, the proportions were set forth as follows:

For body of dam and abutments, one part of portland cement, three parts of sand and three parts of broken stone.

For 12 in. on the outside face of the dam, one part portland cement, three parts sand and two parts of broken stone. From Professor Baker's results referred to the structural value of these mixtures would be about as given below, and the cost would also be about as stated, both structural value and cost being compared with a 1-2-1 mixture.

| Mixture. | Structural Value. | Cost. |
|----------|-------------------|--------|
| 1-2-4 | 100 | \$1.00 |
| 1-3-3 | 60 | 1.21 |
| 1-3-2 | 58 | 1.64 |

On the same basis even a 1-3-6 mixture would show a relative structural value of 0.615, being stronger than either of the mixtures specified, but the cost would be 87 per cent of the 1-2-4 mixture, 72 per cent of the 1-3-3 mixture, and 50 per cent of the 1-3-2 mixture.

It is therefore apparent that the proportions specified produced a concrete structurally weaker than other mixtures which might have been put in for less money.

My own practice has followed the view set forth by Professor Baker. When I have been asked to suggest the constituent parts of a mixture to produce certain given results, I have used from 1-1-2 for the surface of artificial stone sidewalks, where density and re-

sistance to wear is required, and 1-2-4 for the actual arch of concrete arch bridges, to a mixture of 1-6-12-, which I used on one occasion to cover the bottom of a "shoot the chutes" pond in order to do away with trouble that had developed there from the stirring up of the mud at the bottom of the pond.

In this connection I would say that an 8-in. cube of 1-4-8 concrete taken direct from the mixing board during the construction of the foundation of an abutment at Middletown, built by the company of which I am secretary (the sample procured by Mr. E. D. Graves, engineer of the work, and tested by Messrs. Lathbury & Spackman, of Philadelphia) broke at 1,032 lb. per sq. in., one year after mixing, the individual pieces of trap in the sample breaking in practically a straight line across the test piece, and not pulling out of the mortar at all. Regarding this test, however, the great difficulty of filling such a small cube with a concrete that is absolutely representative of the mass must not be lost sight of.

The important question as to the actual content of a barrel of portland cement, is one that appears to be open to discussion. The Atlas Portland Cement Co. in its pamphlet states regarding this, "Figures are seldom quoted on account of difficulty of obtaining them under equal conditions of packing."

Mr. E. D. Graves gives me the following as the result of measure-



FIG. 1.

ments made in 1898 of barrels in which portland cement had been packed:

| | |
|---|--------------|
| Alpha domestic cement (barrels)..... | 3.59 cu. ft. |
| Champion domestic cement (barrels)..... | 3.40 cu. ft. |
| Alsen imported cement (barrels)..... | 3.38 cu. ft. |
| Alsen imported cement (cylinders)..... | 3.24 cu. ft. |

In 1899 Mr. Henry Souther in making some tests for us established the weight of a cubic foot of Atlas portland cement loose at 91.27 lb., making a barrel (380 lb.) equal 4.16 cu. ft.

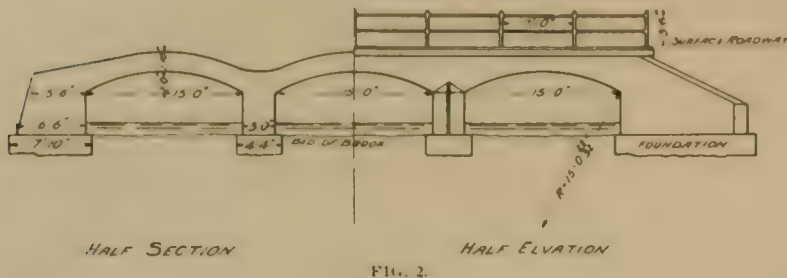
Maj. Walter L. Fisk, Corps of Engineers, U. S. A., in his report to the Chief of Engineers on Defenses of Mouth of Columbia River for 1899, states the cost of cement on his work at \$2.68 per barrel. He then says that in making a cubic yard of concrete he used three cubic feet of cement at a cost of \$2.01, or just three-quarters of \$2.68, demonstrating that he considered the content of a barrel of portland cement, for the purpose of concrete, to be four cubic feet. (Report of Chief of Engineers, U. S. A., on Seacoast Defense for 1899, p. 1,001.)

The volume of a barrel of portland cement is established by the Aurora, Elgin & Chicago Ry., which has used concrete construction extensively, by the following clause in its specifications: "The proportions above expressed are units of volume, a quarter barrel sack of portland cement as packed by the manufacturer being accepted as a cubic foot. The sand must be measured loosely." (Engineering News, Oct. 9, 1902.)

Going on to the question of the volumes of mortar, I find the following report by Mr. Henry Souther as the result of experiments made for us in 1899, being part of the same series of tests that has already been referred to. These tests were made for the purpose of verifying the results of a contract in which our return was governed by the amount of stone a 1-2 mortar would flush. We therefore only experimented with mortar so proportioned, and Mr. Souther found that one barrel of cement (taken at 4 cu. ft.) plus 8 cu. ft. of sand, and mixed with sixteen gallons of water, made 8.35 cu. ft. of

mortar. Mr. Souther then proceeded to experiment as to how much broken stone the 1 to 2 mortar would flush, having established before-hand that the stone he experimented with contained voids of 45.05 per cent. With this percentage of voids it is apparent that 8.35 cu. ft. of mortar would flush theoretically 18.53 cu. ft. of broken stone. The following is an extract from Mr. Souther's report of Oct. 13, 1899:

"A practical determination of the amount of stone that 1 to 2 mortar will flush was made as follows: Six boxes, each of 6 ft. by 6 ft. were made, and were filled with three different mixtures of



concrete, made in duplicate as follows. These were rammed in the boxes as nearly level as possible and the volume of concrete measured by taking 12 points along the edge and 4 through the center. The depth being taken as the average.

"Sample No. 1, mixed September 20, 1899, at 4 p. m.; 1 barrel of Atlas cement, 8 cu. ft. of sand and 16 cu. ft. of stone mixed with 16 gallons of water, after ramming gave a depth in box of 0.46 ft., or a volume of 16.58 cu. ft.

"Sample No. 2, mixed Sept. 27, 1899, at 8:30 a. m.; same mixture as No. 1; gave depth of 0.48 ft., or a volume of 17.14 cu. ft.

"Sample No. 3, mixed Sept. 27, 1899, at 9:30 a. m.; 1 barrel of Atlas cement, 8 cu. ft. of sand and 24 cu. ft. of stone mixed with 16 gallons of water; gave a depth in box of 0.67 ft., or a volume of 24.2 cu. ft.

"Sample No. 4; mixed Sept. 27, 1899, at 11 a. m.; same mixture as No. 3; gave a depth in box of 0.68 ft., or a volume of 24.5 cu. ft.

"Sample No. 5, mixed Sept. 27, 1899, at 2 p. m.; 1 barrel of Atlas cement, 8 cu. ft. of sand and 21.5 cu. ft. of stone, mixed with 16 gallons of water; gave 0.60 ft. depth in box, or a volume of 21.6 cu. ft.

"Sample No. 6, mixed Sept. 27, 1899, at 3:30 p. m.; same mixture as No. 5, gave a depth in box of 0.62 ft., or a volume of 22.3 cu. ft.

"One of each of these samples of concrete, Nos. 2, 3 and 4, was

Major Henry M. Adams reports on work at northern side of eastern entrance of New York harbor, that it required as the mean of 4.700 cu. yd. of concrete, 0.90 cu. yd. of stone, 0.45 cu. yd. of sand and 1.10 barrels of cement to make a cubic yard of concrete.

He then produced the same result at the southern side of the eastern entrance, where 8,736 cu. yd. of concrete were placed, except that his cement was increased to 1½ barrels per cubic yard, and again at defenses of Staten Island, where in 5,873 yd. of concrete, he averaged 0.90 cu. yd. stone, 0.40 cu. yd. of sand, and 1.125 barrels of cement to the cubic yard. (Report of Chief of Engineers on Seacoast Defenses for 1899, pages 763, 766 and 774.) Major Adams therefore found the increase of concrete over stone to have been 11.1 per cent on the work he reported on.

Your committee on masonry in its report to the annual meeting of 1902 stated as follows: "We have recently run across a specification for concrete foundation work to be done in Virginia; in which the engineer has specified exactly the number of cubic feet of both sand and stone required per barrel, instead of giving the ratios only, as is usual. This is evidently done in order to avoid all possible diversity of opinion regarding the dimension of the basing unit, and we would gladly have the expression of the members as to their opinion regarding this course." The cause quoted was,

if I remember correctly, embodied in this report at my suggestion, as the desirability of raising the question of doing away with all possible ambiguity in specifications for concrete had been forcibly brought to my attention, for the reason that I have just been called upon to examine two specifications for concrete work that varied greatly in this respect.

One of these specifications was for some very important work in New York State, and in it the mixture for the preponderating portion of the work was stated as follows, the proportions for the other parts only varying in the amounts of the aggregate to be used.

"Concrete for massive construction, such as retaining walls, column foundations and inverts (where such are used) will usually be proportioned: One part by volume of portland cement. Eight parts by volume of aggregate of stone, gravel and sand."

And again, "The proportion of stone, gravel and sand will be varied from time to time by the engineer as he may require, in order to secure an aggregate as nearly as possible free from voids, taking into account the sizes and qualities of the materials furnished." (Specification for Atlantic Ave. Improvement, Brooklyn, pp. 105-108.)

In this specification there is nothing whatever to show what the engineer intended to use as his basing unit. As before stated, Mr.



broken by pressure applied at the end of the lever (arranged as in Fig. 1), and the broken sections show in each case that the mass of concrete is thoroughly homogeneous and that all the voids are filled. It is my opinion that the concrete in these samples was mixed a little drier than should have been, and had, say, 20 gallons of water been used, the resulting concrete would have been even better than it is."

These results show that the volume of concrete increased over the broken stone used in it, from practically no increase in samples 3 and 5, to an increase of 7 per cent in sample No. 2. In this line the following results from reports of officers of the United States Engineer Corps may be interesting:

Major Fisk states in the report before referred to that it required 24 cu. ft. of crushed rock, 11 cu. ft. of sand and 3 cu. ft. of cement to make 1 cu. yd. of concrete. This gives an increase of bulk of concrete over stone used of 12½ per cent.

Graves has measured barrels as small as 3.24 cu. ft. and Mr. Souther has placed the loose volume of a barrel of cement at 4.16 cu. ft. The comparative cost of the ingredients only, in one cubic yard of concrete, at the price in force when the work was let, and with voids of 45 per cent in the broken stone used, will then be as follows: Basing unit, 3.24 cu. ft.; cost per cubic yd. without labor, \$4.39. Basing unit, 4.16 cu. ft.; cost per cu. yd. without labor, \$3.92.

This shows a possible extreme divergence of opinion equal to \$0.47 per cubic yard which is surely worth considering, as the concrete covered by the specification amounted to approximately 90,000 cu. yd.

The other specification was the Virginia work before referred to. I am sorry to say I have not a copy of their specification at hand to quote from; but it stated squarely just how many cubic feet of sand and broken stone should be used to each barrel of cement, in, if I recollect correctly, three different classes of concrete.

By reference to the Aurora, Elgin & Chicago specification before quoted it will be seen that they reach the same result by defining the volume of a sack of portland cement.

Mr. Allen Hazen states as follows in a paper on the Theory of Concrete, published in the proceedings of the American Society of Civil Engineers, Vol. 25, No. 6, page 488: "The most accurate and convenient method of determining the voids, known to the writer, is to determine, first, the specific gravity of the material as a whole, including the voids. The percentage of space occupied by the particles is then obtained by dividing the specific gravity of the mass as a whole, including the voids, by the specific gravity of the solid particles, and the voids are represented by the difference between the whole volume and the space occupied by the solid particles.

"In case the material used for this purpose is not absolutely free from water, the whole or part of it must be dried after the experiment to determine the amount of water in it, and a correction applied therefor.

It will not do to dry a moist material before taking its specific gravity, as the closeness of the packing will be very likely to be different for wet and dry materials.

"It is usually a comparatively easy matter to determine the specific gravity of the solid particles, but for large classes of materials the specific gravities are so uniform that the errors introduced by assuming an average value of 2.65 are very slight. The specific gravities of sand and gravels of the glacial drift of the eastern states and of all silicious sands are very close to this figure, and much of the broken stone used for concrete is of nearly the same density. The proportion of voids is thus a direct function of the weight per cubic foot."

Mr. Hazen's manner of determining the voids in sand and broken stone was new to me, and as it appeared to be reasonable and simple I thought it might be well to verify his assumption that 2.65 is a safe figure at which to place the specific gravity, of both the stone and the solid portions of sand as found in the Eastern states. I therefore sent Mr. Souther two samples of sand from Burnside, Conn., which is fairly representative of the East Hartford sand used almost exclusively in Hartford. One of these samples, marked damp sand, was an average specimen of the sand as it comes from the bank and is ordinarily used in concrete. The other specimen, marked dry sand, had been artificially dried for use in the sprinklers of the cars of the Hartford Street Railway Co. The stone was trap rock from the quarry of the Hartford Trap Rock & Supply Co., at Newington Mountain.

The results of the experiments by Mr. Hazen and Mr. Souther, and a rough check of same made by the writer (using a metal bucket and common scales) are given below:

| | Stone. | | | Solids in sand. | | | Per cent voids |
|------------------------------|---------|-------------|--|-----------------|-------------|-----------|----------------|
| | Sp. Gr. | Wt. Cu. Ft. | | Sp. Gr. | Wt. Cu. Ft. | | |
| Mr. Hazen | 2.65 | 165.25 | | 2.65 | 165.25 | not given | |
| Mr. Souther, dry sand | 2.684 | 186.1 | | 2.37 | 147.8 | | 37.6 |
| Mr. Souther, damp sand | | | | 2.38 | 148.5 | | 52.5 |
| My own experiment, damp sand | | | | | 148.97 | | 49.0 |

From this it will be seen that the solids in the sand used here are considerably lighter and the stone considerably heavier than the weights given in Mr. Hazen's article, as a specific gravity 2.65 would produce a weight of 165.25 lb. per cubic foot both for the solids in the sand and for the stone.

Fig. 2 shows a section and elevation of a concrete arch bridge built by our company at Scarretts Mill, West Hartford, in October, 1901. These arches happen to embody the smallest relation of rise (2 ft.) to span (15 ft.) of any concrete arch, built without metal, with which I have been connected. Fig. 3 shows a photograph of the same arch taken Feb. 3, 1903. This work was proportioned as follows: The actual arches 8 cu. ft. of sand, and 16 cu. ft. of stone to each barrel of portland cement. All other parts of the structure, 12 cu. ft. of sand and 24 cu. ft. of stone to each barrel of portland cement.

From the data here cited it appears that it is desirable to fill the voids in the broken stone to be used with just as good a mortar as the nature of the work and the money available will warrant, but it is not desirable to use an amount of mortar very much in excess of

the voids. This excess is limited in the 1901 specification for concrete on the Middle Division of the New York State Canals to from one to two per cent.

Second, that it is important to avoid ambiguity in specifications by stating clearly either the number of cubic feet of both sand and broken stone to be used to each barrel of cement, or, the volume at which it is proposed to place the barrel of cement in proportioning your mixtures.

The variation of the meaning of the word "aggregate" as used by different engineers quoted in this paper will also probably bring it self to your attention.

NOTES ON EUROPEAN TRAMWAYS.*

BY RICHARD McCULLOCH.

Most visitors to Europe have noticed and remarked upon the peculiarities of the European city transportation system. Unless the visitor is especially interested in transportation methods however, his attention is chiefly attracted to the multitude of cabs and omnibuses, the funny little cars, the limitation of the number of passengers, the cheapness of the fares and the frequency with which the conductor comes around for another.

As a matter of fact there is not in the whole of Europe a tramway system which gives anything like the service given by the street railways in the average American city. Berlin comes the nearest to it, but Berlin is the most modern of European cities. The much vaunted municipal tramway system of Glasgow consists of only 100 miles of track. Glasgow is a city of 760,000 inhabitants and comparing it with American cities of about the same population St. Louis has 460 miles of track, Boston 409 miles and Baltimore 354 miles. The city of Denver, one-fifth the size of Glasgow, has 142 miles of track. At first thought the temptation is to ascribe this backwardness in transportation facilities to the natural conservatism of the people, but there are other reasons for the lack of tramway progress.

City Construction.

The chief of these reasons is that the location and street constructions of most European cities do not lend themselves readily to tramway building. American cities have been located for commercial reasons, European ones for defensive reasons. One of the attractions in the location of American cities was accessibility; in the European city the very reason for the location was the difficulty of approach. Most European cities consist of an old and a new city. What corresponds to our retail district is usually in the old part while the residences are in the new part. The old parts of the cities have narrow, crooked streets and narrow sidewalks or none at all.

Tramways constructed in these streets must be single track with turnouts as usually it is impossible to find a parallel adjacent street on which the mate for a double track may be built. An interesting example of the old and the new is Vienna. The older part of the city, about 1½ miles in diameter, in which are located most of the retail business houses, hotels, etc., has narrow, crooked streets and no means of transportation except cabs. The walls which once surrounded this city have been demolished and in their place a beautiful boulevard called the Ring has been constructed. All tramways end at the Ring, none of them entering the old city.

The building of tramways on the boulevards and fine streets is usually prohibited and their construction in the old and congested parts of the city is often impossible. These facts combined with the relative cheapness of cab fare and the great number of cabs on the street, tend to cut up the tramway system into a number of unconnected, disjointed lines.

Concessions.

Concessions for the building of tramways are granted under different conditions in the various countries. In England the conditions are so onerous that enterprises of a private nature are discouraged, and many of the large electric systems which have been built are operated by the municipalities themselves. There are a number of horse roads still in operation which are not converted to electric traction because the proprietors cannot afford to spend the money necessary to make such a change under the conditions

*Abstract of a paper read before the Western Society of Engineers, April, 1903.

imposed. On the continent long-time franchises are freely given on favorable terms, the state reserving the right to purchase the tramway after a certain period of operation. The obtaining of a concession in these continental countries is a long and tedious process in the eyes of one accustomed to American practice. The proposed construction and operation of the road must be indicated in the greatest detail. Applications must be submitted to each commune through which the railway is to run and public meetings to discuss the concession are held. After the concession is approved by each commune the plan as a whole is referred to the department or canton council who must pass upon the project in its entirety. The ruling of the department council is final except when the road is in two or more departments, in which case the minister of public works or some federal authority must approve the project. In France, after all the plans are finished it takes about two years to get the final approval of a concession even when no opposition develops.

It is but just to the European municipalities to state that although they hold the tramway companies to a strict compliance to the provisions of the franchise they protect the tramways thoroughly in all their rights and do not use the police power to harass them. All conductors and subordinate officials are sworn officers of the law and have all the authority of police; teams are not allowed to follow the track but only to cross it; disorderly conduct on the cars is punished severely; any interference with the track, signals or apparatus of the tramway is regarded as a penal offense.

Track.

Track in city streets is usually laid on concrete beams without the use of wooden ties. Tie rods hold the rails to gage. The rail mostly in use at present is a section somewhat similar to our grooved or Flrby type. On suburban roads and in some of the smaller cities E-rail laid on wooden ties are used. The joint question has not received the attention it has had in America because the cars have been lighter and are operated on much longer intervals. Ordinary fish plates are used and a great many cast welded joints have been made all over the continent mostly on old rail. The electric equipment at present installed closely resembles that used in America. Unfortunately a number of engineers have thought it necessary to design their own motors and there are a number of small manufacturing concerns who manufacture motors with hand-wound armatures and a commutated field control, a type which has been abandoned in this country for 10 years.

City tracks are usually laid 1.44 meter gage which is the same as our standard gage. The meter gage has been adopted very largely for suburban railways because it takes up less room on the highways. This is a great disadvantage as the narrow gage crowds the motors and brakes on the trucks and prevents the use of standard apparatus.

Cars.

The style of cars varies with the different localities. In England the use of double deck cars is almost universal. It looks like an omnibus body mounted on a street car truck. The double deck car is also largely used in Paris. In London and Paris the climate is so mild that the deck seats are popular the year around. The usual type of car on the continent is a small box car 16 or 18 ft. long mounted on a single truck. These cars usually have an awkward appearance and are cheaply constructed. As the cars are usually short, single trucks are almost universal and the long double truck, easy riding cars which are now so common in America are to be seen on only a few of the very latest European tramways.

Method of Propulsion.

The overhead trolley is much used for the propulsion of cars. Wherever possible, in narrow streets, span wires are fastened by ornamental rosettes directly to buildings and the use of poles is obviated. This vastly improves the appearance of the street. Where poles are used in city streets the municipality usually insists on their being of an ornamental type. In certain portions of the large cities the use of the overhead trolley is prohibited and in these places every known method of propelling a car is in use. The open conduit underground system is in use in Paris, Lyons, Brussels, Dresden, Berlin and Vienna. In these cities, however, the conduit is placed under one of the rails instead of being between the two rails. The storage battery is used on the cars in Berlin to carry

the car past certain places where the overhead trolley is prohibited. In Munich the only place where the trolley is prohibited is directly in front of the Royal Palace, where cars are towed by means of a storage battery locomotive. The surface contact system is in use at Monte Carlo and in Paris. Its use in Paris has been very unsatisfactory. Besides the electric systems there are in use steam locomotives, compressed air cars and Serpollet steam motor cars. All of these systems are to be seen in Paris.

Underground and Elevated Roads.

In a number of the large cities attempts have been made to atone for the lack of street transportation by underground and elevated roads. In London a number of years ago several underground roads were built for operation by steam locomotives. These feed into what is called the Circle, which corresponds to the Union loop in Chicago, except that the area comprised in it is much larger. More recently other underground roads have been built, the latest of which, the Central London Ry., gives fairly good service. It is proposed to change the motive power of steam roads to electricity so that all parts of this immense city will have rapid transit. The London electric underground roads differ from those in other cities from the fact that they are not built in subways but in tunnels, sometimes 80 ft. below the surface. An elaborate underground system has been planned for Paris of which six miles have been in operation for three years and a new section is about ready to be put in operation. A short portion of this is elevated, but that built underground is built as a subway constructed in open cut and built as near the surface of the street as possible. In Berlin a combined underground and elevated road has been recently put in operation the motive power of which is electricity and in Vienna there is an elevated road operated by steam locomotives. In all of the cities where elevated roads are in use the character of the structure and stations is artistic and ornamental. In this it differs radically from American practice.

Service.

Tramway service in Europe and especially on the continent is characterized by a smoothing out or an utter absence of the night and morning peaks. Business begins at varying hours in the morning and stores keep open until later in the evening than with us. In all of the smaller towns and in the smaller stores of the larger continental cities it is customary to close the stores between noon and two o'clock for the mid-day meal and during this time business is entirely suspended. The consequence is that there is a peak at 12 o'clock followed by a period of stagnation, until two o'clock, when there is another peak. Workmen usually live in the neighborhood of the factories and walk to and from their work. This fact robs the tramways of what in America constitutes one of the best sources of revenue. As a consequence of these conditions tramway service in continental Europe is differently planned from that in American cities. There is an absence of the night and morning trippers and in their places extra cars are sent out at noon to take care of the mid-day rush. In some of the cities tourists' travel is a very productive source of revenue, but the banner days are the pleasant Sundays and fete days of which there are a great many.

As a general rule the service given by tramways is poor considered from the American standpoint. The interval between cars is long, a ten minute headway being considered good service. The speed is slow owing to crooked streets, waits at turnouts and city regulations. In most of the cities the number of passengers to be carried by each car is limited to so many seated passengers and so many standing passengers.

One of the most annoying requirements insisted on in continental countries is the division of the cars into classes with different rates of fare. This necessitates cutting the car into two sections or running a train consisting of two or more cars. The rate of fare asked in the first-class compartment is usually one half to one third more than the second-class compartment, but only a small proportion of passengers travel first-class, and the expense of providing this additional service is not justified by the earnings. There are a number of light railways in France, Belgium and Italy which use steam locomotives. Many of these properties with electricity as a motive power and with an active management would prove valuable investments as they serve populous districts and there is no restriction on the carriage of freight. In the dignified, easy-going manner in which they are run only the very best of them are on a paying basis.

There is not in all of Europe a counterpart of our modern electric interurban railway with its right of way, elegant cars, high speed and frequent service.

The fare register on the continent is not often used. There are usually several rates of fare corresponding to the class and length of the ride and the conductor tears out of a book a colored, numbered slip stating the fare paid and the terminus to which the passenger is entitled to ride. The passenger must keep his slip in his possession as long as he remains on the car as inspectors board the cars at frequent intervals and assure themselves that each passenger has a slip and that he has not passed his destination. The conductor settles his accounts by the number of slips which are missing from his books. As the slips are consecutively numbered old slips may not be used over again. At first glance this method looks like an awkward, clumsy system, but on account of the large number of different rates of fare in use it is difficult to devise a better one.

Rates of Fare.

The rate of fare on European tramways is what to the sociologist and municipal reformer is most alluring. He comes back from a trip abroad, announces that in certain European cities passengers are carried for two cents, three cents or four cents and demands why it is that the tramways in America are allowed to charge such exorbitant rates. The municipal reformer's idea of the cheap fare has probably been derived from a very limited experience with tramway travel. If he had attempted to ride for two cents he would have found that his two cents carried him for only a very short distance and that the conductor soon came around for another fare and that by the time he reached his destination he had expended more than he would have paid in an American tramway. It is unfortunate and misleading that writers giving the fares charged in European cities do not also give the distances. It will be found that the rate per mile will average about $1\frac{1}{2}$ cents and sometimes higher. In France the fare is established at two cents for the first kilometer and one cent for each succeeding kilometer. This would limit the ride to be had for five cents to $2\frac{1}{2}$ miles, or would make the fare for a ride of 5 miles 9 cents. On the Chicago City Ry. the length of several of the trunk lines is 10 miles, while the longest ride offered for one fare of 5 cents is about 20 miles. The average ride taken by the passenger is difficult to estimate, but is probably between four and five miles. For this average ride his fare under European rates would be 8 cents instead of 5 cents. Beyond the question of cost of transportation the zone system is an effectual barrier to the growth of a city.

Employees and Wages.

The employees on the continental roads have had a military training and lend themselves readily to the discipline of a railway system. Good men can be obtained for conductors and motormen and the fine trade schools furnish material for foremen and petty officials. Socialism is rampant among this class of men and strikes are not of infrequent occurrence. What impresses the visitor, especially in smaller places, is the instinctive politeness of the employees. In France the conductor says "Merci" when he collects your fare and if you possess a pass he touches his cap. Wages vary with the locality of the road. In Italy, Southern France and Switzerland 80 cents per day is paid for motormen and conductors, in northern France and Germany \$1.00 per day is paid and in Great Britain the rate is a little higher. Aid and relief societies, accident insurance, pensions, etc., supported partly by the employees and partly by the company are common.

Future Development.

Most of the large cities and towns are equipped with tramways but a great deal remains to be done in the consolidation of management in weaving the separate and independent roads into a united system, in changing the motive power, in standardizing the equipment, etc. The great opportunity for new enterprises is in the direction of suburban and interurban railways. There are many cases of existing light steam railways where the introduction of electricity and a little push would make a good property and there are many cases where new roads could be built and profitably operated. Foreign concessionaires are not favorably regarded although foreign capital is eagerly welcomed. Many roads are now being built entirely with American apparatus or apparatus modeled after

the American type. It is found difficult, however, to operate these roads in the American fashion on account of what is politely termed the conservatism, but what the builder is more apt to term the stupidity of state and government boards of control.

In this article the question of power station construction has not been taken up as European practice does not differ in any essential from the best American practice.

DAMS BURST IN STREET RAILWAY PARKS.

Oakford Park, situated $3\frac{1}{2}$ miles from Greensburg, Pa., and owned and operated by the Pittsburgh, McKeesport & Greensburg Railway Co., was the scene of a catastrophe Sunday, July 5th, which resulted in the death of between 30 and 40 persons. A dam or retaining wall which backed up the water forming an artificial lake gave way and the water swept through the ravine in which the park is located. It carried away all the park buildings and amusement features, except the dancing pavilion and large lunch stand, and still further on destroyed a trolley waiting room and swept a car and its passengers away, wrecking the car. A heavy rain, followed by a cloudburst were responsible. James McGrath, the park superintendent, foresaw the danger, and with his assistants warned as many persons as possible. The torrent flowed down Brush Creek to Jeannette, Penn Station, Irwin and Manor, doing incalculable damage. Fifty families in Penn were rendered homeless.

The lake at Oakwood Park, Pittsburgh, Pa., burst its banks Sunday night, July 5th, and the water, rushing down the hillside, washed the street car tracks out for a distance of several hundred feet, delaying traffic on the Carnegie line of the Pittsburgh Railways Co. nearly two hours. The lake was made by damming one end of the ravine some distance above the tracks, and it is supposed that excessive rains filled the lake above its capacity. Oakwood Park is owned and operated by the Pittsburgh Railways Co., and is reached by its West End lines.

ELECTRIC CAR AND AUTOMOBILE REGULATIONS IN LEIPSIG.

It is reported by Consul B. H. Warner that the municipal ordinances in Leipzig prescribe that electric street cars shall not run at a higher rate of speed than 9 miles an hour in the business section. With trailers the speed is limited to 7.2 miles. In the residential sections a speed of 10.8 miles an hour is permitted or 9 miles with trailers and in the suburbs 15 miles or 12 miles with trailers. Penalty for exceeding the speed limit is a fine of not more than \$15 or imprisonment for 14 days or both. In case of accident a higher penalty may be inflicted.

The city council recently passed an ordinance prohibiting the use of automobiles in most of the streets of the inner city and in other places allowing them to be driven on those streets which are traversed by electric cars.

ELECTRIC RAILWAY FOR BILOXI, MISS.

Biloxi, Miss., is soon to have an electric road, which is being constructed for the Biloxi Electric Railway & Power Co. by Knox, George & Co., consulting engineers, of Chicago and New Orleans. There used to be a five-mile mule line in Biloxi, operated by the Biloxi Street Railway Co., which owned 10 cars and 16 mules, but it was abandoned some time ago and the tracks torn up. The new road is to be seven miles long, connecting Biloxi and the small fishing villages in the vicinity. It is regarded as the nucleus of an interurban system between Biloxi and Mississippi City.

The members of Knox, George & Co. are George W. Knox, of Chicago, president of the Knox Engineering Co., and the Knox Construction Co., and James Z. George, a well-known New Orleans engineer.

The Williamsport (Pa.) Board of Trade has issued an illustrated, descriptive pamphlet, setting forth the advantages of the city for home or business purposes. The association has a guaranty fund of \$215,000, subscribed by the citizens, for the expansion of local industries and to loan to manufacturers. A copy of the pamphlet may be had by addressing H. R. Land, manager of the Board of Trade.

NIAGARA FALLS TRANSMISSION LINES.

BY ARTHUR B. WEEKS.

When transmission lines Nos. 1 and 2 were run from the Niagara Falls power house to Buffalo, via Tonawanda, they were so connected that either could be put into service, as desired. The possi-

closed, and switch B' opened. Buffalo can be cut off from that point should there be any short circuit on that section, though current can still be supplied by No. 1 line through switch C' to the Tonawanda bus bars.

Each of the three lines is similarly connected, as shown at the left of Diagram No. 1.

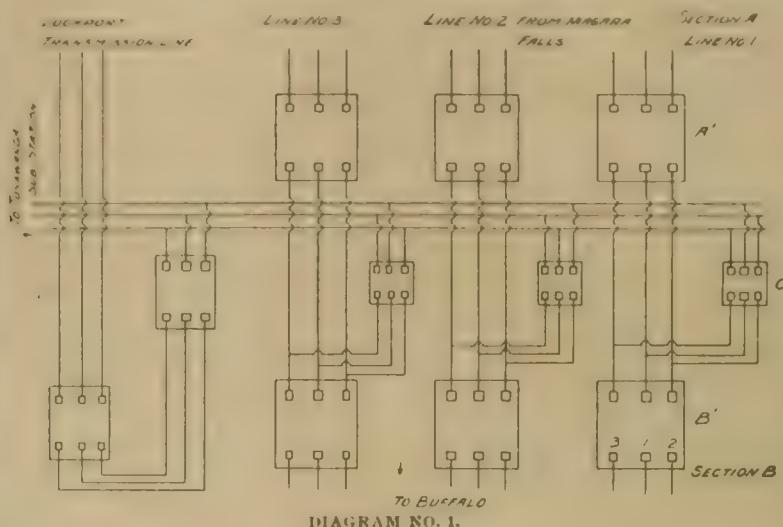
Lockport is supplied with current directly from the Tonawanda



OVERLOAD CIRCUIT BREAKERS, TERMINAL HOUSE, BUFFALO.

bility of troubles either at Lockport (controlled by switches at Tonawanda) or on the line between Niagara Falls and Buffalo made this a case of necessity. The Tonawanda station is frequently requested by the electricians at the power house to change from one line to another, and these changes must of course be made at Tonawanda first.

When line No. 3 was constructed, it did not connect at Tonawanda station at all. It fell to Mr. H. W. Buck to design a building and switchboards for controlling all three lines from Tonawanda



bus-bars. Usually any short circuit on the Lockport line is taken care of by the circuit-breakers at its power house; but cases have occurred where a short circuit has demanded the killing of the transmission lines from the Niagara Falls power house. On starting up again, the faulty section is left off until remedied.

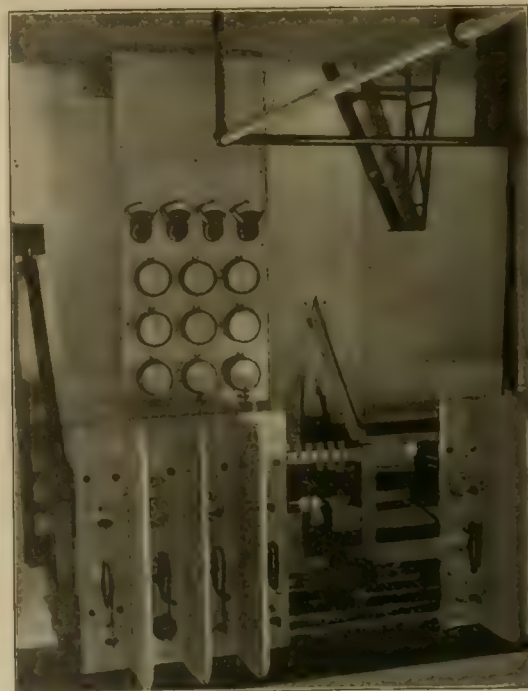
Owing to the fact that there are no circuit-breakers at the section tower on any of the transmission lines, when Tonawanda changes



DISTRIBUTING BOARD, TERMINAL HOUSE, BUFFALO.

A description of the resulting section tower and wiring never having appeared before will doubtless be of interest.

At the top of the diagram, No. 1, are shown the three lines entering from Niagara Falls, marked Nos. 1, 2 and 3, Section A. It will be observed that line No. 1 can be opened at switch A', which would cut off all of that line beyond that point. With switch A'



HIGH TENSION BUS BARS, STANLEY STATIC GROUND DETECTORS.

from one line to another Buffalo must parallel the lines before Tonawanda can make the change. This is to prevent severe arcing on opening the switches. It is customary for the Buffalo terminal house to run its railway load on separate bus-bars as much as possible. Before the terminal house ever parallels its lines the transmission lines must of course be parallel at the Niagara Falls power

house. Diagram No. 2 shows the wiring of the Buffalo terminal house.

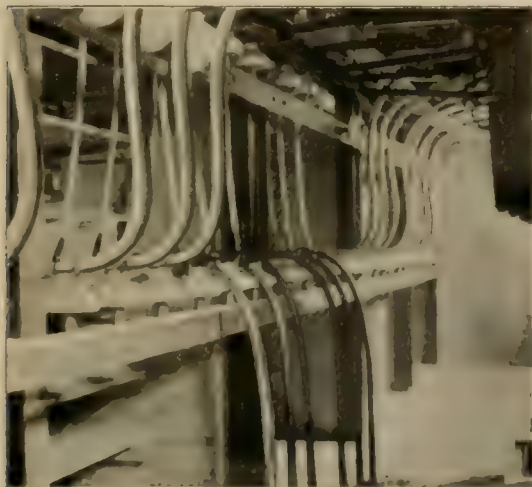
The terminal house and Tonawanda make no changes except as they receive orders from the electrician in charge at the Falls; hence mistakes in paralleling cannot occur. The lines have occasionally been separated, the Buffalo load being on a-line by itself and Tonawanda and Lockport on another line. When they are to be paralleled, the electrician in charge at the Falls parallels the bus-bars at the switchboard and then instructs his assistant to parallel the high tension bus-bars in the transformer room. Any changes on the lines are then directed by telephone to Tonawanda and terminal house stations.



RECEIVING PANELS, 22,000 VOLT LINE, TERMINAL HOUSE, BUFFALO.

As is generally known, there are corresponding bus-bars at the Niagara Falls Power House, and the two sets of bus bars are suitably connected.

The Westinghouse low equivalent lightning arrester has been used



CABLES ON REAR OF SWITCHBOARD.

on these 22,000-volt transmission line for two seasons, and are thoroughly reliable. It is of course necessary to make the usual examinations of the series and shunt resistances to learn the condition of the apparatus, for there may be burnt out resistance

Again, the fuse which is run inside a fibre tube about 30 in. in length may also be out. Ozone occasionally eats away the fuse. The multi-gap cylinders may also need replacing.

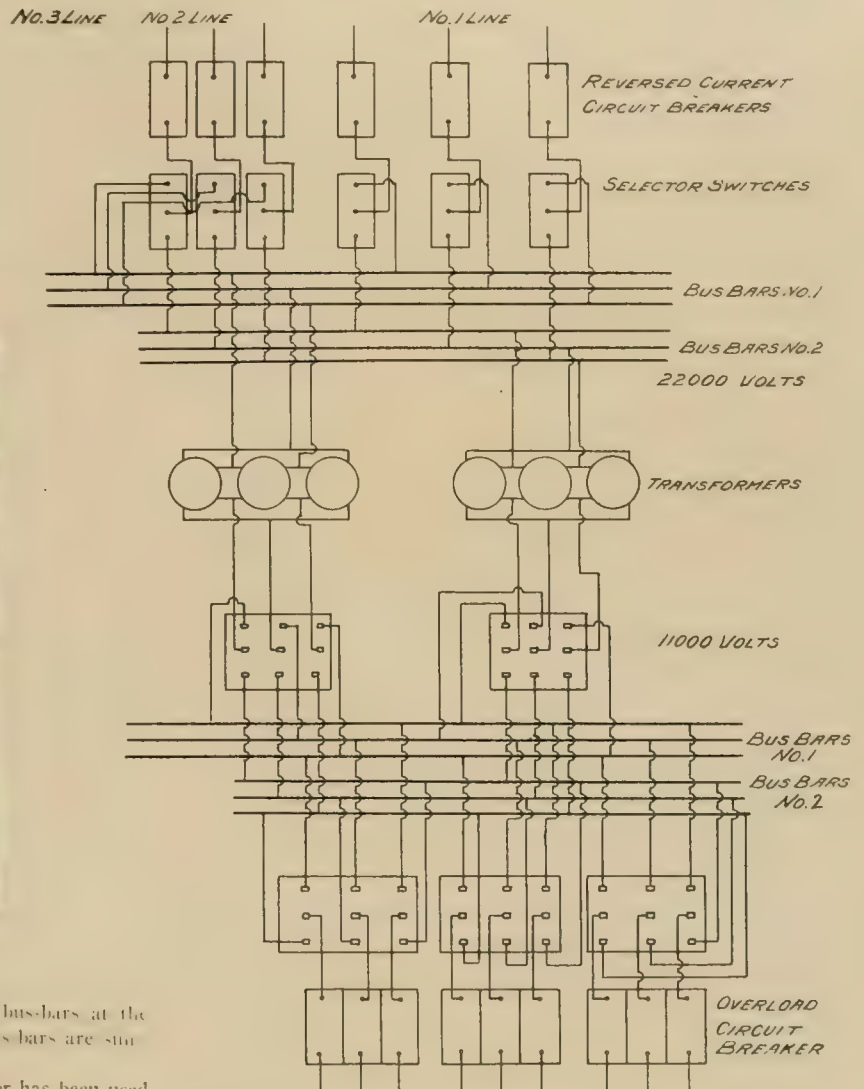


DIAGRAM NO. 2.

The Stanley ground detector shown in one of the illustrations is connected at the Niagara Falls power house transformer room. These occupy the lower part of the central panel. The instruments

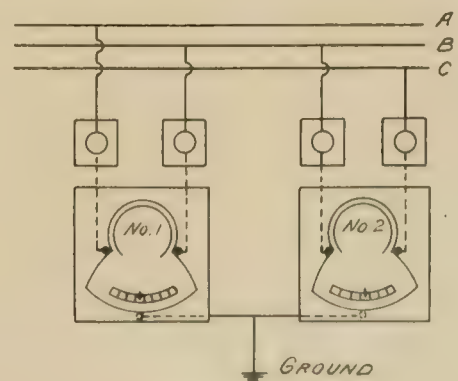


DIAGRAM NO. 3.

above them are ammeters, one on each leg of the three transmission lines. The diagram, No. 3, explains its connections and direction of the needle when there is a ground on the line. The primary is connected to the line bus-bar, on top of this is the secondary

of the contact which is connected to the fixed vanes of the ground detector.

The movable vane is acted upon inductively by the fixed vane so that the force produced by each pair is equal but opposite. The movable vane, therefore, takes up a position equidistant between the two fixed vanes. This position is the same, whether the instrument is charged or not, and the pointer stays at zero, indicating no ground.

Should the primary plate of one of the condensers and the movable vane become electrically connected, as happens when there is a ground, the pair of fixed vanes which lead to that condenser assume with the movable vane a like polarity, and the latter is repelled. At the same time, the action of the other fixed vanes is to attract.

The two forces acting in the same direction, the movable vane takes a position entirely within the vanes oppositely charged to it, and the pointer takes a position indicating a ground on the side of its deflection. The condensers may be placed upon the bus-bars or upon the panels, as desired.

MASSACHUSETTS NOTES.

At one time during its last session the Massachusetts Legislature had on the calendar of the street railway committee 68 matters for consideration. The bulk of these, however, were for roads in different parts of the state, some running and some contemplated, which wanted the right to carry merchandise and baggage. When the first bill of this nature reached the governor he vetoed it, explaining that a general bill delegating this power to the railroad commissioners was more desirable. One fact that is now troubling the companies is that the governor insisted that the word "freight" should be included in the general bill as well as baggage and small parcels of merchandise. This the roads fear may make them common carriers of freight with no power to refuse whatever may be tendered them. This bill, however, says "with the approval of the local authorities" and that is looked upon as the saving clause, for the companies do not believe that these officials would allow street railways to haul manure, lumber, etc., through the public streets.

Besides these bills there were others asked by roads that wanted special charters covering points that could not be granted under the general law. In many of these cases the freight clause was the one desired and when the general bill was passed, the governor intimated that he would veto these as unnecessary and they were abandoned before reaching the executive. There was some objection to this course from the parties interested in the various projects on the ground that they had lost six months already and to commence all over again would cause another long delay. Only two special charters have been granted, one to the Huntington & Westfield River and the other to the Shelburne Falls & Ashfield. When built these will be connecting lines and are to traverse a sparsely settled territory. So much so in fact that the most liberal kind of a charter was necessary to interest capital and it is doubtful now if anything is done with it, although it allows the sale of electricity for heat, light and power purposes and all the freight and baggage carrying privileges.

The greatest consolidation effected this year is one by which a number of roads in northeastern Massachusetts and southern New Hampshire were consolidated under the name of the Northern Massachusetts Street Railway Co. This was such a complicated matter that the aid of the legislature had to be invoked to make it legal.

In one case a town was authorized to invest in the securities of a new company to help it along. This was the town of Plymouth which can legally subscribe to \$15,000 of the stock of the Plymouth, Carver & Wareham road.

One lease was approved, that of the Lowell & Pelham to the Hudson, Pelham & Salem Co.

Up to this time companies in making their annual report to the railroad commissioners have been obliged to send with it a check for \$20. The legislature this year abolished this fee.

One new matter of regulation was that street railway companies shall report all accidents with particulars, etc., to the railroad commissioners. While railroads have been obliged to do this, street railways have been exempt heretofore.

One matter that is yet to cause the companies some worry is the order for a special committee to be appointed by the governor to

investigate the coming summer and fall the laws bearing on the subject of employers' liability. After this investigation they are to report what changes if any should be made in the present law at the next session of the legislature. At the present session several bills were introduced bearing on this subject and this investigation was a compromise measure. So whatever changes are suggested by the committee will lead to a contest next session for the corporations, street railways and others, are opposed to any letting down of the bars.

A measure that was defeated and which if passed would have required the expenditure of considerable money was that to give the local authorities power to compel the companies to provide waiting rooms at different places along their routes. This was a popular measure because it would look to the constituents of each member that he had done something directly for his district if he compelled a company to put in a waiting room. It was advocated for the country districts especially but it was killed in the senate on the argument that it applies to city roads as well and could give the Boston board of aldermen power to compel the company to lease the most expensive building in the city as a waiting room.

A bill which passed gives the railroad commissioners authority to regulate the speed of electric cars through the approval of the regulations of local authorities. The board has already issued a general order under this.

Another bill provides that cars in addition to being equipped with fenders shall at the suggestion of the railroad commissioners be equipped with emergency tools and air brakes.

One of the last measures to be signed by the governor was a bill to give the local authorities power to authorize street railway companies to take land by the right of eminent domain for the purpose of improving grades and curves. The matter got into a dispute between the two branches over provisions that a referendum clause should be attached to the bill and that railroad companies should be allowed to run cars by electricity in the public streets. Each proposition was advocated by one branch and finally a committee on conference suggested that both propositions be struck out of the bill, which was agreed to by both branches.

ROB.

CEDAR RAPIDS-IOWA CITY RY.

Grading is in progress on the Cedar Rapids, Iowa City & Southern Ry., of Cedar Rapids, Ia., and it is hoped to have it in operation by Jan. 1, 1904. It is being built by the Cedar Rapids, Iowa City & Southern Construction Co., and the members of The Chicago Engineering & Constructing Co. (formerly Weston Brothers) are consulting engineers. The new road will run from Cedar Rapids, Ia., through Linn and Johnson Counties to Iowa City, in all about 28 miles. Later it will be extended. It is purposed to carry passengers, light express and freight and the company expects to derive a substantial revenue transporting live stock and farm produce from along the line. It will be of standard, direct current construction, and the Chicago Engineering & Constructing Co. is preparing general plans. The president of the railway company is William G. Dows; vice-president, N. M. Hubbard, jr.; secretary and treasurer, Isaac B. Smith.

STATISTICS OF UNITED STATES RAILROADS.

The Interstate Commerce Commission issued last month an abstract of statistics of railroads of the United States for the year ending June 30, 1902. The more pertinent data follow: Total single-track mileage, 202,471.85 miles, an increase over 1901 of 5,234.41 miles; number of railways in the hands of receivers, 27, a net decrease of 18; number of roads placed in receivers' hands during 1902, 4; number taken from receivers' hands, 22; locomotives in service, 41,228, or 1,644 more than in 1901; number of persons employed, 1,189,315, an increase of 118,146; amount of railway capital outstanding, \$12,134,182,964; passengers carried, 649,878,505 an increase over 1901 of 42,600,384; gross earnings from the operation of 200,154.56 miles of line, \$1,726,380,267, an increase of \$137,854,230; operating expenses, \$1,116,248,747, an increase of \$85,851,477; net income, \$280,276,327; dividends declared, \$185,421,239; surplus, \$94,855,088; total number of persons killed on account of railway accidents, 8,588; total number injured, 64,662; total number of passengers killed, 345; of employees, 2,969; of other persons, 5,274.

Chicago 99-Year Act Valid.

Judge Grosscup Instructs Receivers to Permit No Interference With Lines of Union Traction Company Operating Under Grants Made to Companies Named in the Act of 1865.

June 18th the receivers of the Chicago Union Traction Co., as directed by Judge Grosscup, of the United States Circuit Court, in his letter of instructions of May 27th, filed a voluminous petition setting forth the claims of the company under the so-called 99-year act. The court had directed that the city and all other parties in a position to inform the court regarding the 99-year act be invited to be present at the hearing June 18th. The city declined to appear and the only arguments submitted were made by counsel representing the traction company.

At the conclusion of the arguments Judge Grosscup expressed his wish to hear from some one who believed the 99-year act to be invalid, and his regret that the city had not seen fit to be represented. He stated that it would be necessary for him to decide as to the validity of the act in question in order to determine what action should be taken after July 30th, and that should he err in his decision because of want of information the responsibility would be upon those who withheld the data.

July 10th Judge Grosscup delivered a letter of instructions to the receivers, in which are embodied the views of the court as to the claims of the traction company. The letter of instructions is as follows:

It is not my purpose now to announce any final judgment upon the questions raised and discussed. The absence of full discussion on the part of those who are said to believe the ninety-nine year act to be invalid and inapplicable, makes final judgment at this time inopportune. Nor shall I take any step toward requiring the city to intervene to test the validity and scope of the act. I have not given up the belief that the railway companies and the city will ultimately, in the spirit of fair play, get together upon a basis just alike to both, and without the delay of protracted litigation.

My purpose in this communication is to give you such instructions in the matter of continuance of your possession of the street railway properties when the 30th of July arrives, and of immediate expenditure of money for the improvement of the system, as will, in my judgment, adequately conserve the property rights of the companies, while requiring them to fulfill their obligations to the public.

Chicago's initial street car ordinance was passed by the city council Aug. 16, 1858. The city then had a population of about 95,000, and the purpose of the ordinance was to install a street car service by granting to certain persons therein named, and to others to be associated with them, authority to lay tracks in certain streets, and to operate their railway system in the manner, and upon the conditions, therein named. A period of twenty five years was fixed for the life of the ordinance.

But it turned out that at that time there was no state law authorizing municipalities to make such grants. Thereupon, Feb. 15, 1859, the state legislature, instead of passing a general law conferring authority upon municipalities in the matter of street railways, proceeded to deal concretely with the Chicago street railway problem by incorporating the Chicago Street Railway Co. and the North Chicago Railway Co., with authority to maintain and operate their railways—with all necessary and convenient tracks, side tracks and appendages—in and over such streets as the city council had already set apart, or should thereafter set apart for such purpose; leaving it to the city council and the companies to fix, by contract, the manner, terms and conditions of such occupancy. The grant embodied in this act was for a period of twenty-five years. Supplementary to this the legislature, Feb. 21, 1861, created the Chicago West Division Railway Co., conferring upon it like powers and upon like conditions; the duration of the grant being also for the period of twenty-five years.

Feb. 6, 1865, the so-called ninety-nine year act was passed. Its manifest purpose was to extend the period of the grants previously mentioned from twenty-five years to ninety-nine years. In express terms it provided that "all contracts, stipulations, licenses and undertakings entered into between the common council and any one of said corporations, respecting the location, use or construction of rail-

ways in or upon the streets or any of them, should be continued in force during the life of such act." Other language of similar significance is used. It may be a matter of legitimate difference of opinion whether the legislature meant to confine the legislative grant thus given to the streets named in the act, or meant to include, as well, the streets that must prospectively, in the natural evolution of a street railway system, come into additional use. However that may be, the legislative grant, when rightly interpreted, controls; any ordinance of the city to the contrary notwithstanding; for, under the constitution of 1848 the state, in the matter of control of streets, was the original depository of power, the municipalities having no power except such as was conferred by the state, and exercising that only as the arm of the state.

Two questions, then, are presented. Are the granting acts of the legislature constitutional? and, Does their grant of rights to the occupancy of the streets reach, not only those streets actually named in the acts, and put into use at the time, but those also that prospectively were seen to be needful to the natural evolution of a street railway system?

The constitutional points—so far as I have been able to dig any out—do not merit space for statement, much less for discussion. Upon that phase of the matter my judgment is at rest. But what is to be regarded as the legitimate scope of the legislative grants—what streets now used must be held to be in use under the grants thus obtained—is a matter of greater difficulty.

It is not easy always to lay aside one's supposed knowledge concerning the origin or one's opinion concerning the wisdom of an act of the legislature to be interpreted; but such must be the mental attitude of the court that is to interpret and the public that is to observe an existing law of the land. The legislative grants, whatever their origin, are the existing law of the land. They constitute the contract between the people of the state and the railway companies. They measure the rights and the obligations of both. They have been the accepted basis for tens of thousands of transactions by people who never heard of the legislature of 1865. To set them aside now, either covertly or openly, or to deprive them of their full meaning and effect, would be a judicial evasion of contract and a breach of public faith as reprehensible as the repudiation of some undoubted but unpopular public debt. There is no way left, then, to approach the interpretation of these grants other than as one would approach any plainly written contract between disputing parties.

The legislative grants, taken together, look to the installation of a railway system in the city of Chicago, and, to that end, grant to the railway companies, for the period of ninety-nine years, the right to occupy certain streets; leaving to the city, by contract with the companies, the manner and conditions of such occupancy. Thus, when the companies entered into occupation under these grants, the underlying right of their occupancy was from the state, the manner of its exercise only being governed by the ordinances of the city. The state was the grantor, the city the supervisor. Now, while the power of the city over the exercise of the grant thus obtained from the state was made ample, it remained, and remains, a subservient power. Its function is to promote the uses of the grant; it cannot be made a means to defeat the grant, for the rights of both the city and the companies, under these legislative grants, are substantial rights, and the courts are bound to see that the substance of both are preserved. So much for the streets actually named in the legislative grants and entered upon by the companies at that time. This brings me to the streets subsequently occupied by the companies.

There is much force in the view that the legislature had in mind in enacting the grants, a street railway system, adequate not only to the then present, but to the future needs of the city; that the natural growth of the city was foreseen, and a corresponding expansion of railway facilities forestalled; that the grants were meant to cover the branches and twigs, as well as the trunks of a growing system. In this view the legislative grants were, when passed, already executed and vested, as to the streets named in the grants; and, though in fieri as to streets not named, naturally falling, in course of the

city's growth under the system and none the less effective as vested grants when the new streets are occupied. In this view, too, the ordinances of the city, subsequent to the legislative grants, are to be held to be not independent city grants, but ordinances in execution of the legislative grants, and as such, have the effect, not of giving right of occupancy, but of prescribing the manner of such occupancy.

However, I do not mean now to commit my judgment to this view of the legislative grants. I think it forceful enough to guide my action as conservator of this property—for a conservator may not give away that upon which the companies have a reasonable claim—always upon the understanding that it is open for further discussion or any joining of issues that will finally settle this controversy.

I will go further. It is within the power of the court to compel the companies to accept any reasonable arrangement that does not involve confiscation of property rights. I am ready, in the interest of a just settlement of these street railway difficulties, to exercise that power. There has grown up in the public mind a good deal of confusion respecting the purpose of a waiver by the companies of the so-called ninety-nine-year act, and the character such waiver should take. Undoubtedly many think that the surrender of these legislative grants should be without condition, and without compensation. On the other hand, there has grown up in the minds of some parties interested in the railway companies the belief that no concessions whatever can be made; that there can be no surrender of any feature of the legislative grants without the consent of every bondholder, as well as the consent of the companies; that the sole safety of their interests lies in an unflinching grasp upon the letter of the grants as they exist today.

Both of these views are, in my judgment, too rigid and too far reaching. The city can have no real interest in seizing, either by brute force or by superior advantage, that which lawfully belongs to the companies, at least until the owner is fully compensated. I am sure the mayor and a majority of the aldermen entertain no such project.

On the other hand, the bondholders, though interested in the legislative grants, are so interested to the extent only that such grants are part security for their debt. Any equivalent security—any arrangement, for instance, whereby the cash value of the unexpired term of the grants should be substituted for the grants themselves, as pledge to the debt—would meet the just claims of the bondholders. This leaves us, then, free to look about for such adjustment as will give to the city all it may fairly ask, without confiscation of property or invasion of vested rights. Fortunately, as I view it, such an adjustment is at hand.

The feature of the so-called waiver of the ninety-nine-year act that really interests the city lies in the fact that continuance of title to the companies under the legislative grants may interfere with the city's projects looking to municipal ownership; and, independently of municipal ownership, to the maintenance of a supervisory and warning hand over the character of the service to be given.

Indeed, so long as the companies have title under the legislative grants, municipal ownership may be impossible. Title to the streets having come from legislative grants and for street railway purposes, it is at least doubtful if the city could constitutionally obtain, even by act of the legislature, the right to occupy by eminent domain, the streets thus covered.

Hitherto, eminent domain has been used, not to change the personnel of ownership, but the character of use. It is doubtful, also, if the so-called Mueller law even purports to convey such power. In this state of affairs, unless there be a surrender by the company of its title under the legislative grants, the city might find itself, even when actually ready for municipal ownership, at a complete standstill.

But aside from municipal ownership, a surrender of title under the legislative grants is desirable to give the city the warning hand. Should the companies enter upon a new period, knowing that the city could not terminate the grant even at the end of twenty years, there might be temptation to disregard such claims for good services as the city has a right to demand.

But all this can be accomplished by a full surrender, by the companies, of title under the legislative grants, accompanied with a stipulation either to assess presently the value of the unexpired term or to make such assessment at the end of the new grant, if the grant is not to be renewed. No legal difficulty need entangle such an arrangement.

The right of the companies to occupy and their right to be compensated for a quitclaim of such occupancy are distinct legal rights. The former can be surrendered in consideration, or part consideration, of the latter. When so separated, the right of payment becomes a claim against the city, secured possibly by a lien on the title surrendered, but is no longer tied up with the title surrendered. The title, except for purposes of lien, would become extinct; and there would be no payment adjudged until after judicial determination of the validity and scope of the legislative grants. For my own part, I cannot see why this is not a simple and effective way out of present complications.

Conscious of what this generation is doing for the reclamation of the streets of this city from the prairie and the marsh—trying heroically to make of it a finished and compact city—I can see no business or moral objection to leaving it to the next generation to discharge whatever money obligations these legislative grants may impose upon the city. The obligation is theirs as much as ours; we stand in need now, much more than will they, of money to put into actual improvement of street facilities, and the chances are many to few that the obligation will never mature; for, confronted with certain loss of the use of the streets unless good service is given it is almost certain that the companies will fulfill their obligations to the public and thus earn a renewal of the leases.

In view, then, of what has been said, I instruct you: First: To suffer no interference with your possession of any of the streets named in the legislative grants, or occupied by the companies named in the legislative grants, or their successors, under ordinances of the city, which in the view I have outlined are to be treated as subservient to the legislative grants. Any attempted interference you will report immediately to me.

Second: To pledge to the city, if the city wishes negotiation, the co-operation of the court to bring about a settlement on the lines indicated, or such other lines as will observe existing contract rights.

Third: Since the receivership began, eighty-five cars have been added to the regular service. These were old cars taken from the barns, quickly repaired and repainted, and though in some instances incongruous at this season, have added something to the comfort of the public. The report of the general manager, submitted to me July 8, 1903, shows that upon an expenditure of about \$480,000, one hundred new double-truck electric motor cars, each capable of seating comfortably more than fifty people, can be added.


The general manager also reports that for something less than \$100,000 he can equip electrically certain portions of the cable lines, so that cars on outlying lines may be brought electrically much nearer the business center, and, transferred as trailers to cable trains, bring their occupants into the business district without change of cars. This would add to the convenience of the public, and to the capacity of the companies' carrying facilities.

I instruct you to procure the equipment indicated.

PETER S. GROSSCUP.

DOG TICKETS AT BIRMINGHAM, ALA.

In the "Review" for June we illustrated a form of ticket issued by the Hartford Street Railway Co., of Hartford, Conn., for the transportation of dogs. Since the publication of that Mr. J. B. McClary, manager of the railway department of the Birmingham

| | | |
|---|--|----------------------------|
|  | Birmingham Railway, Light & Power Co. | |
| | RAILWAY DEPARTMENT. | |
| | DOG PERMIT. | Birmingham, Ala. 1903 |
| | Conductor | line, allow |
| | Mr. | to carry |
| | dog | from |
| | to | and return. |
| | Good only till..... 1903. It is expressly agreed and understood that no liability is incurred by the B. R. L. & P. Co. for said dog or dogs. J. B. McCLARY, Mgr. Ry. Dept. | |
| | INCOMING CONDUCTOR WILL TAKE By..... | |
| | THIS UP CANCEL AND TURN IN TO THE OFFICE WITH HIS REPORT. | |
| | COLLECT REGULAR FARE. | |

Railway, Light & Power Co., has sent us a form of ticket authorizing the transportation of dogs on the lines of that company. The size of the original from which the accompanying engraving was made is 2 x 4 in.

FOR BORING ARMATURE BEARINGS.

There seems to be some difference of opinion among master mechanics who attempt to pour and bore babbit bearings in their own shops, concerning the best ways of insuring an accurate fit between the armature shaft and the bearings. In fact, there seems to be some doubt as to the necessity of providing for an accurate fit between the shaft and the bearings in order to insure best results. Some of the larger companies, notably the Union Traction Co., of Philadelphia, do not make a practice of boring bearings, believing that if the bearing boxes are properly poured the fit will be sufficiently accurate for all practical purposes. While this practice does away with the expense of reboring, it obviously requires that when the armature shaft has become worn to any considerable extent, the shaft must be brought back to proper diameter by shrinking on a steel bushing. The Union Traction Co. has adopted three standards for shaft diameters and when a shaft has become worn it is brought to the nearest standard by means of bushing.

Several ingenious forms of chucks for holding split and solid bearing shells in the lathe while they are being bored, have been suggested for use in street railway shops making a practice of boring babbit bearings. A source of annoyance in carrying on this work is found in the tendency of bearing shells to get out of true, due to uneven wear, and to the successive heating and cooling to which they are subjected when in service and when the babbit linings are poured. This variation in diameter will amount in some cases to

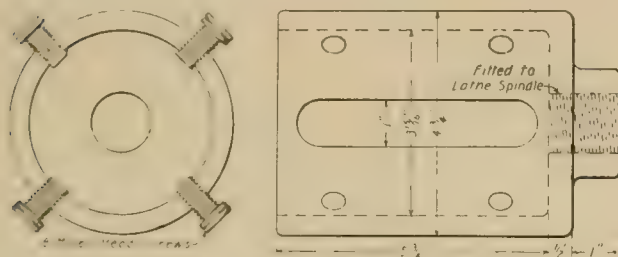


FIG. 1.

1/16 in. from the standard, and to obtain an accurate bore a separate jig or chuck must be provided for practically every set of bearings used.

To get away from this difficulty several shops are now using some form of universal chuck.

Two of these were described in the "Review" for June 15, 1901, page 368. The Capital Traction Co. of Washington, D. C., uses the jig shown in Fig. 1. Its interior diameter is slightly larger than that of the bearing boxes, the box to be bored being supported on the point of eight milled head thumb screws, and does not touch

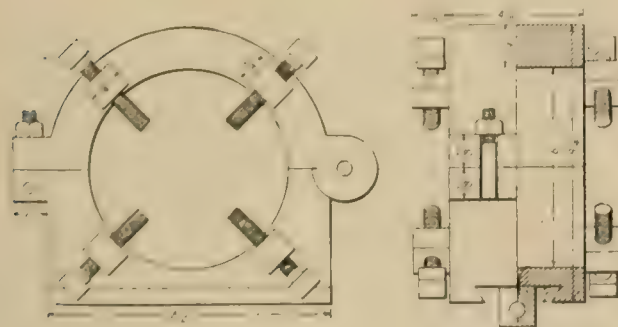


FIG. 2.

the inside wall of the jig. By adjusting the screws the box can be brought to perfect alignment on the lathe.

A somewhat similar device is used at the shops of the Lynn & Boston R. R. and is shown in Fig. 2. In this case the bearing box is carried on the point of screws which are adjusted with the use of a wrench. The jig is made in two halves, hinged at one side, and held by a bolt and nut at the other side. By having the upper

half of the jig hinged in this way, the time required to put in the bearing shells and remove them from the lathe is materially reduced.

Still another form of universal jig is used at the street railway repair shops in Atlanta, Ga. This is shown in Fig. 3 and is made of cast iron. It has six narrow slots cut in its walls extending from a point just below the shoulder of the jig clear down to the larger end and rendering the walls capable of considerable compression. The outer face of the jig is threaded for a distance of about 1 1/4 in. from the larger end, these being V threads cut to a taper of about 1/16 to 1 in. Travelling on these threads is a closely fitting collar.

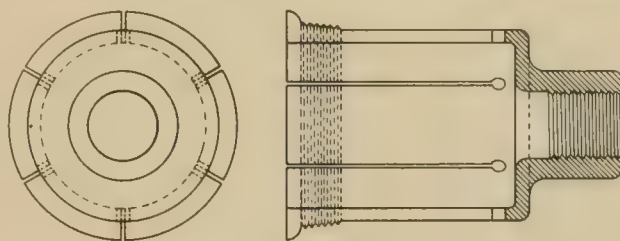


FIG. 3.

It will be observed that by turning this collar in the proper direction the inside diameter of the jig can be very materially reduced. In this way the jig is made to accommodate bearings having a considerable range in diameter.

RIVAL INTERURBANS AT CRAWFORDSVILLE, IND.

Jan. 1, 1903, the city of Crawfordsville, Ind., granted a franchise to the Consolidated Traction Co., which plans to build an electric interurban line from Indianapolis to Crawfordsville, and later extend to Veedsburg and Covington, Ind., and Danville, Ill., and build branches to La Fayette and Rockville. This franchise to the Consolidated company was for practically all the streets in Crawfordsville, naming them. March 1st the city council granted to the Indianapolis & Northwestern Traction Co., which is building from Indianapolis to La Fayette via Lebanon and Frankfort, with a branch from Lebanon to Crawfordsville, a general franchise to enter the city of Crawfordsville, but naming no streets. March 15th the city decided it wished to have a local urban street railway and granted a franchise amendatory and supplementary to the Consolidated franchise providing for a local system, and that all interurban lines should enter over the city tracks. Before this abrogation of its grant the Indianapolis & Northwestern company had accepted its franchise and paid the city clerk the certified check required.

Both of the companies made attempts to occupy streets in Crawfordsville, which were prevented by the use of force on the part of the city, which early in June secured an injunction against the Indianapolis & Northwestern, alleging that it had no rights within the city except that of entering over the tracks of the Consolidated company. The Indianapolis & Northwestern replied by a cross-bill against the city and the Consolidated company, in which it was alleged that the latter was endeavoring to annul the contract between the city and the Indianapolis & Northwestern company.

The city endeavored to withdraw from the litigation by rescinding its action in requiring the Indianapolis & Northwestern to enter over the Consolidated tracks, and dismissing its bill of complaint against the former company which was followed by the Indianapolis & Northwestern dismissing its cross-complaint against the city. The same day, July 6th, that this was done the Consolidated Traction Co. filed a petition and bond for the removal of the cause to the federal court, which petition was granted.

Both companies are enjoined from track construction in Crawfordsville until a hearing is had before the United States Circuit Court at Indianapolis.

The Indianapolis & Northwestern Traction Co. is financed by Tucker & Anthony, of Boston, and the line is being built by Townsend, Reed & Co.

The Consolidated Traction Co. has its general offices at Indianapolis; the officers are: President, Edward Hawkins; vice-president, A. F. Ramsey; secretary, Guy E. Hawkins; treasurer, A. M. Glossbrenner.

THE RELATIVE ADVANTAGES OF OVERHEAD, DEEP-LEVEL AND SHALLOW SUBWAY LINES FOR THE ACCOMMODATION OF URBAN RAILWAY TRAFFIC.*

BY S. B. COTTRELL.

The question of rapid means of communication in large towns has been for a considerable period demanding very serious consideration, and the solution of the problem becomes daily more necessary. The congestion of traffic in the streets of many great towns has become such as to make rapid transit impossible, and it is necessary to relieve the streets of passenger traffic to make them available for the carting traffic. In numerous towns the congestion on the streets is so great that the passenger and light traffic so impedes the heavy cart traffic as to add considerably to the cost of conveying merchandise to the points where it is required; therefore, busy streets should, as far as possible, be relieved of passenger traffic requiring to travel any considerable distance. The means of doing this is either by overhead railways or by deep-level or shallow subways, all of which possess their particular advantages and disadvantages.

Overhead Railways.

The author has had many years' experience of working an overhead railway—viz, the Liverpool Overhead Railway, which is the only overhead railway in England, and was the first overhead railway in the world to be worked by electricity. Overhead railways possess among other advantages the feature that the passengers are always in the open, rendering traveling more pleasant. In Liverpool the overhead railway has solved the problem of urban communication along the line of docks. The disadvantages of overhead railways are that to be built economically they must necessarily be of a somewhat unsightly character, and in the author's opinion they would not be permitted in this country, as they are in New York, Boston, Chicago, etc., along important public streets. In fact, the compensation that would have to be paid for obstruction to light, etc., would render their cost prohibitive.

Deep-Level Railways.

Deep-level railways have the advantage that they can be constructed without interfering with the sewers, gas pipes, etc., with which all busy streets in important towns are necessarily so full, and there are many instances of such railways in London doing useful work, such as the Central London and the City and South London Railways, which, although the cost of construction was very high, are yet able to pay a dividend; but it must be remembered that at the present time neither of the railways referred to has efficient surface competition.

In the author's opinion, in the interests of the public the tubes for such lines should not be less than 13 ft. 6 in. in diameter.

The disadvantage of these deep-level railways is the time occupied in descending, by means of lifts, to the platform level. For short distances, if there be taken into account the time of descending in lifts, traversing a foot-subway, and waiting for a train, even if only one or two minutes—this operation being reversed at the point of arrival—the time so occupied does away with the advantages of the rapid transit between the points selected, and therefore any keen surface competition, such as by electric tramways, would seriously decrease the earning powers of these deep-level subways.

Another drawback of deep-level subways is due to the question of ventilation, which in existing tube railways leaves much to be desired.

Shallow Subways.

The special advantage of shallow railway subways is that passengers can reach the trains without the necessity for using lifts and foot-subways; therefore they enjoy the advantages of rapid transit from point to point without the waste of time required in descending to a deep level.

The author spent considerable time in making himself acquainted with the shallow subway at Budapest, and although this subway has surface competition, the fact that passengers can reach the trains

by descending a few steps only, and the advantages of rapid transit enable this electric railway to be a financial success.

The Paris Metropolitan Railway, which is also a shallow subway, has had the effect of relieving the streets of a large number of omnibuses, and has rendered them available for other purposes. This railway also is a commercial success.

In the author's opinion, the fact that the Metropolitan and Metropolitan District Railways are what may be almost described as shallow subways is one of their "assets;" and when these railways are electrified, they will enter upon a new era of prosperity in spite of other competition.

Another great advantage possessed by shallow subways is that the ventilation is very much easier than in deep-level subways. They may be described as self-ventilating.

The disadvantage of shallow subways is that in this country, below the surface of the streets (where shallow subways are required to relieve the congestion) there is encountered such a haphazard accumulation of sewers, gas and water pipes, telegraph and telephone mains and electric light cables, as to render the construction of shallow subways very expensive, owing to the necessity for diverting these obstructions. Yet if the local authorities, telephone companies, postoffice, etc., would meet the promoters of shallow subways, and make another subway to contain their sewers, pipes, wires, etc., the result would be to the advantage of all.

The author therefore advocates, for the accommodation of urban railway traffic:

1. Overhead railways, if they can be constructed to meet the requirements, in back streets, where compensation would be immaterial and their unsightly appearance would not be objectionable.
2. Shallow subways where they can be constructed and the cost is not prohibitive.
3. Deep-level railways.

The author has assumed in all these cases that the operation of the railways would be by electricity. Deep-level railways would be commercially impossible if worked by steam, and shallow subways so worked are undesirable. Overhead railways are, of the three systems dealt with, the only ones that could be commercially worked by steam, but for urban traffic steam is undesirable. Electric traction has the advantage not only of being more desirable, but also, for rapid and frequent transit (the solution of the problem of urban railway traffic), of being more economical.

PACIFIC ELECTRIC RAILWAY NOTES.

The Riverside & Arlington Ry., controlled by the Pacific Electric Co., of Los Angeles, has built an extension from its Main St. line in Riverside, Cal., through 7th St., to the Santa Fe depot and a 20-minute service has been established. Work was begun on this branch June 19th at Vine St., one block west of the depot, instead of at either terminus. This was because Salt Lake interests have a franchise for a steam road on Vine St., and the electric railway management deemed it advisable to be the first to have a track laid at that crossing point. In a short time electric cars will be run from Roubidoux Heights to Victoria Hill via 7th St. and the east side.

A deed has been recorded transferring to the Pacific Electric Railway Co. a wide strip of land through the large Botiller ranch near Rincon and a double-track electric line is soon to be built from Corona to Santa Ana to form a connecting link between the Riverside and Los Angeles lines.

On the short route to Pasadena two more tracks are to be laid, making four in all, between East Lake Park and Monrovia Junction. The object is to obtain greater speed by reserving two tracks for the Pasadena cars, using the other two for Monrovia and Alhambra traffic.

The Pacific Electric Railway Co. is making a good many changes in cars, remodelling the old and getting out designs for new ones. There is more work than can be taken care of at the company's shops, so the old shops of the Los Angeles Railway Co. were fitted up, affording facilities for handling 10 cars per month additional.

The electrical department recently fitted up a new shop in which switchboards, switches, insulator clamps, wire terminals, fuse blocks and many special devices for the new power house and sub-stations will be built.

The storage battery at Agricultural Park has been in operation some time and those at East Lake and West Lake Parks are practically completed.

*Read at the Engineering Conference of the Institution of Civil Engineers, England, Section 111, Machinery.

A RATIONAL TRAIN RESISTANCE FORMULA.

We find a single variable formula with first power factor gives too small results for high speeds if it is correct for low speeds. We find, also, that a single variable formula with a second power factor gives too high results at high speeds if it is correct at low speeds. This would seem reasonable, as it is apparent that there are at least three forms of friction—plain sliding friction, which is independent of the speed; rolling friction, which varies directly as the speed; and fluid friction, which, in case of air, would vary theoretically as the second power of the speed.

It seems, then, perfectly reasonable that a rational formula should have these three terms. Experience shows that while a formula having three terms of zero, first and second power variables, respectively, will give accurate results for a wider range than either of the single variable formulae, it in common with the second power single variable formula gives too large results at high speeds, if it is correct at the lower speeds.

There is a point in rational formulae which is very important; namely, that the terms for head and stern resistance have in the denominator a factor proportional to the length or weight of the train. This appears in many formulae, and is reasonable when it is considered that the head and stern resistance would be independent of the length of the train, and therefore, when expressed in pounds per ton, would be inversely proportional to the weight or length. In most formulae the weight is used rather than the length.

This would give as a principle that the head and stern resistance, which varies as a power of the speed between one and two, should have a weight factor in the denominator.

It has been found by experiment that the air resistance on the sides of the cars varies as power of the speed higher than the first. It is evident that this factor of total resistance should be proportional to the length or weight of the train, and therefore in our form of formula would have no weight factor in the denominator.

The head and stern resistance can be divided if it is desired. It is found in actual practice that the head resistance is much larger than the stern resistance. Professor Goss' experiments on models show that this head resistance is 6.5 times the stern resistance, and that the head and stern resistance together are about 6.2 times the side resistance of one car.

From collateral evidence it would seem that the coefficient of the variable in the side resistance term should be considerably lower than that of the head resistance term. The air, in case of the side resistance, is not compressed, but is sheared off, and the fluid particles are dragged aside rather than piled up on each other.

On the basis of the above, the rational formula would be:

$$R = A + BM + CM^n + DM^p \div T + EM^q \div T.$$

Where R = resistance in lb. per ton,

M = speed in miles per hour,

T = weight of train in tons,

n = exponent of side friction term,

p = exponent of head and stern friction terms,

A = coefficient for sliding friction,

B = coefficient for rolling friction,

C = coefficient for side air resistance,

D = coefficient for head resistance,

E = coefficient for stern air resistance.

Now, we have not yet enough data for determining the proper exponents, nor to separate the exponents into the two forms. Again, as there are always two ends to a string, the head and stern resistance will always come together.

Until we find sufficient evidence to give us the two exponential factors, we will be better served to combine all three exponential factors into one. Again, for general work this would be simpler and sufficiently accurate. We would then have:

$$R = A + BM + (C + D + E) M^n \div T$$

This is essentially the formula given by me in 1899, the only difference being in the coefficient of the exponential term separating out a factor representing the side resistance which is proportional to the train weight.

Where R = resistance in lb. per ton,

M = speed in miles per hour,

T = weight of train in tons,

Abstract of a paper read before the American Society of Mechanical Engineers by John Batch Blood.

n = exponent 1.8,

A = coefficient of sliding friction,

B = coefficient of rolling friction,

C = coefficient of side resistance,

D = coefficient of head and stern resistances.

The values of these various coefficients are as follows:

$A = 3$ for heavy freight trains.

$A = 4$ average passenger trains.

$A = 5$ heavy large electric cars.

$A = 6$ medium electric cars.

$A = 7$ light electric cars.

$B = .15$ for light track construction.

$B = .12$ for heavy track construction.

$C = .0016$ for ordinarily constructed cars.

$C = .0014$ for cars with vestibules.

$D = .25$ for small cross section cars.

$D = .30$ for medium section electric cars.

$D = .35$ for large electric or suburban trains.

$D = .40$ for largest express trains.

As our experimental data is increased, it will be possible to correlate these coefficients more intimately with the elements of friction they represent.

The foregoing has shown the gradual development of the train resistance formula from a rational standpoint. It, however, has been viewed all along from the start from an empirical standpoint.

Let us consider the uses of a train resistance formula. Originally, it served more as a guide than an engineering hypothesis. As skill in design and application increased, more and more attention was paid to the fitting of machines to the work they had to do. Moreover, with steam railroads and long trains, extreme accuracy was not essential, as one or more cars could be added or taken off as conditions required.

With the advent of short suburban trains with three to five cars, short distances between stations and a demand for increased schedule speed, it became very necessary to fit the motive power with a nicety to its work. In case of a three-car train, if the locomotive was too small, the taking off of a single car would reduce the train weight 33 per cent, and then the locomotive would be too large, besides necessitating a change in the time tables.

This need was still further emphasized by the high speeds of such trains as the Empire State Express of the New York Central & Hudson River Railroad, and also by the high speed interurban electric cars. In case of these electric cars, the motive power of each car being on its own axles, there is no possibility of adjustment if it is not suited to its work.

It will be seen, then, that the use of train resistance formulae has changed from that of a general guide to that of a fundamental engineering criterion. Extreme accuracy is now a desideratum, functional as well as absolute.

Again, the complication of the number of terms and the fractional exponent is not the drawback that it would appear, as the use of such formulae now takes the intermediary of charts or curves, eliminating all complication of calculation. Moreover, the general use of the slide-rule makes a fractional power practically as easy of calculation as the integral factor.

Mr. C. O. Mailloux recommends an empirical formula, and one of the form

$$R = A + BM^n.$$

Now, mathematically, this equation can be made to very closely represent any curve with a constantly increasing function, and therefore, can be made to represent any given test curve, probably, within the limits of accuracy. If a curve be plotted representing a given set of readings, and a curve of form of this equation be plotted to represent such curve, if the highest points of the two curves coincide, it will be found that the empirical curve cuts the real curve at two points, and that the values of the resistance as calculated from the empirical curve beyond the upper limit are higher than the true values. It is very important in extending curves to have all points determined as accurately as possible, for a slight variation in direction is magnified by the amount of extension. That this empirical curve would give high results on the extension is obvious when it is considered that a factor varying as the first power of the velocity is eliminated, and its place taken by an augmented

coefficient of the higher power factor. At low values of the speed, the difference between the true value of the first power variable and its substituted higher power factor would probably be within the limit of accuracy of observation, but this is not so at high values and would always lead to high results. This empirical train resistance formula is good to represent a given series of results for mathematical or functional comparison. It, however, is of little, or perhaps better stated, inferior value for predicted results of extension beyond the highest value of observation. It is very important for extending the curve that the first power factor be present and accurately determined as to its coefficient.

Another important point which the empirical formulae entirely leave out is the relative value of the different portions of the resistance. In a rational formula it will be seen that the side air resistance comes within the limits of accuracy at about 30 miles per hour, and the head and stern resistances become negligible for a six-car train at about the same speed; but for a single-car train, they do not become negligible till you get down towards 20 miles per hour. It would seem this is a very important function of a train resistance formula. It would seem, in conclusion, that all arguments favor the rational form rather than the empirical form, and that the highest exponential variable should have a fractional exponent between one and two.

SPECIAL WORK OF THE INDIANAPOLIS SWITCH & FROG CO.

The accompanying illustration is from a photograph of special work built by the Indianapolis Switch & Frog Co., of Springfield, O., for the Springfield & Xenia Traction Co. This piece of track is located in Springfield, O., and it will be noted that the crossing is



SPECIAL WORK FOR SPRINGFIELD & XENIA TRACTION CO.

on a sharp curve. Both the tracks are provided with easier rails, which, together with the main rails, give sufficient width to carry the wheel tires and prevents their striking the ends of the abutting rails at intersections. This preserves the alignment and materially lengthens the life of the crossing. This style of construction is the standard style furnished by this company for steam and interurban lines with heavy traffic. The company manufactures T-rail special work of all descriptions for steam and electric railways such as frogs, switches, crossings, curves and car barn layouts and also switch stands. It has just completed a large addition to its works which now comprise over two acres of floor space under one roof, and it has added the most improved equipment to facilitate the handling of its large business. In addition to having equipped numerous interurban lines throughout the east and central western states with all of their special work the company has recently made large consignments to the Pacific coast and to Mexico. The company's plant is located adjacent to four main lines of railway which give ample shipping facilities.

CHRISTENSEN AIR BRAKE AGENCIES.

On account of the resignation of Mr. J. F. Eldred, who has been in charge of the Chicago sales office of the air brake department of the National Electric Co., Mr. F. C. Randall, the general manager of air brake sales department of this company, has made a redistribution of the territory to be covered by the various sales agents of the National Electric Co., and orders for Christensen air brakes will be handled by the following corps of sales agents. The territory heretofore covered by Mr. Eldred has been subdivided into three parts to be handled by Messrs. J. S. Hamlin, J. J. Nef and S. I. Wailes, respectively.

Mr. Hamlin will make his headquarters at the Chicago office, No. 1020 Old Colony Bldg. Mr. Hamlin was formerly general sales agent of the Neal duplex brake. Mr. Nef will also make his headquarters in the Chicago office. Mr. Nef was formerly connected with the Standard Air Brake Co.

Mr. S. I. Wailes will make his headquarters at Cincinnati office. Mr. Wailes was formerly connected with the engineering department of the Brooklyn Rapid Transit Co.

Mr. W. A. Grauten will make his headquarters at the Brown Palace Hotel, Denver, Col., and remains in charge of the Pacific Coast territory.

Mr. H. N. Ransom remains in charge of the Cleveland office of the company at No. 812 Prospect St.

Mr. J. T. Cunningham, who has charge of the New England territory and New York City, will make his headquarters at the general sales office, No. 135 Broadway, New York City.

Mr. W. W. Power, who has charge of the company's interests in Pennsylvania and in the southeastern states, will make his headquarters at the Philadelphia office, No. 1402 Erie Ave.

Mr. J. D. Maguire will be connected with the general sales office

as special representative of the air brake department, and in charge of sales of electrical machinery for the eastern district. Mr. Maguire was formerly president of the Magnet Wire Co., of New York City.

The first through traction car from Lima, O., to Cincinnati made the trip June 30th in 8 hours and 20 minutes over the Western Ohio Railway Co., the Dayton & Troy Electric Railway Co., and the Cincinnati, Dayton & Toledo Traction Co. systems. It was a special car. The return trip was made in 7 hours, 15 minutes. Officials of the three companies and interested capitalists made up the party.

The South Side Elevated Railroad Co., of Chicago, recently purchased a Westinghouse 1,500-kw. generator of 600 volts, and running at 75 revolutions per minute, to be installed in the power house corner of 40th and State Sts., where two Westinghouse generators of the same type and size have been in successful operation for some time.

REPORT OF MASSACHUSETTS STREET RAILWAYS.

The Massachusetts Railroad Commissioners' report for the year ending Sept. 30, 1902, has just been issued and contains the returns from 105 street railway companies, together with returns of two companies leased by a New Hampshire corporation. One company failed to make a report. Six new companies were regularly organized during the year and three others were organized under special acts, while 21 companies were dropped from the list, 20 having been consolidated during the previous year and 1 having abandoned construction. Three of the 105 companies reporting having been consolidated with other companies at the end of the year, there were really 102 existing companies. Of these 78 were operating their own railways; the railways of 17 were operated by other companies under lease or contract; 3 had organized and were constructing their railways, and 3 had organized and paid in a portion of

Street Railway Mileage Owned, 1901 and 1902.

| MILEAGE OWNED | 1901. | 1902. | Increase. |
|----------------------------------|-----------|-----------|-----------|
| | Miles. | Miles. | Miles. |
| Length of railway line, | 1,904.744 | 2,111.293 | 206.549 |
| Length of second track, | 272.232 | 332.895 | 60.663 |
| Total length of main track, . . | 2,176.976 | 2,444.188 | 267.212 |
| Length of side track, | 132.090 | 147.267 | 15.177 |
| Total, reckoned as single track† | 2,309.066 | 2,591.455 | 282.389 |

their capital stock, but had not commenced the construction of their railways. One railway was not in operation during the year.

During the year the additions to the street railways aggregated 282,389 miles measured as single track; 206,549 miles of main line; 60,663 miles of second main track, and 15,177 miles of side track. The total owned by Massachusetts is 2,591.455 miles; 2,111.293 miles of main line; 332.895 miles of second main track, and 147.267 miles of side track. This statement excludes the track in the subway in Boston. All of the street railway mileage owned, except 19,128 miles (in Rhode Island), is in the state. The total miles of main

Capital Stock, Net Income and Dividends, 1893-1902.

| YEARS. | Capital Stock. | Net Divisible Income. | Dividends Declared. | Percentage on Total Capital Stock. |
|-----------------|----------------|-----------------------|---------------------|------------------------------------|
| 1893, | \$25,888,575 | \$1,993,399 | \$1,716,637 | 6.63 |
| 1894, | 26,971,275 | 1,812,668 | 1,610,886 | 5.97 |
| 1895, | 27,906,685 | 2,257,355 | 1,606,196 | 5.76 |
| 1896, | 30,727,818 | 2,280,776 | 1,802,847 | 5.87 |
| 1897, | 32,670,273 | 2,593,147 | 1,965,243 | 6.02 |
| 1898, | 38,938,917 | 2,534,002 | 2,076,233 | 5.33 |
| 1899, | 41,380,143 | 2,502,942 | 2,318,398 | 5.60 |
| 1900, | 48,971,168 | 3,037,502 | 2,409,874 | 4.92 |
| 1901, | 54,069,933 | 3,398,183 | 3,417,117 | 6.32 |
| 1902, | 60,036,328 | 3,388,851 | 3,138,711 | 5.23 |

track operated is 2,465,608, an increase of 250,149 miles over the previous year. This includes 16,015 miles of elevated track in Boston and 51,095 miles of track operated outside of the state.

The average cost of the street railways of the state per mile (including the cost but not the length of side track) was \$24,491.86 for construction; \$9,023.02 for equipment; \$11,898.68 for lands and buildings; total, \$45,499.52. The average capital investment per mile was \$46,261.

The gross assets were \$123,200,552, an increase of \$15,049,902; the gross liabilities were \$119,441,792, an increase of \$15,843,750; the net

plus was \$3,758,760, an increase of \$100,152; the sinking and other special funds were \$1,611,272, an increase of \$213,764. The surplus is 6.26 per cent of the capital, as against 6.75 for 1901, 7.43 for 1900 and an average of 4.49 for the past ten years.

Cost and Capital Investment per Mile of Main Track, 1893-1902.

| YEARS. | Construction. | Equipment. | Other Permanent Property.* | Total Cost per Mile. | Capital Investment per Mile.† |
|-----------------|---------------|------------|----------------------------|----------------------|-------------------------------|
| 1893, | \$26,792 | \$11,739 | \$15,455 | \$53,986 | \$53,367 |
| 1894, | 26,748 | 11,528 | 15,356 | 53,632 | 52,963 |
| 1895, | 23,984 | 10,479 | 14,266 | 48,729 | 49,120 |
| 1896, | 23,396 | 9,805 | 12,840 | 46,041 | 46,373 |
| 1897, | 22,755 | 9,374 | 12,329 | 44,458 | 44,683 |
| 1898, | 22,537 | 8,957 | 11,735 | 43,229 | 44,958 |
| 1899, | 22,863 | 8,518 | 11,598 | 42,979 | 45,040 |
| 1900, | 23,443 | 8,510 | 11,684 | 43,637 | 44,273 |
| 1901, | 23,953 | 8,678 | 11,666 | 44,297 | 45,757 |
| 1902, | 24,495 | 9,026 | 11,889 | 45,410 | 46,261 |

* Chiefly lands and buildings.

† Outstanding capital stock and net debt.

The gross earnings from operation were \$23,486,474, an increase of \$1,720,134; income from other sources brought the total income up to \$24,918,161, an increase of \$1,738,857. Operating expenses were \$15,912,852, an increase of \$1,347,711; interest, \$2,161,160; taxes, \$1,611,851; rentals of leased lines and other charges on incomes, \$1,843,447; dividends, \$3,138,711; surplus for the year, \$250,140.

Volume of Traffic for Ten Years, 1893-1902.

| YEARS. | Total Passengers Carried. | Average Number per Mile of Main Track Operated. | Total Car Miles Run. |
|-----------------|---------------------------|---|----------------------|
| 1893, | 213,552,009 | — | 34,507,282 |
| 1894, | 220,464,099 | — | 36,722,978 |
| 1895, | 259,794,308 | 238,963 | 43,655,560 |
| 1896, | 292,358,943 | 226,452 | 53,613,685 |
| 1897, | 308,684,224 | 212,403 | 61,577,917 |
| 1898, | 330,889,629 | 207,982 | 68,206,418 |
| 1899, | 356,724,213 | 205,098 | 73,367,235 |
| 1900, | 395,027,198 | 200,262 | 81,750,768 |
| 1901, | 433,526,935 | 195,683 | 93,005,225 |
| 1902, | 465,474,382 | 188,787 | 100,280,687 |

The total of cash dividends was \$278,400 less than in the preceding year, and the surplus for the year showed an increase of \$200,074, there having been a deficit of \$18,934 in 1901. Out of the 105 companies 40 paid dividends ranging from 2 to 10 per cent and 65 companies, new and old, declared and paid no dividends; 1 paid

Percentage of Operating Expenses to Gross Earnings, 1893-1902.

| YEARS. | Gross Earnings from Operation. | Operating Expenses. | Percentage of Expenses to Earnings. | Net Earnings. |
|-----------------|--------------------------------|---------------------|-------------------------------------|---------------|
| 1893, | \$10,832,174 | \$7,501,845 | 69.26 | \$3,330,329 |
| 1894, | 11,119,846 | 7,729,059 | 69.51 | 3,390,787 |
| 1895, | 13,184,342 | 9,088,086 | 68.93 | 4,096,256 |
| 1896, | 14,844,262 | 10,563,371 | 71.16 | 4,280,891 |
| 1897, | 15,815,267 | 10,904,040 | 68.95 | 4,911,227 |
| 1898, | 16,915,405 | 11,672,731 | 69.01 | 5,242,674 |
| 1899, | 18,151,550 | 12,378,488 | 68.20 | 5,773,062 |
| 1900, | 19,999,640 | 13,159,947 | 65.80 | 6,839,693 |
| 1901, | 21,766,340 | 14,565,111 | 66.92 | 7,201,199 |
| 1902, | 23,486,474 | 15,912,852 | 67.75 | 7,573,622 |

2 1/4 per cent from previous surplus, and 72 per cent from the past year; 1 paid 10 per cent; 8 paid 8 per cent; 1 paid 8 per cent on preferred and 7 per cent on common; 1 paid 7 1/2 per cent; 13 paid 6 per cent; 1 paid 5 1/2 per cent; 5 paid 5 per cent; 1 paid 4 1/2 per

cent. 4 paid 4 per cent, 1 paid 3 1/2 per cent, 1 paid 3 1/4 per cent, and 1 paid 2 per cent.

The total number of passengers carried was 495,174,882, an increase of 31,947,447 over the previous year; the car-miles run were

Gross and Net Earnings from Operation per Car Mile Run and per Passenger Carried, 1893-1902.

| YEARS | AVERAGE PER CAR MILE | | | AVERAGE PER PASSENGER | | |
|-----------------|----------------------|-----------------------|--------------|-----------------------|-----------------------|--------------|
| | Gross Earnings | Expenses in Operation | Net Earnings | Gross Earnings | Expenses of operation | Net Earnings |
| 1893, | 31.39 | 21.74 | 9.65 | 5.07 | 3.51 | 1.56 |
| 1894, | 30.28 | 21.05 | 9.23 | 5.04 | 3.50 | 1.54 |
| 1895, | 30.20 | 20.82 | 9.38 | 5.07 | 3.50 | 1.57 |
| 1896, | 27.69 | 19.70 | 7.99 | 5.08 | 3.61 | 1.47 |
| 1897, | 25.68 | 17.71 | 7.97 | 5.12 | 3.63 | 1.59 |
| 1898, | 24.80 | 17.11 | 7.69 | 5.11 | 3.52 | 1.59 |
| 1899, | 24.74 | 16.87 | 7.87 | 5.09 | 3.47 | 1.62 |
| 1900, | 24.46 | 16.10 | 8.36 | 5.06 | 3.33 | 1.73 |
| 1901, | 23.40 | 15.66 | 7.74 | 5.02 | 3.36 | 1.66 |
| 1902, | 23.42 | 15.87 | 7.55 | 5.05 | 3.42 | 1.63 |

100,280,687, an increase of 7,275,462. The number of persons employed by the street railway companies was 15,202; number of cars, 7,144; number of electric motors, 12,504.

The whole number of persons injured by street railway operation was 4,253, of whom 85 received fatal injuries; number of passen-

Employees and Equipment, 1893-1902.

| YEARS | Employees. | Cars | Other Vehicles. | Electric Motors. |
|-----------------|------------|-------|-----------------|------------------|
| 1893, | 8,070 | 4,040 | 681 | 3,013 |
| 1894, | 7,451 | 4,058 | 1,790 | 3,906 |
| 1895, | 8,048 | 4,426 | 1,755 | 4,704 |
| 1896, | 9,130 | 4,913 | 1,876 | 5,958 |
| 1897, | 9,716 | 5,344 | 1,953 | 6,908 |
| 1898, | 10,416 | 5,734 | 1,997 | 7,643 |
| 1899, | 11,944 | 6,042 | 2,076 | 8,530 |
| 1900, | 12,766 | 6,531 | 2,371 | 9,545 |
| 1901, | 14,749 | 6,997 | 2,488 | 11,284 |
| 1902, | 15,292 | 7,144 | 2,577 | 12,504 |

gers injured, 2,870, of whom 18 were injured fatally; injuries to employees, 247, of which 10 were fatal. Altogether 1,720 more persons were injured than in the preceding year.

Data as to capital, dividends, earnings, expenses, employees, mile-

Summary of Accidents Reported in 1901 and 1902.

| KILLED AND INJURED | KILLED | | INJURED. | | TOTALS | |
|--------------------------|--------|-------|----------|-------|--------|-------|
| | 1901. | 1902. | 1901. | 1902. | 1901. | 1902. |
| Passengers, | 20 | 18 | 1,600 | 2,861 | 1,620 | 2,879 |
| Employees, | 17 | 10 | 60 | 237 | 77 | 247 |
| Other persons, | 39 | 57 | 797 | 1,070 | 836 | 1,127 |
| Totals, | 76 | 85 | 2,457 | 4,168 | 2,533 | 4,253 |

age, traffic and accidents are given in the accompanying tables.

Accompanying the report of the railroad commissioners is a large map of the electric railways of Massachusetts, corrected to Jan. 1, 1903.

ACCIDENTS.

An eastbound passenger train collided with a milk car on the Grand Rapids, Holland & Lake Michigan Railway Co.'s line at Limestone, Mich., June 21st. Five persons were injured and both cars badly damaged.

June 23d a West Walnut St. car of the Louisville Railway Co. was struck by a locomotive and six persons were injured.

A Chesapeake & Ohio freight train and a Camden Interstate Railway Co. car were in collision at Huntington, W. Va., June 25th and 15 persons were injured, one fatally.

On Wilson Ave., Cleveland, O., June 29th, a heavily-freighted electric car collided with another at the foot of the hill, resulting in the serious injury of two men, while several others were hurt.

A five-car third-rail train collided with a trolley car on a trestle over Coney Island Creek, near Brooklyn, N. Y., June 28th. Several passengers were thrown into the creek and the trolley car was demolished. A score were injured, but only one seriously.

An Archer Ave. trolley car in Chicago ran into a belt line freight train at Archer Ave. and 47th St. June 29th. Two passengers were killed and 10 others injured. The motorman was badly hurt, also. It occurred at 1 a. m., and the passengers were nearly all returning from Sunday outings. The car was wrecked.

A car on the Center and Larimer line of the Pittsburg Railways Co. jumped the track on the Lincoln Ave. bridge, Pittsburg, Pa., on the morning of July 4th and went over the bridge, falling to Beechwood Boulevard 80 ft. below. Three persons were killed outright, one of them being a motorman, and three others were thought to be fatally hurt. Besides the motorman and conductor there were four passengers on the car, which was demolished.

A car on the Wenona Beach line of the Bay Cities Consolidated Railway Co., with 52 passengers on board, jumped the track at a switch June 30th and fell on its side into a ditch. Nine persons were injured, but none seriously.

Fifteen persons were injured July 3d in a collision between two cars at the intersection of Olive St. and Jefferson Ave., St. Louis. One car was overturned by the impact.

Two cars on the Grand Rapids, Grand Haven & Muskegon Railway Co.'s line collided July 4th just east of Berlin, 10 miles from Grand Rapids. One man was killed. An employe not in uniform had been sent to stop one of the cars, it was stated, but the motorman did not know him and ignored the signal.

Two cars were in collision on the steep hill near the entrance of Chestnut Hill Park, Philadelphia, July 5th and 25 passengers were hurt, 4 seriously. Both cars were wrecked. The motorman of the rear car lost control of it, it was stated.

Two Elston Ave. electric cars collided in Chicago July 5th and five persons were injured. A coupling broke and the trailer car which it controlled jumped the track in front of a car bound in the opposite direction.

A rear-end collision occurred on the Rapid Railway System three miles from Marine City, Mich., July 5th and one man was injured so that he died shortly afterward. Brakes failed to work, it was stated.

In a head-on collision of two trolley cars on the Buffalo (N. Y.), Lockport & Olcott line of the International Traction Co. between 60 and 70 persons were injured July 4th at 5:20 p. m. One of the injured died shortly afterward. The cars collided at a curve near Burt, N. Y., while running at high speed. There was a misunderstanding between the motormen as to where the cars were to pass each other, it was stated.

A car of the Northern Ohio Traction & Light Co. ran down hill into a "loop" car in Akron, O., July 2d. Three passengers were injured; both cars were wrecked.

There was a head-end collision on the Bessemer line of the Birmingham Railway, Light & Power Co.'s tracks at Ware's Station July 4th. Nine persons were injured, but none fatally. The cars met on a curve in a cut.

Two persons died as a result of a collision on the Warren (Pa.) Electric Traction Co.'s road at Irvindale Park, three miles from the city, July 6th.

With a view of standardizing its equipment and getting rid of the older types the United Railroads of San Francisco has ordered fifty 2-motor G. E. 1000 equipments to replace W. P. 50 and miscellaneous motors now in the service.

HIGH SPEED ELECTRIC RAILWAY PROBLEMS.*

BY A. H. ARMSTRONG

A question of importance to be considered in a new railway project is the proper speed at which to run the road, as depending upon this factor is not only the first cost of the road but its cost of operation and probable receipts. Owing to the wide field covered by the electric railway motor it is not possible to consider all classes of railways and therefore this discussion is limited to the relatively high speed roads. Although the so-called high speed roads stop at comparatively infrequent intervals the relation existing between stops and scheduled speeds often calls for the most serious consideration of fractional speed running of the motors. Such roads really act as tributaries to large city street railway systems and must be able to operate over several miles of city track at slow schedule and with frequent stops and also be adapted for operation at 40 or 50 miles per hour with infrequent stops. Roads can generally be divided into two classes, those having frequent stops and those having few stops. Both classes will probably parallel steam lines and must make a speed that will compare favorably with that on the competing steam road. This high schedule speed must also be made with more frequent stops than given by the steam service and in nearly all cases over track with many sharp curves which still further increases the number of stops. Interurban roads having very infrequent stops, private right of way and an alignment free from curves of less than 3° can give a service equal or superior to any competing steam line, and can provide the frequent service which is one of the valuable assets of electric roads. Moreover the gen-

stops are less frequent. Owing to the considerable city running at slow speeds the suburban roads must make as good time as possible on the suburban route in order to bring passengers from the more distant points within a reasonable time including city running. Such roads when paralleling steam lines operating on private right of way and giving excellent service are compelled to face serious problems due to the tremendous amount of generating apparatus, line copper and motive power required for equally good service.

A suburban road will develop a considerable amount of traffic due to its frequent service, but there comes a time when such roads will

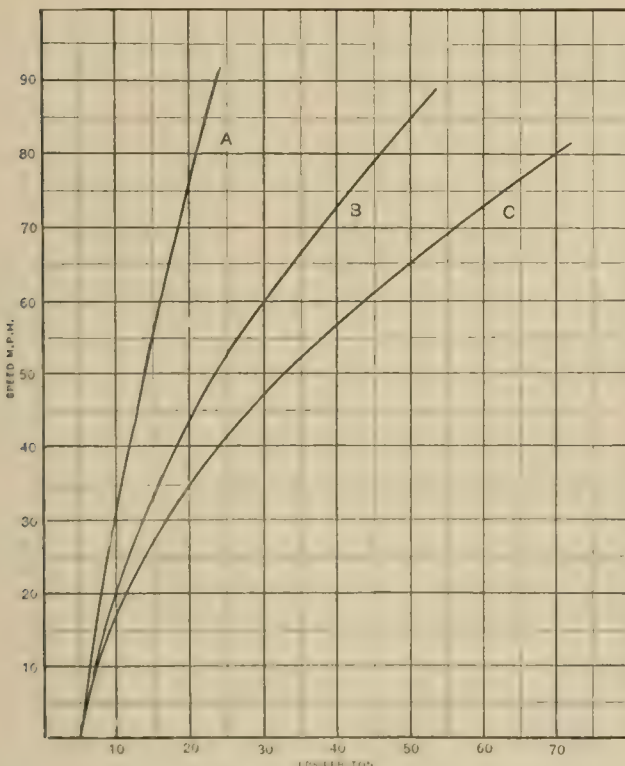


FIG. 1-FRICTION CURVES.

erating station and feeder system are low in first cost and the motor capacity and power consumption are moderate. The problem of high speed electric service under these conditions is a simple one.

Suburban roads that pick up their loads at frequent intervals and still have to compete with steam lines present much more difficult problems from an economic standpoint. It is the custom of such roads to establish stopping points and stop at these points only on signal. During certain portions of the day, however, cars will be obliged to stop at nearly all of these stations and will either fall behind their schedule at such times or will have too much leeway when

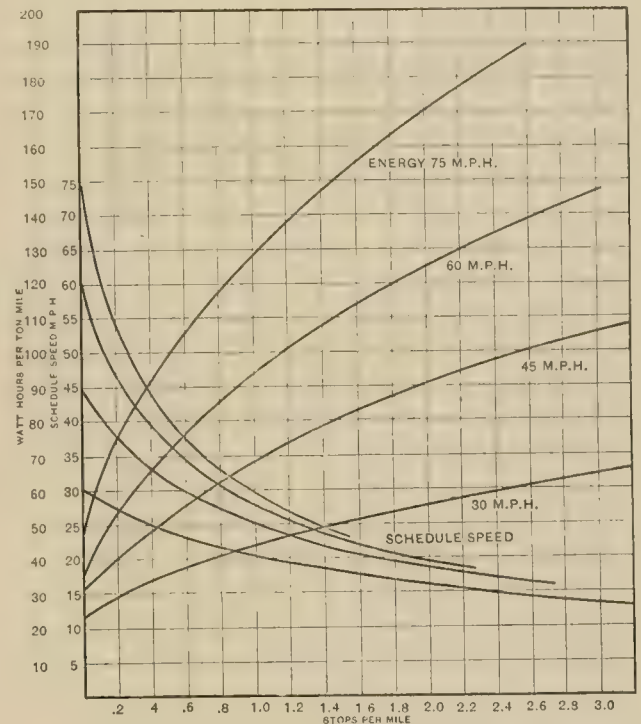


FIG. 2-SPEED AND ENERGY CURVES. A. FRICTION CURVE.

extend to outlying districts hitherto belonging exclusively to the steam roads. The frequent service will always be a valuable asset, but if it takes considerably longer to reach the city by the electric line than by the steam road the former will fail in its purpose due to the frequent stops to which its previous popularity was due.

In considering the possible speeds of a car or train of cars it is necessary to obtain some accurate idea on the question of car and train friction. The only attempt known to the writer to obtain friction values with different numbers of cars was made by Mr. W. J. Davis, jr., through the courtesy of the International Railway Co. on its Buffalo and Lockport line, in March, 1900. Using these tests as a basis the writer has drawn up three friction curves, Fig. 1, designating them A, B and C. The C curve is for single car operation where the car weighs about 40 tons. The B curve applies to the operation of two such cars in a train and the A curve to eight or more such cars in a train. The friction curves have been extended to maximum speeds approaching 90 miles per hour in order that questions of motor capacity, train energy, possible schedule speeds, etc., can be followed up to the speeds in vogue on steam roads.

With the friction curves in Fig. 1 as a basis, the curves in Figs. 2, 3 and 4 have been calculated showing the possible schedule speeds and energy consumption required for these speeds up to 75 miles per hour maximum. The rate of acceleration and of braking does not have a marked effect on the energy consumption of high speed roads. The controlling factor in all of these curves is the friction curve which includes track, rolling, journal and wind friction. The constants used in calculating these curves are those pertaining to average high speed work, as follows:

Gross accelerating rate 120 lb. per ton
Braking effort (average) 120 lb. per ton
Duration of stops 15 seconds each
Track assumed to be perfectly straight and level.

In these curves due consideration is given to all the losses occur-

*Abstract of a paper presented at the annual convention of the American Institute of Electrical Engineers, June 20, 1903.

ing during acceleration with the standard series parallel controller and direct current motors. The inertia of the rotating parts is taken at 5 per cent and the speed curve of a standard 125 h. p. motor is used throughout. The energy curves given are somewhat affected by the amount of coasting done, although this is not so determining a factor in high speed work as in slow speed rapid transit accelerating problems. The energy curves are plotted with only 10 seconds of coasting permitted. Therefore, the scheduled speeds given are nearly the maximum possible. The energy curves are also the maximum possible with the maximum speeds assumed.

An inspection of these three sets of curves shows the very great effect of wind friction on trains of one or two cars at very high speed; in fact, at 75 miles per hour the operation of a single car train becomes impracticable with light, 40-ton cars of standard construction, and even at 60 miles per hour is questionable. From the curves it will be seen that it requires an energy consumption of 47 watt-hours per ton-mile for a train of several cars, as against 137 watt-hours per ton-mile for a single car operating at 75 miles per hour without stops. Single car operation would require 3.7 times the energy per ton that would be required for the operation of a train of many similar cars. Even a two-car train will require but 92 watt-hours per ton-mile or only 67 per cent of the energy required per ton for single car operation.

Another interesting feature not perhaps fully appreciated is brought out by the curves of schedule speeds possible for different maximum speeds. The fallacy of using high speed equipments for frequent stops is forcibly brought out by referring to the energy curves in Figs. 2, 3 and 4. With one stop per mile it requires 200 watt-hours per ton-mile with 75-mile maximum speed equipment, and the 30-mile maximum speed equipment can obtain 76 per cent of the same schedule with an expenditure of only 28.5 per cent of the energy. These values, though taken for extreme maximum speed, show the tremendous price paid for high schedule speeds at frequent stops.

Before considering the application of the previous curves to a

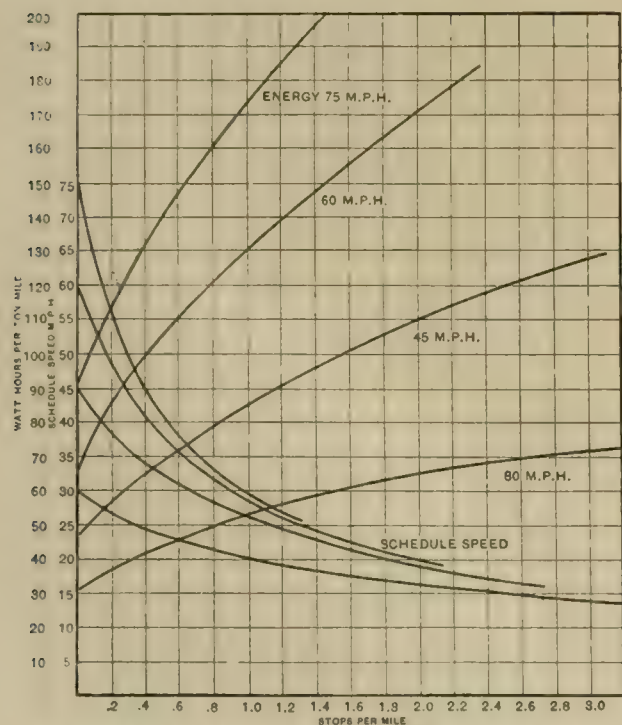


FIG. 3 SPEED AND ENERGY CURVES. B. FRICTION CURVE.

concrete case it is necessary to include the effect of the different friction curves at high speeds upon the capacity of the motor equipment. A sample motor capacity curve of 125 h. p. equipment operating at a maximum speed of 45 miles per hour is shown in Fig. 5. An inspection of the curve given in Fig. 5 discloses the fact that for a given temperature rise the capacity in tons per motor is practically a fixed amount. For example, a temperature rise of 60° C. will be obtained with approximately 16.2 tons per motor over a range extending from one stop in four miles to five stops per mile.

It is thus sufficient to associate a given motor and gear ratio with a definite car weight which it can operate with a given temperature rise, and with any scheduled speed which the number of stops per mile will permit. This affords a means of comparing motors of different capacity by means of the "tons per motor" which is permitted for, say 60° rise and a given maximum speed equipment.

Fig. 6 embodies the results of a large number of experiments and calculations on motors of similar design giving the relations between the commercial one hour rating of the motor and the num-

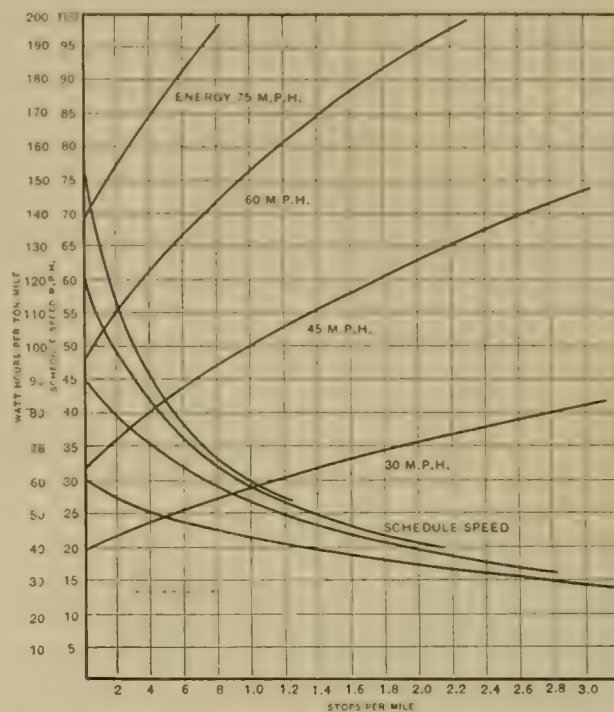


FIG. 4 SPEED AND ENERGY CURVE. C. FRICTION CURVE.

ber of tons which that motor will carry at maximum speeds of 30, 45, 60 and 75 miles per hour. The curves of 30 and 45 miles per hour are probably accurate, those at 60 miles per hour may be perhaps conservative, and at 75 miles per hour, with the superior ventilation afforded by the schedule speed the motor capacity curves perhaps indicate too low a ton weight for 60° rise. The degree of error, however, should not exceed more than 15 per cent. Figs. 7 and 8 are plotted for 60° also, but using friction curves B and C, so that by means of Figs. 6, 7 and 8 it is possible to determine the capacity of motor required for any maximum speed and any weight of train. From Figs. 2, 3 and the possible schedule speed and energy consumption can be obtained for any maximum speed and frequency of stop. These curves are all plotted with motors of the first type. Where motors can be operated partially or fully open the capacity, especially at high speeds, will be considerably increased.

The results brought out by curves 6, 7 and 8 are very instructive as determining the probable trend of very high speed electric railroading where trains of one or more cars are used. For example, a 40-ton car equipped with four motors, thus giving 10 tons per motor, will require a 133 h. p. motor for a 60° rise when operating a train of several cars at 75 miles per hour maximum speed, while the same weight of car would require a motor of at least 230 h. p. if operated as a single car with the same temperature rise and similar design of motor. That is, the motive power is doubled in going from train to single car service. Thus not only is train friction the determining feature of energy values, but it is the controlling feature as well of the motor capacity required to perform a given high speed service.

Having obtained the data on which to base calculations for the proposed electric road, the best method of showing its application would be to take a concrete case. Let the distance from A to B be 100 miles, or great enough to get over the consideration of location of substations in relation to the length of time. Assume also that the proposed road will parallel a steam line and that stops will occur every four miles and will be of 15 seconds duration, and that

the motors will be direct current, supplied from sub-stations fed from a single generating station. It is desired to know the effect that a single car or train operation will have upon first cost and cost of operation.

It is assumed that the competing steam road will have a schedule speed in the vicinity of 40 miles per hour. By referring to Fig. 4 we find that a schedule speed of 40 miles per hour can be obtained with a maximum speed of approximately 48 miles per hour with one

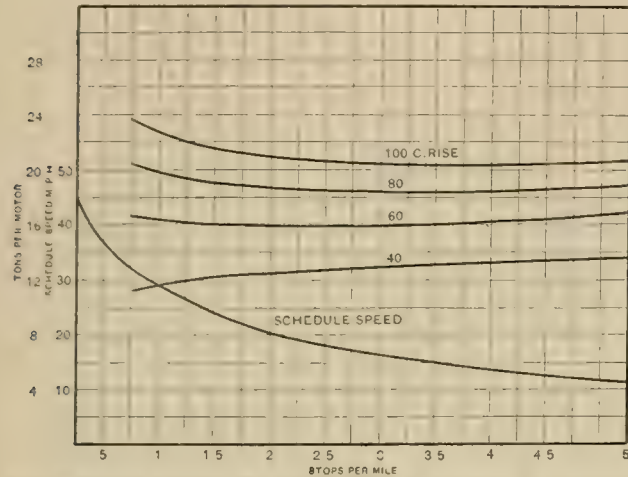


FIG. 5. MOTOR CAPACITY CURVES 125 H. P. MOTOR. B. FRICTION CURVE.

stop in four miles. The energy consumption will be 82 watt-hours per ton mile, and the motor capacity will consist of four 110-h. p. motors operating a single 40-ton car with a temperature rise of 60° (Fig. 8). The energy consumed at the car will therefore be 131 kw. or 144 kw. at the sub-station bus-bar, allowing an average drop of 10 per cent in the third rail. With a sub-station bus-bar potential of 600 volts each car will average 240 amperes.

Assuming that the road would be double track, with 80-lb. track rails and a 100-lb. third rail, the distance apart of the sub-stations will be approximately 13 miles with a maximum drop of 170 volts

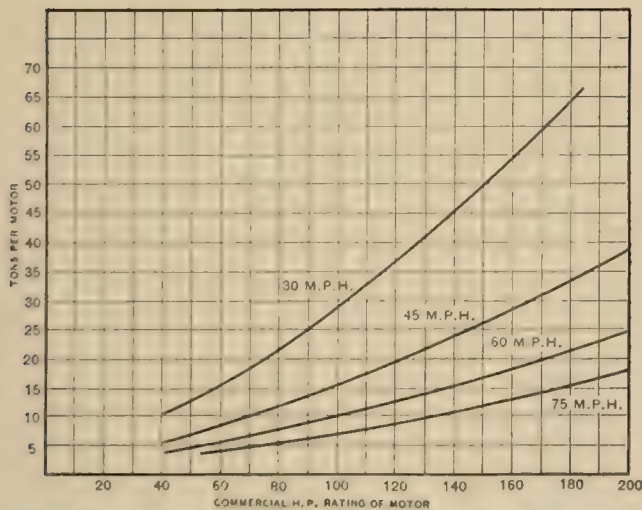


FIG. 6. MOTOR CAPACITY 60° C. RISE. A. FRICTION CURVE.

when two cars are passing midway between sub-stations, one of which is accelerated. Each sub-station must be able to accelerate one car and supply another at full speed or must give 850 amperes momentary output and a sustained output of 500 amperes. The sub-station will therefore be called upon to deliver momentarily 510 kw. and should contain not less than one 300 kw. rotary converter, and preferably two, one being in reserve. It is assumed that the cars always run as single units and that converter can find a momentary overload of 100 per cent. With half hour service cars will be spaced 20 miles apart, so that there will be required a generator capacity of two cars every 20 miles (double track) or 340 kw., assuming 17 per cent loss in rotary converter sub-station and train

mission lines. The generating station capacity per mile of track will therefore be 17 kw. and the sub-station 46 kw. with reserve, and 23 kw. with no reserve. Taking the cost of a generating station in round numbers at \$100 per kw. and the sub-station at \$35, the cost of a 40-ton car complete with four 110-h. p. motors, controllers, etc., at \$6,000, we arrive at the following approximate cost for installing:

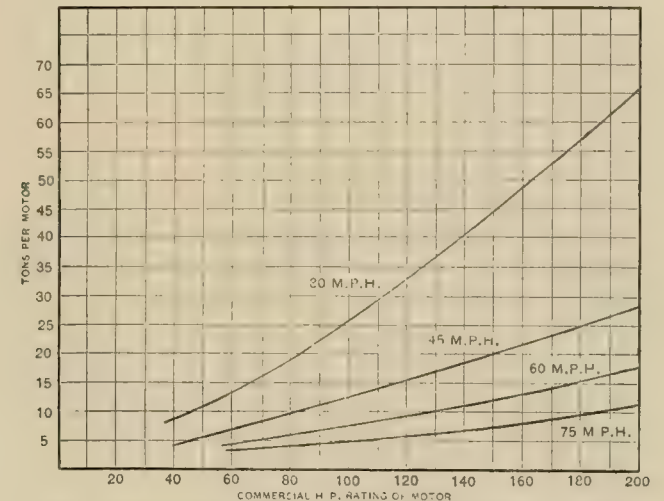


FIG. 7. MOTOR CAPACITY 60° C. RISE. B. FRICTION CURVE.

Approximate First Cost Per Mile, Single Car Train.

| | |
|--|---------|
| Generating station | \$1,700 |
| Sub-stations with reserve | 1,610 |
| Equipment (plus 20 per cent reserve) | 1,120 |

Total

Following through the same process with two 40-ton cars operating on one-hour headway at 40 miles per hour schedule, with the same track and third rail construction, we arrive at the following conclusions:

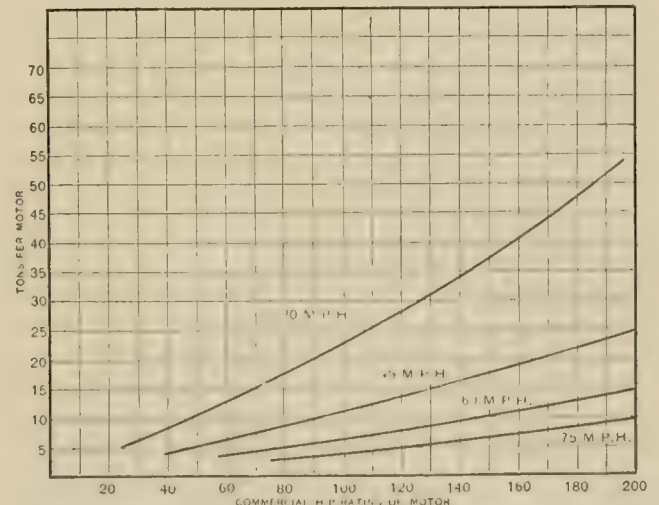


FIG. 8. MOTOR CAPACITY 60° C. RISE. C. FRICTION CURVE.

| | |
|--------------------------------------|-------------------|
| Watt-hours per ton mile..... | 63 |
| Train energy at train (80 tons)..... | 202 kw. |
| Distance apart sub-stations..... | 9.1 miles |
| Size of sub-station..... | two 400 kw. units |

Each train consisting of two 40 ton cars will consume 224 kw. at the sub-station or 264 kw. at the generating station, allowing the same percentage of loss as before. These trains, making the same schedule speed at double the headway, will be spaced 10 miles apart and the generating capacity will, therefore, be 528 kw. every 49 miles, or 13.2 kw. per mile. The sub-stations consisting of two 400 kw. units (with reserve) every 9.1 miles will have a capacity per mile

of 88 kw. Expenses for cars will be the same as before and the following approximate values obtained:

| Approximate First Cost Per Mile—Two Car Train | |
|---|---------|
| Generating station | \$1,320 |
| Sub-station | 3,080 |
| Equipment | 1,120 |
| Total | \$5,520 |

The energy consumed for the two methods of operation is 17 kw. per mile of track with a single car as against 13.2 kw. per mile with a two-car train. Thus, while the two-car train at one hour headway will cost 24.5 per cent more to install (for the items mentioned only) it will consume but 72.5 per cent of the energy required to operate a single car individually. The difference in power required is 3.8

NEW MAIL CARS IN BALTIMORE.

By courtesy of Mr. W. A. House, second vice-president and general manager of the United Railways & Electric Co., of Baltimore, Md., we are able to present herewith plans of the new United States mails cars built in the shops of the company. These cars are for use in Baltimore and have the following principal dimensions: Length over bumpers, 26 ft. 6 in.; length over corner posts, 16 ft. 10 1/4 in.; length of platform, 4 ft. 3 in.; width over sills, 7 ft. 3 in. These cars were built specially for mail service, and the end doors are arranged to facilitate the mail clerks entering and leaving the interior of the car, being slightly out of center in the opposite direction from the way they are regularly thrown to make the accelerator type of door for passenger service.



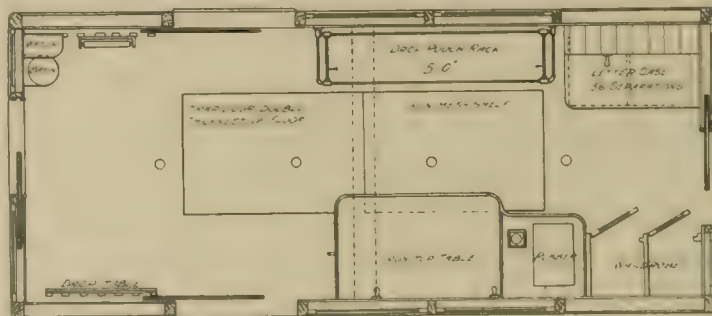
NEW MAIL CARS IN BALTIMORE.

kw. per mile of track. Assuming 12 hours per day operation at the above headway the total kw. h. per day will be 45.5, which, at \$.007 per kw. h., would be \$110.50 per year, or 10 per cent on \$1,105. It would therefore pay to invest the \$1,090 per mile of track difference in cost between one car and two car operation as found above if the same receipts could be secured with one hour headway as with 30 minute headway.

While the desirability of the two-car service seems evident in this case it might result in the falling off of receipts due to the less frequent service to such an extent as to more than make up the saving in operating expenses. There is an additional saving in train crew expense which was not entered into above and which would amount to rather more than half as much as the cost of power. With two-car operation it is possible to reduce the motor capacity per car from four 110-h. p. motors to approximately four 95-h. p. motors, thus reducing the cost of the equipment item. It would be more conservative, however, to consider the same size of equipment in both cases as a single car might be used during certain parts of the day. The sub-stations with the two-car trains being placed somewhat closer together would have a labor account per mile of track in excess of that for single car operation. This may be balanced against the saving which would result from smaller crew expenses of the two-car train. These examples are used to illustrate the very broad application of the foregoing curves. The curves given are not absolutely correct but are sufficiently so for approximation purposes. For the slower speed work where stops are more frequent and where acceleration is a more important factor it will be necessary to have more complete curves in order to determine the proper rate of acceleration to use. The importance of the wind friction as affecting electrical operation at a very high speed will probably lead to the construction of special cars reducing wind friction to a minimum when the higher maximum speeds are put into commercial operation. No conclusive data are at hand upon the effect of different shaped car ends on single or two car operation.

The interior furnishing of the car is arranged in accordance with plans submitted by the Post Office Department, and comprises a letter case of 56 separate compartments, a drop rack for holding mail pouches, a table covered with sheet iron for canceling mail, two wardrobes, wash basin and a combination water cooler and tank. There is also a drop table which is used for canceling parcels, etc. The cars are mounted on "Lord Baltimore" single trucks, and are equipped with Westinghouse No. 49 motors and K-10 controllers. The average weight of the car complete is 18,691 lb.

There are no side or hood signs on the cars, but each car is equipped with a sheet iron dash sign, giving the route to which it is assigned, with "Through Service" painted on one side, and "Local Service" on the other, the car displaying the "Local Service" sign



FLOOR PLAN OF BALTIMORE MAIL CAR.

when collections are made from the street boxes, and "Through Service" when it operates between suburban stations, in which service it has the right of way over passenger cars. The cars are painted white, striped in blue, all numbers and lettering being in gold.

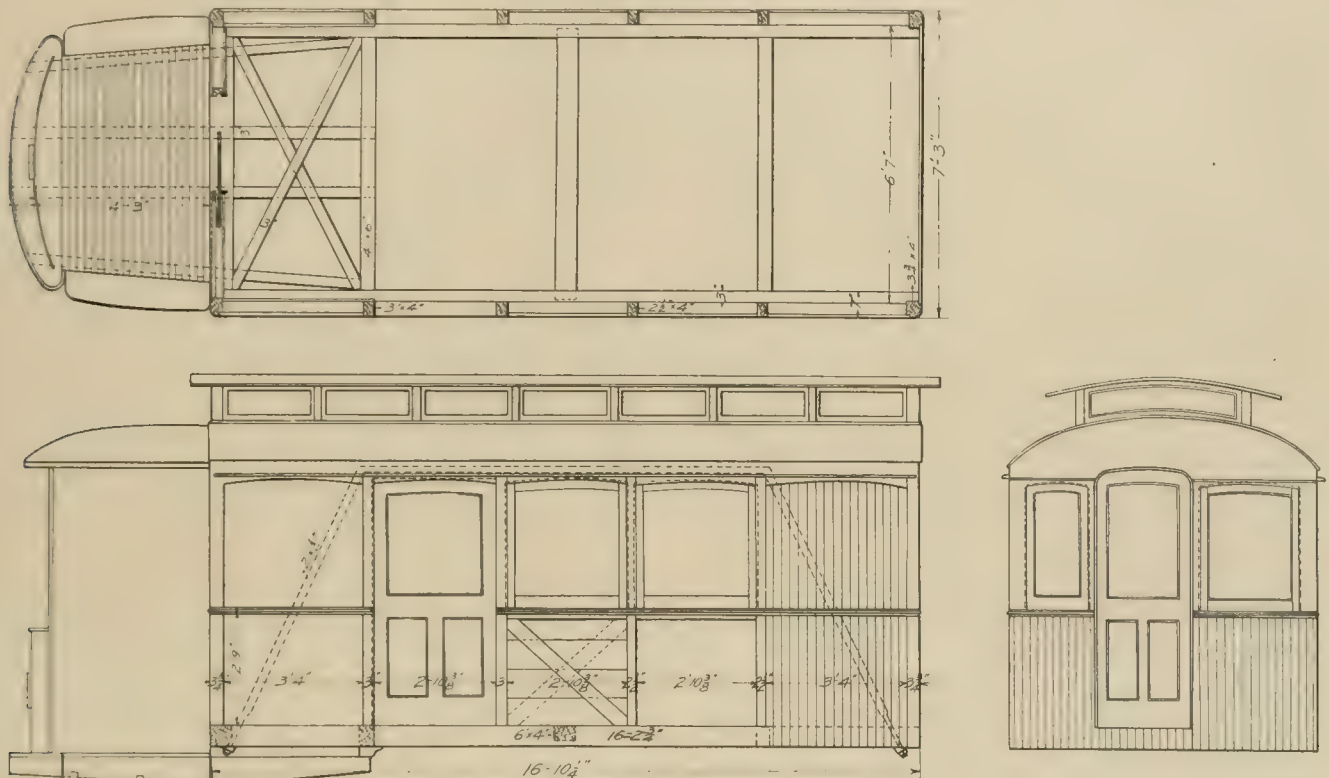
The street railway mail service of Baltimore has some novel features which were described at some length in the "Review" for August, 1902, page 472. Not only do the postal cars collect and deliver pouches in the various sections of the city, but at frequent intervals during the day the cars, each carrying from one to three clerks, start out over different routes and make collections from the

The Washington (Pa.) & Cannonsburg Ry. was opened to traffic July 8th.

regular street deposit boxes. As the car approaches a collection box a clerk jumps off with a mail pouch, empties the box of its mail and jumps back onto the car, oftentimes in less than 30 seconds. In conjunction with this service, the regular carriers collect the mail in sections adjacent to the car lines and bring their collections to designated points in time to catch the mail cars, thus saving considerable time. The mail cars in no way interfere with the regular

ALLIS-CHALMERS CO'S. ANNUAL REPORT.

The second annual report of the Allis Chalmers Co., for the year ending April 30, 1903, shows the net surplus at the beginning of the third fiscal year to have been \$820,835.57, the profits for the year being \$1,653,576.06, from which was paid \$1,137,500.00 in dividends, being 7 per cent on the preferred stock. The orders unfinished and on



PLAN AND ELEVATIONS OF BALTIMORE MAIL CARS.

passenger cars, but they can make better time and, instead of blocking the line, the regular cars have to hurry to get out of their way.

ELECTRIC RAILROAD SECURITIES CO.

The Electric Railroad Securities Co., of South Bend, Ind., has been organized for the purpose of financing and managing electric interurban railways and building a car manufacturing plant. As announced in the company's prospectus, it is its intention to issue two kinds of stock—common and guaranteed. The guaranteed stock is to be secured by bonds of equal par value, running 30 years and bearing 2 per cent. interest, which are deposited with a trust company. When the bonds deposited to secure stock mature the stockholder may elect whether he will take the proceeds of the bonds, in which case the stock is surrendered to the company, or retain the stock, in which case the bonds are canceled. Interest on the bonds securing stock goes to the stockholders. The officers of the company are S. M. McDonald, president, and Thomas W. Kenyon, secretary and treasurer. The fiscal agent is Robert G. Ruxton, 32 Broadway, New York.

NEW STREET CAR ADVERTISING AGENCY.

Announcement is made that James V. Howell & Co. have opened a street car advertising agency with headquarters in the Columbia Theater Building, Cincinnati, and are prepared to lease the advertising privileges of city and suburban traction systems throughout the United States. Street car advertising has been common in city cars for several years, but up to this time it has not been adopted on suburban and interurban lines to any extent.

The Louisville Traction Co., capital \$14,500,000, has been incorporated to consolidate all the street railway lines in Louisville.

hand April 30, 1903, amounted to \$8,797,483.00, a gain of \$640,448.25. Among the assets the value of the manufacturing plants is given as \$29,199,492.97. The current assets amount to \$9,235,388.26; current liabilities, \$1,364,045.66; net current assets, \$7,871,342.60. The president, Mr. Charles Allis, says that the outlook for work was never better.

All the officials, committees and superintendents were re-elected at the annual meeting with the addition of James Stillman, of the National City Bank, New York, and Charles Allis, as members of the finance committee. Elbert H. Gary is chairman of the board of directors; president, Charles Allis; vice-president and treasurer, William J. Chalmers; second vice-president, Henry W. Hoyt; third vice-president, Philetus W. Gates; fourth vice-president, Joseph H. Seaman; assistant secretary, Joseph O. Watkins; general counsel, Pam, Calhoun & Glennon, Chicago.

KNOX ENGINEERING CO. CONTRACTS.

The Knox Engineering Co., of Chicago, has been engaged to prepare plans for an electric railway system in Canton, Ill., and also to report upon the feasibility of constructing an interurban system through a number of outlying towns, including Farmington, Lewistown and, perhaps, Pekin, a distance of 45 miles. The city line will be six miles long. James A. Lawrence, of Chicago, is interested in the projects.

The Knox Engineering Co. has also been awarded a contract for changing the feeder line equipments and re-wiring the cooling tower motors at the power station of the South Side Elevated Railroad Co., Chicago.

The Massachusetts railroad commissioners have issued orders restricting the speed of single-truck trolley cars to 15 miles an hour, unless authority is specifically given to the contrary.

PERSONAL.

MR. SAMUEL M. KENNARD has resigned as president of the St. Louis & Suburban Railway Co.

MR. NORMAN B. REAM, of Chicago, has been elected a member of the executive committee of the Brooklyn Rapid Transit Co.

MR. T. B. REDMOND has been appointed assistant to the general manager of the Saginaw Valley Traction Co., of Saginaw, Mich.

MR. J. B. MARVIN, treasurer and manager of the City Electric Railway Co., of Rome, Ga., has resigned. His successor is Mr. C. N. Fuller, of New York.

MR. CHARLES F. GAY, a prominent business man of Napoleon, O., is one of the directors of the People's Rapid Transit Railway Co., of Toledo, which was mentioned in the "Review" for June, 1903.

MR. JOHN B. PARSONS, president of the Philadelphia Rapid Transit Co., accompanied by Mrs. Parsons, sailed for Europe last month for a brief season of rest. They will return in September.

MR. T. F. MANVILLE, accompanied by his family, sailed for London June 23d. Mr. Manville will be absent about two months, having business in connection with the London branch of the H. W. Johns-Manville Co.

MR. HARRY BULLEN, formerly assistant general superintendent of the Detroit United Ry., has been appointed general superintendent of the Rapid Railway Co., of Detroit, to succeed Mr. W. O. Wood, resigned.

MR. DUNCAN MAC DONALD, formerly superintendent of the Montreal Street Railway Co., has returned from Paris to resume his old position. He was actively employed in street railway work abroad about a year.

MR. E. C. FOLSOM has been appointed general manager of the Fort Wayne Traction Co., vice Mr. A. L. Scott, resigned. Mr. Folsom was formerly general manager of the Indianapolis & Logansport Traction Co.

MR. ALBERT PATTEN, son of Mr. Joseph M. Patten, general manager of the Topeka Railway Co., has been appointed superintendent of the street railway lines. He has been employed in the operating department of the company several years.

MR. HORACE LOWRY and Mr. W. H. Goadby were recently elected directors of the Twin City Rapid Transit Co., of Minneapolis, vice Mr. J. Kennedy Tod and Mr. A. E. Ames, resigned. Mr. Lowry is the only son of Mr. Thomas Lowry, president of the company.

MR. B. R. STEPHENS, auditor of the Fort Wayne & Southwestern Traction Co., has resigned and will enter another field. He will be succeeded by Mr. Louis McFerran, who has been connected with the Huntington (Ind.) offices of the Chicago & Erie R. R. several years.

MR. CLIFFORD C. BAKER has resigned as president of the Topeka Railway Co., Mr. E. W. Wilson, of Peoria, being his successor. Mr. Baker planned the reorganization of the Topeka City Railway Co. and the Topeka Rapid Transit Railway Co., 15 years ago, when he was chosen president.

MR. CHARLES P. THRASHER has been appointed general manager of the New York & Long Island Traction Co. He has been connected with the Mandelbaum-Pomeroy syndicate for the past two years in the capacity of auditor of the Southern Ohio, and later of the Western Ohio Railway Co. systems.

MR. GEORGE T. BISHOP has been elected president and general manager of the Eastern Ohio Traction Co., to succeed Mr. H. Clark Ford and Mr. R. L. Andrews in those respective offices. He will assume his new duties August 1st. Mr. Bishop was formerly president of the Northern Texas Traction Co.

MR. A. E. MEIXELL, formerly superintendent of the Fairmont Park Transportation Co., of Philadelphia, is now on the road, representing H. S. Sanville, dealer in street railway supplies. Mr. Meixell is well known to the street railway trade, having been connected with street railways for a considerable length of time.

MR. WILLIAM BURLINGHAM has accepted an appointment as chief engine designer with the B. F. Sturtevant Co., of Hyde Park, Mass., resigning a position in the United States inspection office with the William R. Trigg Co., of Richmond, Virginia. Mr. Burlingham has previously been associated with the Bath Iron Works, the General Electric Co., the Southwark Machine & Foundry Co., and the Newport News Ship Building & Dry Dock Co., and

has also served on Mr. T. A. Edison's staff at the East Orange laboratory. He is a graduate of the Worcester Polytechnic Institute.

MR. THEODORE WENTZ, who has been general manager and secretary of the Toledo, Fostoria & Findlay Electric Railway Co. since its organization, has resigned as general manager, but retains the secretaryship. Mr. Fred W. Adams, of Canal Dover, O., local agent of the Cleveland, Lorain & Wheeling Ry., succeeds Mr. Wentz as manager.

MR. ROBERT E. SHELDON has resigned as president of the Columbus Railway Co., and has been elected president of the Columbus Railway & Light Co., a holding company, of which Mr. L. S. Steward was chosen vice-president. Mr. Butler Sheldon, son of Mr. R. E. Sheldon, was elected president of the Columbus Railway Co. in his father's stead.

MR. E. B. GUNN has been appointed general superintendent of the Columbus, London & Springfield Railway Co., and the Dayton, Springfield & Urbana Street Railroad Co., vice Mr. R. K. Howard, who resigned because of poor health. Mr. Gunn was formerly superintendent of the Richmond (Ind.) Street & Interurban Railway Co., and formerly was superintendent of the La Fayette (Ind.) Street Ry.

MR. E. R. GILBERT, who until the appointment on July 2d of Messrs. W. K. Schoepf and C. C. Richardson as receivers for the Miami & Erie Canal Transportation Co., was general manager of the company, will after July 20th be connected with the sales department of the Westinghouse Electric & Manufacturing Co., with headquarters in Boston. Mr. Gilbert was for several years general manager of the Chicago Electric Traction Co.

MR. E. S. DIMMOCK, general manager and purchasing agent of the Bay Cities Consolidated Railway Co., of Bay City, Mich., will retire from that company August 1st to enter the employ of Stone & Webster, of Boston. He will first report upon the condition of the street railways operated by that syndicate, after which he will be in charge of one of the properties. Mr. Dimmock is a brother of Mr. W. S. Dimmock, manager, Tacoma Railway & Power Co.

MR. C. A. DENMAN, who was recently appointed superintendent of the Richmond (Ind.) Street & Interurban Railway Co., vice Mr. E. B. Gunn, was formerly general manager of the Toledo, Bowling Green & Southern Traction Co.; also of the Toledo & Maumee Valley Railway Co. and the Toledo, Waterville & Southern Ry. He was connected with the Toledo consolidated offices nine years and was general manager of the interurban lines seven years.

MR. STEPHEN R. BALDWIN on July 1st resigned from the management of the New York office of the Pennsylvania Steel Co. Mr. Baldwin has been with this company over 25 years and while resigning active duties will retain his connection with the company in an advisory capacity with headquarters at No. 71 Broadway, New York, as heretofore. Mr. A. E. Aeby, who for 14 years has been Mr. Baldwin's first assistant, will have charge of the New York office.

MR. H. H. VREELAND, president of the Interurban Street Railway Co., of New York, was tendered a complimentary dinner by the employees prior to his departure for Europe, which was announced in the June "Review." The dinner marked Mr. Vreeland's 10th anniversary as head of the New York traction service. In front of his plate was a silver loving cup, nearly two feet high and a foot in diameter, the gift of the employees. There were 210 men at the banquet representing the 13,000 employed.

THE SAN BERNARDINO VALLEY TRACTION CO., the Redlands Street Railway Co., and the San Bernardino & Highlands Electric Railway Co. have been consolidated under the name of The San Bernardino Valley Traction Co., with its principal offices at San Bernardino, Cal., to which place future communications should be addressed. The officers of the company are: Henry Fisher, president, Redlands, Cal.; A. C. Denman, jr., vice-president and general manager, San Bernardino; C. W. A. Cartlidge, secretary and treasurer, San Bernardino.

MR. JAMES ROSS has resigned as vice-president of the Montreal Street Railway Co., and as vice-president of the Toronto Railway Co., and has also severed his connection with the directorates of both companies. He will devote his time to his duties as president of the Dominion Iron & Steel and the Dominion Coal Companies. He is also president of the Mexican Light & Power Co. Mr. F. L. Wanklyn, general manager, succeeds Mr. Ross as vice-president of

the Montreal company, and Mr. Frederick Nichols has been elected vice-president of the Toronto Railway Co.

MR. H. D. WALBRIDGE was elected president of the Saginaw Valley Traction Co., at the meeting of the directors July 9th. Other officers chosen are: Mr. B. C. Cobb, vice-president; Mr. G. L. Estabrook, secretary and treasurer; Mr. C. E. Mershon, assistant secretary and treasurer; Mr. P. P. Crafts, general superintendent; Mr. M. S. Hopkins, consulting engineer. The change in officers is due to the consolidation of the Saginaw and Bay City companies, which, as announced in the June "Review," is practically a fact, although it will not be consummated until fall.

MR. L. T. LAW, general manager of the Wabash River Traction Co., of Wabash, Ind., has resigned and gone to his former home in New Haven, Conn., where he intends to take a long rest. For the present he will be succeeded by his nephew, Mr. Dwight Copley. Mr. Law went to Wabash May 1, 1901, before the line to Peru was in operation. He had charge of much of the work of completing the construction and then became general manager, his jurisdiction being extended with the additions to the interurban, known as the Logansport & Wabash Valley Traction Co.

MR. H. E. SAWYER has been appointed general superintendent of the Cincinnati, Georgetown & Portsmouth R. R., vice Mr. E. M. Stevens, who resigned to go with the Westinghouse Electric & Manufacturing Co., at Pittsburg. Mr. Sawyer has been general freight and passenger agent of the road since July 1st, having gone to Cincinnati from Springfield, O., where he had occupied a similar position with the Appleyard roads. He will continue in charge of the traffic department of the Cincinnati, Georgetown & Portsmouth, as well as having charge of the operating department.

MR. EDWIN C. FABER has been chosen general manager and secretary of the Aurora, Elgin & Chicago Railway Co., and vice-president of the Elgin, Aurora & Southern Traction Co., of which he was formerly general manager. Mr. Faber succeeds Mr. Warren Bicknell as general manager of the Aurora, Elgin & Chicago, and, although the changes do not take place officially until August 1st, he has taken up his residence in Wheaton and entered upon his new duties. Previous to going to Aurora he was general superintendent of the Cleveland Electric Railway Co., having entered the service of that company as an office boy in 1892.

MR. D. A. BELDEN, whose resignation as general manager of the Birmingham Railway, Light & Power Co. was announced in the "Review" for June, has been elected president of the New Hampshire Traction Co., with headquarters at No. 50 Merrimack St., Haverhill, Mass. The New Hampshire Traction Co. is a holding company for the following Massachusetts and New Hampshire companies: Exeter, Hampton & Amesbury Street Railway Co., Hudson, Pelham & Salem Electric Railway Co., Haverhill & Southern New Hampshire Street Railway Co., Lawrence & Methuen Street Railway Co., and Lowell & Pelham Street Railway Co.

MR. D. F. CARVER, chief engineer of the street railway department of the Public Service Corporation of New Jersey, assumed his new duties about June 1st. Mr. Carver was originally connected with steam railroads, starting with the Chesapeake & Ohio Ry. in 1887. In 1889 he entered the construction department of the Pennsylvania R. R., and in 1893 he went into the electrical department of the Long Island Traction Co., which was afterward merged into the Brooklyn Rapid Transit Co., where he remained until 1900, when he received an appointment as chief engineer of the Cleveland Electric Railway Co. He resigned the Cleveland position to go to New Jersey.

MR. GEORGE O. NAGLE assumed charge of the system of the Wheeling Traction Co., Wheeling, W. Va., July 15th, as general manager, succeeding Mr. C. E. Flynn, whose resignation was announced in our last issue. Mr. Nagle has been with the Stone & Webster interests for the last two years, first in the expert department, investigating street railway properties, later as manager of the Savannah (Ga.) Railway & Light properties, and more recently engaged in special work with headquarters in Boston. Mr. Nagle was for many years with the Chicago City Railway Co., becoming superintendent upon the succession of the late M. K. Bowen to the presidency of that company, and later assistant general manager under Capt. Robert McCulloch.

MR. H. M. LITTELL was recently appointed general manager of the Rapid Transit Co. of Chattanooga, Tenn., and has assumed his new duties. Mr. Littell has been in railway work since he was

18 years old, when he entered the office of the Louisville City Ry., as clerk, in 1874. From 1883 to 1885 he was general manager of the St. Paul City Railway Co., and then became general freight and passenger agent of what later became known as the Chicago Great Western Ry. In 1888 he was appointed manager of the Cincinnati Inclined Plane Ry., and built the first electric line in Cincinnati, and resigned that office to take a similar position with the New Orleans Traction Co., on Jan. 1, 1893, where he built 126 miles of electric road. He was president and general manager of the Atlantic Avenue line in Brooklyn until its absorption by the Nassau Electric Co., and in 1896 he was elected vice-president and general manager of the Metropolitan Street Railway Co., New York City. Mr. Littell was president of the American Street Railway Association for 1896. His brother, Mr. H. H. Littell, was the Association's president for 1883.

MR. H. M. BYLLESBY, electrical engineer, who is prominently identified with several electric railway, power and lighting systems, has just removed to commodious offices in the New York Life Building, Chicago. Mr. Byllesby has been prominent in the electrical field for a number of years, and is at present the dominant factor in a rapidly increasing consulting engineering business. A few of the interests with which he is connected are as follows: Consulting engineer of the Wilkesbarre & Hazleton Railroad Co. (third-rail); vice-president and engineer of the Zanesville Railway, Light & Power Co. (this plant is just putting up an extensive water power and steam turbine station, enlarging the system, and rebuilding the track); engineer for the financial interests of the Columbus, Delaware & Marion Electric Railroad Co.; president and general manager of the Mansfield (O.) Railway, Light & Power Co., and of the Mansfield-Shelby interurban company; director and consulting engineer of the Freeport (Ill.) Railway, Light & Power Co.; president and general manager of the Venice & Granite City Electric & Power Co. of Illinois; vice-president and general manager of the Belleville (Ill.) Gas & Electric Co.; vice-president and general manager of the Centralia (Ill.) Gas & Electric Co.; president of the Enid (Okla.) Electric & Gas Co.; consulting engineer of the Shreveport (La.) Gas & Electric Co.

OBITUARY.

MR. CHARLES HATHAWAY, a pioneer street railway builder, died at his home in Cleveland, O., July 2d. He was nearly 79 years old, having been born Nov. 7, 1824, in Grafton, Mass. His



CHARLES HATHAWAY.

childhood was spent on a farm, and at the age of 15 years he was sent to a school at Worcester, Mass., where he remained three years. He studied engineering there and upon leaving school became an apprentice in a machine shop. In 1844 he constructed several branches of road for steam railway companies; he laid and ballasted the first track on the Hudson River R. R., from Poughkeepsie, N. Y., to Bennington, Vt.; he then secured several con-

tracts with the Fort Atkinson R. R. constructing the road between Lowertown, Pa., and Vienna. In 1887 Mr. Hathaway turned his attention to the building of street railways in that year constructing a system of lines in Philadelphia. Following that he built, equipped, leased or operated roads in nearly every leading city of the United States and Canada. In 1860 he went to England at the suggestion of Mr. George Francis Train, with whom he worked in company, and built three roads in London, one in Birkenhead, one in Staffordshire and one in Darlington. The cars for these roads were built in Philadelphia and shipped in sections to Birkenhead, where they were put together, painted and fitted for service in car shops owned by Mr. Hathaway. He remained abroad 18 months. In 1873 he went to Cleveland, where he became prominently identified with street railway interests. He built the Broadway & Newburg railroad, the Superior Street and the Payne Avenue roads; in 1884 he bought the St. Clair Street road and operated it until 1890, when it was consolidated with the Cleveland City Cable Railway Co.; at the end of that year he retired from active work. During his term of service Mr. Hathaway was president of the Superior Street railway 15 years, and for a long time president of the St. Clair Street company; he held a like office in the Evansville (Ind.) Street Railway Co. The firm with which Mr. Hathaway was connected was known by the name of Hathaway & Robison and upon Mr. Hathaway's retirement the business was conducted by Mr. F. DeH. Robison, his son-in-law. It is stated that the firm built more than 130 street railways throughout the United States.

MR. THOMAS CHALMERS, father of Mr. W. J. Chalmers, chairman of the executive committee of Allis-Chalmers Co., died July 13th and was buried Thursday, July 16th. Thomas Chalmers was the founder of the firm of Fraser & Chalmers, which was recognized as the world's largest producers of mining machinery. He was born in Dronley, near Dundee, Scotland, June 14, 1816, his father being William Chalmers, a manufacturer of linen. At the age of 14 he was apprenticed to a Dundee machinery company to learn the trade, which he followed in all its branches in Scotland and England for 13 years. He was married in 1840 and in 1843 Mr. and Mrs. Chalmers came to America and settled on a farm between Joliet and Lockport, Ill. In the spring of 1844 Mr. Chalmers walked 40 miles to Chicago and sought employment in a machine shop. His first position was with a Mr. Nickerson and while in his employ he put in the first steam-heating apparatus in Chicago, that of the old Dearborn School. Later he entered the employ of the late P. W. Gates, and for nearly 30 years the two were associated in business. Mr. Chalmers built Chicago's first water works, a single pump at the foot of the river, and during his early career he was the largest builder of sawmill machinery in the United States. In 1855, with Messrs. P. W. Gates, E. S. Warner, A. G. Warner and David R. Fraser, he formed the firm of Gates, Warner, Chalmers & Fraser, which was succeeded in 1857 by the Eagle Works Manufacturing Co. In the winter of 1871-72 this corporation was dissolved, and with Mr. Fraser and Messrs. Robert Anthony and David Marchant Mr. Chalmers formed the firm of Fraser & Chalmers. Two years ago this company, with three others, was merged into the Allis-Chalmers Co., and Mr. Chalmers, sr., withdrew from active participation in its management. Mr. Chalmers was a staunch Republican, a member of the Presbyterian Church, a Mason and an Odd Fellow. A widow and five children survive him.

NEW PUBLICATIONS.

SPECIFICATIONS FOR MATERIAL AND WORKMANSHIP FOR STEEL STRUCTURES. Adopted 1903 by the American Railway Engineering and Maintenance of Way Association. Pamphlet form, 6 x 9 in., 10 pages. Copies may be obtained from the secretary of the association, 1562 Monadnock Block, Chicago. Price per single copy, postpaid, 10 cents; 10 or more copies on one order, 5 cents each.

LE VULCAIN for June 14, 1903. The first issue of a new weekly paper, 16 pages, 10 x 13 in., styled a technical and financial review of the industrial world. Its scope, as outlined on the title page, is varied and the subjects to be treated of include the following: Coal and other combustibles, generation of heat, motive force, gas and lighting, metallurgy, iron, glass and pottery, cement, lime, coke ovens, electricity, chemical products, etc. The first number contains an interesting article on the process and plant designed by

Mr. H. DeWit for treating refractory ores in zinc manufacturing. It is illustrated among the views being a half-tone showing the DeWit works at Newport, Belgium. Subscription price, per annum, 1 fr. Belgium, 10 francs, elsewhere, 12 francs. Address: M. Emile Lemaire, 5 Rue Annexe, Brussels, Belgium.

STREET RAILWAY ACCOUNTANTS' ASSOCIATION. Report of the Committee on Standard Blanks and Accounting for Materials and Supplies made to and approved by the Sixth Annual Convention held at Detroit, Mich., Oct. 8, 9 and 10, 1902. This is a reprint in pamphlet form of the report appearing at pages 64 to 68 of the proceedings of the Association for 1902; and the discussion thereon, on pages 69 to 86 of that report, should be read in connection with this report.

KANSAS CITY FLOOD SOUVENIR. Published by the Implement Trade Journal Co., Kansas City, Mo. This is chiefly a collection of views of the recent flood that devastated the bottom lands of Kansas City, causing a heavy loss of life and many dollars' damage. The views are said to form the first collection of flood pictures that adequately portray the situation. They include a bird's eye view of a large portion of the flooded district, the Union depot, partially submerged, the Wabash and Burlington railroad yards, the new elevated railroad power house, debris above the Missouri Pacific bridge, wrecked business buildings, houses, cars, and car tracks, wreckage at the Santa Fe sink hole, and several other interesting scenes, there being 33 large half-tone cuts in all, the majority 5½ x 9 in. in size. In a brief introduction the publisher states that although the Implement Trade Journal's office was ruined by the flood, it did not miss an issue.

CAR BUILDERS' DICTIONARY. 1903 Edition. An illustrated vocabulary of terms which designate American railroad cars; their parts, attachments and details of construction, compiled for the Master Car Builders' Association by Rodney Hitt, B. M. E., assisted by A. M. Waitt, late superintendent of motive power, New York Central & Hudson River R. R.; J. S. Lentz, master car builder, Lehigh Valley R. R., and W. P. Appleyard, master car builder, New York, New Haven & Hartford. 426 pages with 4,971 illustrations. The Car Builders' Dictionary is published by the Railroad Gazette under the authority and supervision of a committee of the Master Car Builders' Association, the first edition of this work having been authorized in 1872 with the idea of standardizing car building terms. The scope of the 1903 edition and the principles in accordance with which it has been compiled may be gathered from the following extracts from the preface: The definitions have been carefully edited with a view to eliminating the ancient history which many of them contained; in the matter of illustrations the aim has been to show nothing that is either experimental or rapidly going out of use; one new feature has been added, that of Car Shop Machinery; particular attention has been paid to the selection of drawings of freight car bodies, the steel car having made rapid strides; the illustrations of standard types of framing for passenger cars covers a large proportion of passenger equipments. The dictionary portion is very valuable in itself and is conceded to be authoritative; references to the illustrations in the second section of the book are given where possible. The engravings are drawn to a liberal scale and will be found useful in railroad drafting rooms. The best of American practice is introduced, no foreign equipment being shown. The treatment of electric cars is meager, the author being of opinion that that is a subject that should be treated of exclusively in some other publication.

FINANCIAL.

The gross earnings of the St. Louis Transit Co. for June were \$645,589.82, a gain of \$88,475.80 over June, 1902.

The Omaha Street Railway Co. has filed a mortgage for \$2,000,000 in favor of the Central Trust Co., of New York.

The net earnings of the Twin City Rapid Transit Co. for May were \$180,407; the net from January 1st was \$817,282, an increase of \$109,729.

The gross earnings of the Cleveland & Southwestern Traction Co. for May, 1903, were \$39,038, an increase over May, 1902, of \$13,993; operating expenses, \$22,146; increase, \$9,074. For the first five months of 1903: Gross receipts, \$156,303; operating expenses, \$98,-

045, being \$53,110 and \$34,461 greater than for the corresponding period last year.

A. E. Woods, treasurer of the Pueblo (Col.) & Suburban Traction & Lighting Co., reports the gross receipts for May as \$39,496.26; total to June 1st, \$191,082.92.

The Cincinnati, Dayton & Toledo Traction Co. passenger earnings for June were \$44,004.33, against \$39,479.42 for the same month last year. The daily increase was \$172.83.

Of 21 roads reporting gross earnings for the third week in June 18 showed increases amounting to \$583,980 and three decreases amounting to \$39,906, leaving the net increase \$544,074.

Earnings of the Syracuse Rapid Transit Co. for May were as follows: Gross, \$66,584; operating expenses, \$38,328; net earnings, \$28,255; fixed charges, \$20,222; surplus, \$8,033; damage claims, \$2,000.

The gross earnings of the Interurban Street Railway Co., New York City, for the quarter ending Mar. 31, 1903, were \$3,573,469; expenses, \$1,835,805; net earnings, \$1,737,664; other income, \$151,336; total income \$1,889,000; charges, \$2,174,593; deficit, \$285,593; cash on hand, \$599,026; profit and loss deficiency, \$441,395.

The New Manchester (N. H.) & Haverhill Street Railway Co. recorded a first mortgage for \$350,000 last month in favor of the American Loan & Trust Co., of Boston, to secure an issue of \$350,000 5 per cent 25-year gold bonds issued by the company January 1st last.

The passenger earnings of the Elgin, Aurora & Southern Traction Co. for June were \$37,769.94, against \$29,975.26 for June, 1902. The increase is \$7,794.68, an average of \$259.82 per day. For the year the earnings were \$377,790, against \$323,761 for the previous year. The increase is \$54,029, an average of \$148 per day.

Directors of the Lake Street Elevated Railroad Co., of Chicago, voted June 30th to pay the semi-annual interest on the first mortgage bonds. The earnings were not sufficient in the half year to make the full payment and the balance was advanced by Northwestern interests. The amount of the deficit was not stated, but the deficit for the year 1902 was \$29,916.

The gross earnings of the Aurora, Elgin & Chicago Railway Co. for May were \$28,010; net earnings, \$15,280. The operating ratio is about 46 per cent. The Elgin branch has been opened a short time only, but it has appreciably bettered the earnings and a 100 per cent increase is predicted when the system is in full operation. For the first five days of July the receipts were \$12,744.

The stockholders of the Toledo, Bowling Green & Southern Traction Co. have been notified that no dividends will be paid this year. The surplus earned will be devoted to improvements. The consolidated power house at Cygnet will be built and the rest of the surplus will be used on the road bed. The company has a bond reserve of \$275,000 and this will be issued and the bulk of the proceeds used to build a line over a recently acquired right of way into Toledo.

Cobe & McKinnon are endeavoring to arrange for a reorganization of the Calumet Electric Street Railway Co., which shall place the property in the hands of stockholders. This property constitutes the principal asset of the National Bank of Illinois, which failed some years ago, and for the unpaid liability of \$3,250,000 with accrued interest the stockholders of the bank have to look to the Calumet. As the other assets of the bank have been wound up it is considered that it would now be desirable to reorganize the Calumet railway and distribute stock and bonds to the stockholders of the bank.

It is stated that the Washington, Baltimore & Annapolis Electric Railway Co. has been placed in the hands of receivers as a precautionary measure pending the completion of a new financial plan. James G. Christy, jr., the general manager, and a representative of

Marbury & Gosnell, of Baltimore, are named as receivers. The company was incorporated May 22, 1899, with a capital of \$2,000,000, and the system was to be completed early in 1904. Some of the subscribers failed to pay in their subscriptions, thus making the original financial plan inadequate. The projectors state that there is no occasion for alarm.

The Philadelphia Rapid Transit Co. closed its first operating year at midnight June 30th and officials stated that it was the most profitable 12 months ever experienced by traction lines in Philadelphia. Gross earnings were estimated at approximately \$16,000,000. Owing to the large sums spent in improvements, the increase in operating expenses and fixed charges the net earnings are expected to be about \$1,500,000. The total fixed charges, including \$900,000 which must be paid the Union Traction Co., amount to \$7,734,722, and the operating and improvement expenses are estimated at a like amount. The number of passengers carried is estimated at 416,000,000.

OAKLAND TRANSIT CO.

Following is the official statement of the earnings of the Oakland (Cal.) Transit Co. for May: Gross earnings, \$107,369; operating expenses, \$49,538; net earnings, \$55,830; fixed charges, interest and taxes, \$23,546; surplus, \$32,284. This is the first month the earnings have exceeded \$100,000. The operating ratio is only 47 per cent and the surplus of \$32,284 is at the rate of a little more than 6 per cent per annum on \$6,000,000 of stock.

ITHACA STREET RAILWAY CO.

The report of the Ithaca Street Railway Co., of Ithaca, N. Y., for the month of May, 1903, which we have received by courtesy of the general manager, Mr. H. A. Nicholl, shows most gratifying results. The gross earnings from operation in May, 1903, were \$9,284, an increase of \$1,433 compared with May, 1902; operating expenses, including taxes, \$4,860, a decrease of \$5,480; net earnings from operation, \$4,424, as against a deficit of \$2,851 in May, 1902. The gross income from all sources for May, 1903, was \$6,388, from which are deducted \$1,625 interest and \$122 for taxes, leaving a surplus of \$4,641 as against a deficit of \$2,192 for May, 1902. The ratio of operating costs to earnings was .5234 excluding taxes and .5366 including taxes.

ELGIN, AURORA & SOUTHERN.

The Elgin, Aurora & Southern Traction Co. reports as follows:

| | 1902. | 1903. | Increase. |
|---------------------------|-----------|-----------|-----------|
| Gross earnings (May)..... | \$ 35,115 | \$ 39,147 | \$ 4,032 |
| Operating expenses..... | 19,628 | 21,794 | 2,166 |
| Net earnings | 25,487 | 17,353 | 1,866 |
| Deductions | 8,333 | 8,333 | ..... |
| Surplus | 7,154 | 9,020 | 1,866 |
| Five months' gross..... | 152,582 | 168,544 | 15,962 |
| Expenses | 92,107 | 102,178 | 10,011 |
| Five months' net..... | 60,415 | 66,366 | 5,951 |
| Deductions | 41,007 | 41,007 | ..... |
| Five months' surplus..... | 18,748 | 24,000 | 5,951 |

CHICAGO & MILWAUKEE ELECTRIC RY.

| | 1902. | 1903. | Increase. |
|--------------------------|-----------|-----------|-----------|
| Gross earnings (June) .. | \$ 17,750 | \$ 22,482 | \$ 4,732 |
| Operating expenses | 7,065 | 7,742 | 677 |
| Net earnings | 10,685 | 14,740 | 4,055 |

For six months ending June 30th:

| | 1902. | 1903. | Increase. |
|-----------------------|-----------|-----------|-----------|
| Gross earnings .. | \$ 78,939 | \$ 93,720 | \$ 14,781 |
| Operating expenses .. | 38,052 | 39,840 | 1,794 |
| Net earnings .. | 40,887 | 53,873 | 12,986 |

INTERNATIONAL TRACTION SYSTEM.

The following statement of income account of the International Traction Co., of Buffalo, for May was forwarded by Mr. R. F. Rankine, secretary and treasurer:

| | 1902. | 1903. | Increase. |
|-----------------------|--------------|--------------|---------------|
| Gross earnings .. | \$204,084.78 | \$327,126.23 | \$ 123,041.45 |
| Operating expenses .. | 146,786.52 | 171,157.03 | 27,971.13 |
| Net earnings | 117,398.26 | 155,969.20 | 38,570.94 |

| | | | |
|---|------------|------------|------------|
| Fixed charges | 128,476.38 | 131,997.52 | 6,221.14 |
| Net income | \$8,078.12 | 20,071.00 | 29,092.18 |
| Net income, July 1 to date 1913 | 200.80 | 157,208.13 | 155,992.70 |
| Operating ratio | 505 | 542 | 923 |
| *Include earnings of Pan American Exposition period | | | |
| *Decrease. | | | |
| *Deficit. | | | |

PHILADELPHIA CO. AND AFFILIATED CORPORATIONS

Comparative statement for May of Philadelphia Co., Equitable Gas Co., Consolidated Gas Co. of the City of Pittsburgh, the Allegheny County Light Co. and the Pittsburgh Railways Co.

| | 1902 | 1903 | Increase |
|---|-------------|-------------|------------|
| Gross earnings | \$1,140,700 | \$1,240,120 | \$ 108,357 |
| Expenses | 636,458 | 745,254 | 78,796 |
| Net earnings | 504,311 | 533,871 | 29,560 |
| Miscellaneous | 15,300 | 24,007 | 8,708 |
| Total earnings | 519,680 | 557,879 | 38,199 |
| Fixed charges | 307,245 | 317,113 | 9,868 |
| Total income | 212,435 | 240,765 | 28,330 |
| Accrued dividend on preferred stock of Philadelphia Co. | 23,934 | 23,936 | 2 |
| Net income—surplus | 188,501 | 216,828 | 32,327 |
| Proportion due to other owners of common stock of affiliated corporations | 154 | 107 | 13 |
| Available for Philadelphia Co., . . . | 188,346 | 216,661 | 28,315 |

The gross earnings for the five months amounted to \$6,521,567, an increase of \$747,951; operating expenses, \$3,530,291, an increase of \$538,508; total available for Philadelphia Co., \$1,513,788, an increase of \$62,392.

TOLEDO RAILWAYS & LIGHT CO.

Statement of the Toledo Railways & Light Co. for May:

| | 1902. | 1903. | Increase. |
|--------------------|------------|------------|-----------|
| Gross earnings | \$ 117,005 | \$ 135,415 | \$ 18,410 |
| Operating expenses | 60,240 | 70,720 | 10,470 |
| Net earnings | 56,750 | 64,680 | 7,930 |
| Interest | 37,851 | 40,836 | 2,985 |
| Surplus | 18,007 | 23,853 | 4,945 |
| Operating ratio | 51.49 | 52.23 | .74 |
| First Five Months | | | |
| Gross earnings | \$ 548,601 | \$ 630,033 | \$ 82,031 |
| Operating expenses | 288,224 | 320,309 | 41,175 |
| Net earnings | 260,377 | 301,233 | 40,855 |
| Interest | 189,179 | 200,035 | 11,756 |
| Surplus | 71,198 | 100,208 | 29,000 |
| Operating ratio | 52.54 | 52.23 | .31 |

*Decrease.

CINCINNATI, NEWPORT & COVINGTON

Following is the condensed statement of the Cincinnati, Newport & Covington Light & Traction Co. for May:

| | 1902. | 1903 | Increase. |
|---------------------------------|-----------|------------|-----------|
| Gross earnings | \$ 92,530 | \$ 100,801 | \$ 8,357 |
| Operating expenses | 36,593 | 42,848 | 6,255 |
| Damages, taxes, rents and tolls | 13,728 | 16,839 | 3,111 |
| Total expenses | 50,321 | 59,688 | 9,367 |
| Net earnings | 42,214 | 41,202 | *1,012 |
| Fixed charges | 21,000 | 20,000 | *70 |
| Net profit | 21,147 | 20,205 | *942 |
| Operating ratio | 39 | 42 | ..... |

*Decrease.

Following is the five months' statement:

| | 1902. | 1903 | Increase. |
|---------------------------------|------------|------------|-----------|
| Gross earnings | \$ 428,110 | \$ 469,140 | \$ 41,030 |
| Operating expenses | 178,075 | 196,348 | 18,273 |
| Damages, taxes, rents and tolls | 67,982 | 83,539 | 15,557 |
| Total expenses | 246,058 | 279,887 | 33,829 |
| Net earnings | 182,051 | 189,252 | 7,201 |
| Fixed charges | 104,693 | 105,327 | 634 |
| Net profit | 77,358 | 83,924 | 6,566 |
| Operating ratio | 41.59 | 41.85 | ..... |

CINCINNATI, DAYTON & TOLEDO

The statement for May compares as follows:

| | 1902 | 1903 | Increase. |
|--------------------|-----------|-----------|-----------|
| Gross earnings | \$ 40,113 | \$ 40,173 | \$ 6,060 |
| Operating expenses | 21,922 | 25,924 | 3,999 |
| Net earnings | 18,191 | 21,152 | 2,960 |
| Deductions | 16,768 | 16,950 | *748 |
| Net income | 1,393 | 5,101 | 3,768 |

*Decrease.

Operating expenses include an accident appropriation equal to 2 per cent of gross earnings.

For the 12 months ending May 31, 1903

| | |
|--|-----------|
| Gross earnings | \$489,493 |
| Operating expenses | 271,812 |
| Net earnings | 217,680 |
| Deductions | 193,672 |
| Net income | 24,008 |
| Surplus earnings of subsidiary companies (Southern Ohio Express Co.) | 8,589 |
| Credit balance in accident fund | 7,017 |

STRIKES OF THE MONTH.

RICHMOND STRIKE.

As stated in the "Review" for June, the conductors and motormen of the Virginia Passenger & Power Co., of Richmond, Va., went out on strike June 17th. The "strike" is still on, although the company has been operating upon all its lines since early this month and considers the strike over so far as it is concerned. There has been a great deal of rioting in Richmond and vicinity, accompanied by considerable bloodshed and one fatality. The rioting began the second day and continued with increased violence so that on June 23d, although the police force had been largely increased it was necessary to call for troops and two regiments of militia were ordered out to guard the company's property and patrol its lines. Considerable adverse criticism has been circulated anent the special policemen who were appointed to duty during the strike, it being stated that many of them sympathized with the strikers and failed to do their duty. When the trouble became serious at the beginning of the strike the saloons were ordered closed, women and children were kept within doors and the city was practically under martial law. There were numerous clashes between soldiers and the mob and several were injured on both sides. One man was shot and killed by a soldier in Manchester on July 4th and an inquest was held at which the colonel commanding allowed the military to testify. The mob's favorite procedure was to fire revolvers at the cars from ambush, throw rocks, cut trolley wires, stretch wires across the street to cut the motormen's faces, attempt to wreck cars by blocking the tracks, and in one instance dynamite was used to blow up the track, the explosion resulting in wounding a captain of militia. An incendiary attempt was made to burn the company's trestle bridge at Seven Pines, also.

The first day of the strike the company's general manager, S. W. Huff, issued a notice to the strikers to return to work the following morning or lose their places. The next day the company began to operate in Richmond with non-union men, increasing the number of cars each day. The Petersburg cars were run without difficulty from the start. No attempt was made to run cars on the Manchester lines until the company had things well in hand in Richmond. The company received more applications for positions than were needed, many of the applicants being soldiers, some of whom were hired as soon as they were released on furlough. The ministers of Richmond early participated in the strike and tried to effect a reconciliation, but the company was firm in its refusal to treat with the union. On one occasion the company's junior counsel, Capt. A. B. Guignon, was assaulted by a policeman whom he had requested to arrest a rioter. The sheriff of Henrico County refused to issue a call for troops when necessity for their presence was first manifested and it was not until he was threatened with impeachment that he consented to act. A great many rioters have been arrested and fined during the strike, as were a number of discharged strike breakers, who were caught stealing fares, or sympathizing with the strikers.

A few of the strikers applied for their old positions and were taken back, but the majority of the 800 who went out remained out, some going elsewhere to work.

The Manchester and Seven Pines lines were opened regularly July 2d under heavy guard. Three of the guards were sent to the Henrico County grand jury charged with "feloniously shooting into a crowd of innocent bystanders." On July 8th it was announced that the militia would be sent home and, in fact, about 100 were given a furlough. The guards had been removed from the cars and streets two days before and the cars were apparently being operated in safety, although rock throwing continued. Five men employed on the Oakwood and Hollywood line were stoned July 7th and severely hurt, and, reports of renewed violence coming in from other sections, it was decided to renew the guards on some of the lines, and the colonel in charge of the troops stated that it would be unwise to dismiss the militia at that time.

July 8th the company caused the arrest, for criminal libel, of two editors of "Opinion," the strikers' organ, and a strike breaker for printing an affidavit to the effect that C. B. Buchanan, superintendent of transportation, is living in Richmond under an assumed name. The supply house of Sitterding-Carneal-Davis Co., of which Mr. Sitterding is president, as well as being president of the street railway company, has sued the local bricklayers' union for \$10,000 damages for boycotting the firm's materials.

DUBUQUE STRIKE.

The strike of the street railway employees of the Union Electric Co., of Dubuque, Ia., begun May 6th to enforce "recognition of the union" and the various unreasonable and impossible demands commonly included in that phrase was settled June 23d. In our issue for June we gave a brief account of the strike which June 16th culminated in serious riots requiring the presence of the state militia for their suppression. May 9th the company found that the city would not or could not afford proper police protection and street car traffic was suspended until June 11th. June 16th the militia was called out and remained in Dubuque until June 23d. The basis of the settlement was as follows: The company will not discriminate against union men. If men feel they have grievances the company will hear them or representatives of any organization to which they belong. The company will provide free transportation for employees. The three men whose discharge was one of the causes of the strike are to receive clearance cards stating their services while employed were generally satisfactory. Other strikers desiring employment will be reinstated without prejudice.

These terms are practically identical with the letter of the company of May 5th in reply to the men's original demands.

OTHER STRIKES.

The conductors and motormen of the Beaumont (Tex.) Traction Co. struck July 2d for "recognition of the union" and an increase in wages. The manager refused to sign a contract with the employees on the ground that they are irresponsible. The lines were tied up over the Fourth of July, but it was announced that by July 6th non-union men would begin to operate the cars. More than 500 applications were received. The company positively refused the wage increase asked, nor would it consent to arbitration. So far as reported there has been no rioting.

The conductors and motormen employed by the Columbus (Ga.) Railroad Co. voted to strike July 7th and 21 did so. Later in the day, however, eight went back to work. "Recognition of the union" was the only demand made. The company had 16 men in reserve to fill the strikers' places.

The heads of several departments of the Oneonta, Cooperstown & Richfield Springs Railway Co., of Oneonta, N. Y., resigned June 20th, owing to disagreements as to management, with the result that the engineers, motormen, conductors and others of the operating force refused to work and for several hours on June 30th the road was tied up. The company secured the services of other men later and the road resumed business. The company has since passed into the hands of a receiver.

An incipient strike, which in no way affected the operation of the road, occurred July 4th on the St. Louis Transit Co.'s lines. Demands were made for the recognition of the union, a shortening of the working day, and an increase in the wage scale. As only a small per cent of the 2,700 employees belong to the union the strike did not materially affect traffic. The company anticipated the trouble in part by discharging 40 motormen and conductors.

The differences between the Seattle Electric Co. and the linemen's

union, which have been on for the past nine months, have been amicably adjusted.

An agreement has been effected between the Scranton Railway Co. and the union which provides for arbitrators and lasts for three years.

By a vote of 45 to 19 the striking employees of the Connecticut Railway & Lighting Co. in Bridgeport, Conn., voted July 10th to call off the strike at that place. This was done without the sanction of the union. The strike lasted 58 days. Five of the Waterbury strikers went back to work July 6th, making 60 of the old men now working for the company.

The conductors, motormen and power house employees of the Kanawha Valley Traction Co., of Charleston, W. Va., struck July 11th for "recognition of the union" and increased wages. The superintendent and foremen operated the cars.

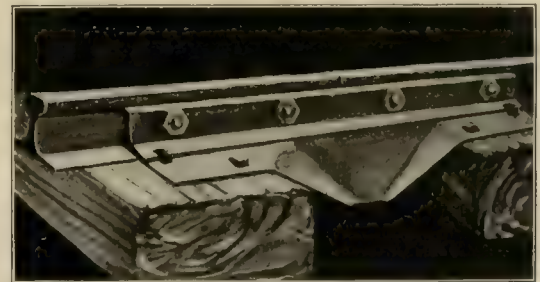
CARS AND TRUCKS FOR INTERBOROUGH COMPANY.

The Interborough Rapid Transit Co. of New York City, has ordered 200 cars and 460 trailer trucks from the St. Louis Car Co., all of which are now in the course of construction. The distinguishing features of the trucks are solid forged frames all the way around, insuring squareness and rigidity. These trucks are of the swing bolster type and the transom bars are all machine fitted. They will be run at a speed of 45 miles an hour.

The cars will have copper sheathing and "Transite" flooring which will make them virtually fire-proof. The general dimensions of the cars are as follows: Length over draw bars, 51 ft. 5 in.; length over corner posts, 42 ft. 7 in.; distance from center to center of needle beams, 10 ft. 11 in.; width over side sills, 8 ft. 8¾ in.; height of end door openings, 6 ft. 6¼ in.; height of body from bottom of sill to top of roof, 8 ft. 9¾ in.

Q & C BONZANO RAIL JOINT.

The accompanying illustration shows the Q & C "Bonzano" rail joint, which is in use on more than a score of the large steam roads of the country, and it is presented by the manufacturer as being expressly suited to electric interurban requirements. The engraving



BONZANO RAIL JOINT.

clearly defines the special features of the joint. It is claimed that the joint has the same strength and resilience as the rail, and that the rails receive equal support laterally and longitudinally, thereby obviating the tendency to spread.

It is further pointed out that this joint does not interfere with the expansion and contraction of the rail, and the vertical wave movement of the track under passing loads is continuous; also, extra tamping of the ties at the joints is unnecessary and the tie is not weakened by extra spiking. The first cost of these joints is said to be but a trifle more than that of angle bars where tie plates are used, and less labor is required on the track and shocks to the rolling stock are reduced.

The manufacturer and sole selling agent of the Bonzano joint is the Railway Appliance Co., Old Colony Building, Chicago.

The Boston & Worcester (Mass.) Street Railway Co.'s system was officially inspected June 26th and regular half hourly service was inaugurated July 6th. For 15 of the 44 miles the company owns a private right of way. It takes less than three hours to cover the distance without speeding.

SELF CONTAINED STREET RAILWAY CARS.

The accompanying illustrations show two views of a new motor car which is being put upon the market by the Chicago Motor Vehicle Co. These cars are entirely self contained, being operated by a gasoline motor and they contain many features which specially adapt them for light street railway service, such as owl cars or for places where the expense of equipping and maintaining a trolley system would not be warranted by the amount of traffic. The car shown in the illustration weighs 7,500 lb., is about 20 ft. long over all and seats 22 passengers. It is driven by a two cylinder engine of opposed type of 25 h. p. capacity which is extremely compact in its design and is capable of operating the cars up to a speed of 30 miles an hour. This equipment provides sufficient excess power for hauling trailers and one of the illustrations shows one of these cars switching two freight cars at the company's side tracks at Harvey, Ill.

One of the most important features of this car is its driving gear which is known as the Worth friction drive. This drive consists of a large disk connected on one end of the main engine shaft, its face being covered with leather which is cemented and riveted to the disk. Against this disk a friction wheel runs which is carried on a shaft whose ends are geared directly to the car axles, the friction wheel running at right angles to the disk. The car is controlled by merely moving the friction wheel along its shaft to any part of the disk, one side of which runs the car in the forward direction and the opposite side backward. When the friction wheel is at the center of the disk there is no tendency for the car to run in either direction and by applying the pressure in this position the driving mechanism acts as a brake. In addition to this the usual wheel brakes are also provided. This friction drive permits the car to be controlled with the utmost ease and the rate of speed either backward or forward can be changed from zero to the maximum without changing the speed of the engine. The engine, however, is provided with a changeable gear so that the car may be arranged in a moment's time to operate at a low speed when a large amount of power

is required or at a higher speed when a light load is to be carried. This changeable gear is similar in its general arrangement to the back gear of a turning lathe. The frame of which the truck is composed is built up of hollow steel, the different pieces being first screwed together and afterward brazed. The oiling system of the engine is also entirely automatic, the oiler being brought up on one side of the controller where there are a number of separate sight feed gages running to the different parts, each of which gages may be set to feed at any rate desired.



GASOLINE MOTOR STREET RAILWAY CAR.

The heating of the car is provided by means of hot water which is carried through pipes underneath the seats. These pipes are con-



MOTOR CAR SWITCHING TWO FREIGHT CARS.

provided with roller bearings. It will be seen from one of the illustrations that passengers enter and leave the car at a door near the front, this design having been adopted so that the car can be operated entirely by one man who, in addition to handling the controlling mechanism can collect the fares as passengers leave the car.

The value of an entirely self contained car of this character for many purposes is generally understood and the economy with which such a car can be operated makes it very desirable for light traffic. These cars are highly endorsed by Robert McCulloch, general manager of the Chicago City Railway Co.; J. F. Wallace, general manager of the Illinois Central Railroad Co.; Robert Quayle, superintendent of motive power, Chicago & Northwestern Ry., and others.

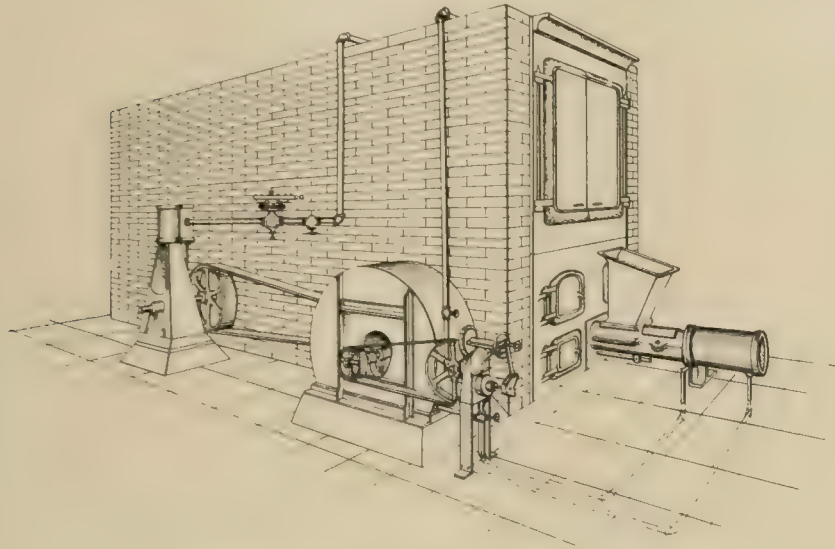
AN ABSOLUTELY AUTOMATIC MECHANICAL STOKER.

The Under-Feed Stoker Co., manufacturer of the well-known Jones under-feed mechanical stoker, has perfected an automatic device to be used in connection with its stoker that is automatic in every sense of the word. The accompanying illustration shows the principle upon which it is constructed. Heretofore, stokers have been termed "automatic" when, strictly speaking, they were only partially automatic, as it has always been necessary for the operator to readjust the automatic device when it was necessary to change the fuel supply, and it has also generally been necessary for the operator to regulate the draft. The application of the device can be made to any of the Jones stokers that have been manufactured for the past five or six years.

On stokers now made which are equipped with the automatic device referred to, the slide valve formerly used on the stoker is removed, as well as the valve stem, the stoker automatic cut-off lever, and operating handle. In place of the slide valve a rotary disk valve is used, this being placed on a standard in close proximity to the blower. This valve is operated by a belt connecting it to the blower, which is in turn operated by the engine shown at the side of the boiler in the illustration. The speed of the engine is governed by the regulating valve in the steam pipe between the boiler and the engine. As the steam approaches the blowing off point the regulating valve closes, the speed of the engine is reduced, necessarily reducing the speed of the blower and the rotary valve which controls the ram plunger that conveys the fuel into the furnace. If steam falls the regulating valve opens, the speed of the engine, the blower supplying the air, and the disk valve controlling the feed to the stoker is immediately increased, the entire operation being entirely automatic and being governed by steam pressure alone and without any attention from the operator. The quantity of air is automatically proportioned in accordance with the quantity of fuel used. The duty of the fireman therefore consists of keeping

a supply of coal in the hopper and cleaning his fires. If a battery of boilers is equipped, a rotary disk valve for each stoker is placed upon the standard referred to.

Stokers equipped with this automatic device (the Cole) have been



ARRANGEMENT OF AUTOMATIC MECHANICAL STOKER.

in use about a year, but the manufacturer until recently has made no great effort to introduce the automatic attachment as the company does not believe in experimenting in the plants of its customers.

perature is frequently far below zero. The cars, however, have been found quite equal in heat-retaining qualities to those of standard construction. We learn that the people of these cities have from the first regarded these cars very favorably. The illustrations show how little the cars vary from the usual types of open and closed cars. The appearance is attractive and the fact that they guarantee protection from summer storms and are quickly opened or closed to meet changes of temperature renders them doubly attractive to passengers. The enclosed vestibules assist in keeping the car warm in winter and do not detract from coolness in summer, since the sashes may be dropped and the doors left open.

In the illustration of an interior, a window and panel are raised into the roof pocket to show the neat appearance and simple arrangement of the system of runways in the posts. The window runways are entirely of metal, a design adopted to eliminate the sticking danger of the sashes. It will be noticed that the curtain runways extend to the floor. This is for protection from wind or sun. The round-corner seat-end panels add stiffness to the base of the posts and give a finished appearance to the car when it is open. Seats for 36 passengers are provided, the seats being of the reversible back type, upholstered in spring cane. The cars are finished inside in natural cherry and have decorated birch ceilings.

The general dimensions are as follows: Length over end panels, 25 ft. 9 in.; length over crown pieces and vestibules, 35 ft. 2 in.; from end panels over vestibules, 4 ft. 8½ in.; width over sills and



BRILL CONVERTIBLE CARS FOR BENTON HARBOR AND ST. JOSEPH.

There are about 100 stokers in Detroit, Mich., alone equipped with the device which the manufacturer states is the only stoking device manufactured in which the fuel and air supply are correctly and automatically proportioned and regulated by the steam pressure in the plant.

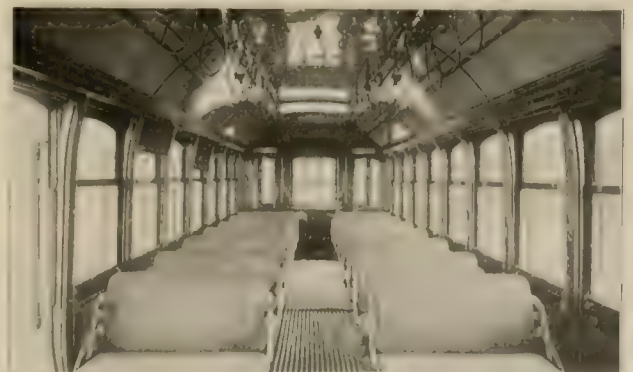
NEW TOURING CAR FOR CLEVELAND.

The Cleveland Electric Railway Co. has put into service, beginning July 12th, a city touring car, on which a two hours' ride may be taken for 25 cents. It is a large open car and it leaves Public Square at 9 and 11 a. m., and 1, 3, 5 and 7 p. m. There are several very pretty routes in Cleveland and vicinity and the innovation promises to become popular. Mr. J. W. Butler is manager of the excursion and pack business of this company.

MORE CONVERTIBLE CARS FOR BENTON HARBOR AND ST. JOSEPH.

A second order for convertible cars has lately been completed by the J. G. Brill Co. for the Benton Harbor & St. Joseph (Mich.) Electric Railway & Light Co. The first order was for four cars of a shorter length mounted on single trucks. These cars have evidently given good service and have successfully met the climatic conditions. Situated on the east shore of Lake Michigan, the cities, from which the railway company takes its name, are exposed in winter to severe storms which blow from the west across the lake, and the tem-

perature is frequently far below zero. The cars, however, have been found quite equal in heat-retaining qualities to those of standard construction. We learn that the people of these cities have from the first regarded these cars very favorably. The illustrations show how little the cars vary from the usual types of open and closed cars. The appearance is attractive and the fact that they guarantee protection from summer storms and are quickly opened or closed to meet changes of temperature renders them doubly attractive to passengers. The enclosed vestibules assist in keeping the car warm in winter and do not detract from coolness in summer, since the sashes may be dropped and the doors left open.



INTERIOR, BRILL CONVERTIBLE CAR

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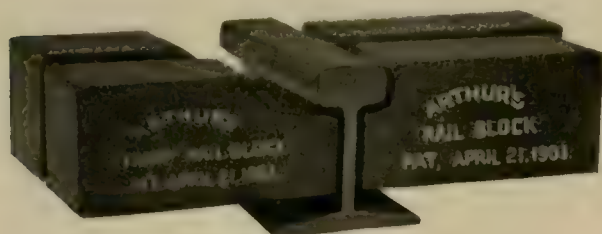
RAIL PAVING BLOCK.

An improved rail paving block has recently been placed on the market which was designed by Mr. William H. Arthur, superintendent of public works at Stamford, Conn. These blocks which are illustrated herewith are designed to be used with T-rail for city pavements. The block, which has been patented by Mr. Arthur, is so arranged that there is practically no chance of the groove alongside the rail becoming clogged with dirt or substances of any kind



VIEW SHOWING RIDGE.

and it is further arranged so that carriage wheels can readily mount out of the groove without any liability of sliding along the rail or being wrenched at the axle. These blocks are intended to be placed between the ordinary paving block and the rail and they are so shaped that a space is left for the travel of the flanges of the car wheels. One end of the block is provided with an inclined shoulder running off into a toe designed to butt against the web of the rail. The top of the block lies on a level with the top of the rail and there is a space between the top of the toe and the head of the rail which will permit of the dirt which gathers in the groove being pressed out of the way under the head of the rail as the flanges of the car wheels pass along. The inclined shoulder of the block is provided with a raised rib at its center and when the blocks are placed in position these ribs are far enough apart to allow a carriage wheel to mount out of the groove and cross the rail without any difficulty whatever.



PAVING BLOCK FOR T-RAILS.

The tire of the wheel strikes one of these ribs, thereby securing a grip on the pavement so that there is no liability of wrenching the wheel. These blocks may be made out of any material and by their use the T-rail will be as unobjectionable in city streets as the grooved girder rail, and the disadvantages of the latter will be avoided. The advantages of the T-rail for traction purposes over any other section is generally understood. It is cheaper, and owing to the absence of the groove and to its symmetrical section a lighter rail may be used, giving an equally substantial track. It has also a cleaner head and it offers no attraction to street traffic. This paving has been examined by a number of railroad contractors and engineers, among whom is Col. N. H. Heft, by whom it has been highly recommended.

ADVERTISING LITERATURE.

THE BALDWIN LOCOMOTIVE WORKS, of Philadelphia, has just issued "Record of Recent Construction No. 43;" 32 pages, 6 x 9 in., illustrated.

THE GOULD STORAGE BATTERY CO., 25 W. 33d St., New York City. Bulletin No. 3, June 10, 1903, on "Line Batteries;" 8 pages, illustrated, 8 x 10½ in.

THE UNDER-FEED STOKER CO. OF AMERICA published the June issue of "The Publicity Magazine," issued in the interests of the Jones stoker, the report of a test conducted by N. C. Wilson, M. E., of Pittsburg, on Geary water tube boilers equipped with

Jones stokers, the report showing an excellent record of efficiency; views of several plants equipped with this device were also published in the June issue.

THE H. W. JOHNS MANVILLE CO., in a 12-page pamphlet, 3½ x 6 in., points out the meritorious features of the Kearsarge flange joint gaskets, which it manufactures, giving prices, directions for ordering, etc.

THE NATIONAL BRIDGE CO., Indianapolis, offers "a few suggestions regarding permanent bridges" in a 16-page pamphlet, 3¼ x 6¼ in., containing data and photographs that cannot fail to interest railway managers and contractors.

J. HOLT GATES & CO., Chicago, western agents for the Skinner Engine Co., Erie, Pa., are sending out circulars illustrating the company's product. On one page is shown the railway type of Corliss engine built by C. & G. Cooper Co., whom Messrs. Gates & Co. also represent.

THE ROOT TRACK SCRAPER CO., of Kalamazoo, Mich., has issued a 16-page pamphlet, illustrated, devoted to the Root spring track scraper and flanger, which is endorsed by about 50 leading electric railway companies. The Root scraper is fastened to the trucks and it follows the rail on the curves, instead of swinging far out, as when fastened to the body of the car. It is highly commended.

THE CROCKER-WHEELER CO., Ampere, N. J., has issued a 16-page pamphlet, 5 x 7½ in., on "The Source of the Electric Light." It treats of the Crocker-Wheeler generators and contains half-tone views of several important units installed by the company. Also Bulletin No. 35, for June, 1903, on "Equipment of a Railway Shop." This is a description of the new locomotive and car shops of the Lake Shore & Michigan Southern Ry. at Collinwood, O. It is handsomely gotten up.

THE MAYER & ENGLUND CO., of Philadelphia, publishes in the "Keystone Traveler" for June "The Tale of Seven Cities," it being an outline in poetry and prose of the nature of seven exceptionally large contracts recently received for the "Protected" rail bond, for which the Mayer & Englund Co. is general sales agent. The cities whence these contracts were received are Boston, Brooklyn, Buffalo, Rochester, Columbus, Indianapolis and Manila. Each chapter is attractively illustrated. Numerous other specialties handled by this enterprising company are advertised in the little paper, also.

THE GENERAL ELECTRIC CO. has issued the following publications: Bulletin No. 4,321, "Continuous Current Two-wire Switchboards with Fuses." Bulletin No. 4,322 (supersedes No. 4,170), "Running Light Telltale Boards." Bulletin No. 4,323 (supersedes No. 4,272), "Small Direct Coupled Generating Sets." Bulletin No. 4,325, "General Electric Air Brake Switches." Bulletin No. 4,326, "Manhole Junction and Fuse Boxes." Supplement to Supply Catalog No. 7,554, "Combined Socket and Shade Holder." Price List No. 5,109 (supersedes No. 5,104), "Type H Oil Transformer, Low Frequency Type." Price List No. 5,110 (supersedes No. 5,105), "Type H Oil Transformers, High Frequency Type."

THE WESTINGHOUSE ELECTRIC & MANUFACTURING CO., Pittsburg, Pa., has issued the following publications: Detail Catalog No. 300 (supplement No. 4, superseding pages 266 to 273), "Westinghouse Regulating and Reversing Controllers, Commutator Type, for Direct Current Motors." Folder No. 4,020, "Westinghouse Regulating and Reversing Controllers, Commutator Type, for Direct Current Motors." Special Publication No. 7,008, "Electrically Driven Shops," by Robert L. Warner. Folder No. 4,019, "Some Facts About Meters and Transformers." Circular No. 1,033 (revised edition, superseding March, 1903, edition and Circular 1,034), "Direct Current Engine Type Generators."

THE GOHEEN MANUFACTURING CO., of Canton, O., sole manufacturer of "Carbonizing Coating" and "Galvanum," has issued two pamphlets treating of these products that should interest every railroad manager, engineer and contractor. The pamphlet dealing with "Carbonizing Coating" is entitled "Hitch Your Wagon to a Star," the particular star to which the company calls attention being a paint to protect iron and steel structures from the ravages of rust and corrosion. "Carbonizing Coating," it is claimed, will withstand to a greater degree the vicissitudes of actual service under all classes of conditions than red lead, graphite or structural paints generally. Acid and sulphur fumes, smoke, steam, brine, gas and moisture do not affect it. There are numerous views of structures

protected by "Carbonizing Coating," together with strong testimonials from users. For "Galvanum" the company claims unhesitatingly that it is the only paint that will adhere permanently to galvanized iron surfaces. It is made in two colors. The "Galvanum" pamphlet also contains convincing views and testimonials. In addition to these pamphlets the company issues a folder emphasizing the merits of "Carbonizing Coating" and containing also the company's guarantee, price list, etc.

TRADE NOTES.

THE DORNER TRUCK & FOUNDRY CO., of Logansport, Ind., reports having in hand several large contracts for its high speed suburban motor brakes.

THE GREEN FUEL ECONOMIZER CO., Matteawan, N. Y., reports that the Springfield (Mass.) Street Railway Co. has installed another Green economizer, of 3,000 h. p. capacity, in its latest power station.

LYTLE HUNTER recently closed a contract with the St. Louis Transit Co. for 500 or more car fenders to be used on World's Fair cars. These cars are being delivered by the St. Louis Car Co. to the St. Louis Transit Co.

THE ARBUCKLE-RYAN CO., Toledo, O., has just closed a contract with the Galesburg Gas & Electric Co., Galesburg, Ill., to build a new street railway power house and lighting plant combined at an estimated cost of \$200,000.

THE SILLS-EDDY MICA CO. announces that its main office is now located at its factory in Newark, N. J., instead of the Broad Exchange Building, New York City. All communications to it should be addressed to Sils-Eddy Mica Co., P. O. Box 135, Newark, N. J.

ONE OF THE LARGE trunk lines has just placed an order for about 10,000 tons of heavy steel rails for the Pacific coast. The well-known house of Arthur Koppel, 66-68 Broad St., New York City, has been successful in securing this and several other large railway orders.

THE CANADIAN GENERAL ELECTRIC CO., Ltd., Toronto, Canada, is now representing the Electric Storage Battery Co. in the sale of the "Chloride" accumulator and the "Exide" accumulator, throughout Canada, and all inquiries from Canada in regard to storage batteries should be addressed to the Canadian General Electric Co., Ltd.

J. P. HORNADAY & CO., Cincinnati, O., announced that they have removed to Suite No. 1108 Traction Building, where they are prepared to buy and sell corporation bonds and industrial securities; build, organize and equip traction and street railways, public utilities and industrial properties, and will purchase entire issues of corporation securities.

THE REEVES ENGINE CO., of Trenton, N. J., reports among its recent sales two large cross-compound, vertical, direct-connected engines for the new municipal lighting plant at Bluffton, Ind., and several direct connected engines for the Bullock Electric Manufacturing Co., several of which are for export. The Reeves company is operating night and day with two shifts of men in order to catch up with the orders on hand.

THE DULUTH STOKER CO., of Duluth, Minn., advises us that it has just closed a contract with the American Steel & Wire Co. for eight "Duluth" stokers of 320 h. p. each, with the option on 14 more of the same size. The company is now installing stokers in plants at South Chicago, Detroit, Cleveland, Madison, Me., and West Superior, Wis. We understand that the company intends to manufacture the "Duluth" stokers in Chicago.

THE UNDER-FEED STOKER CO. of America has decided to establish its advertising department in separate quarters, because of the rapid growth of the business. The advertising department will have its headquarters in Room No. 1533 of the Marquette Building, Chicago, the general offices being at 837 to 842 of the same building. A recent order of the company is from the Boston Elevated Ry. for stokers for 1000 h. p. of boilers.

ADAM COOK'S SONS, 313 West St., New York City, advise us that testimonials showing the superiority of "Albany Grease" for lubricating machinery of all kinds are received daily. One of the latest is from Capt. Orlan Clyde Cullen, inventor and manufacturer of the Cullen ball bearing guns, Waterlick Station, Va., who writes:

I have tested the sample of 'Albany Grease' and same gave very

satisfactory results, far better in fact than several I have tried in the past five years. Please send me by freight to Waterlick Station, Va., one barrel of 'Albany Grease' No. 3, and six more grease cups same as the one you sent." Adam Cook's Sons are the sole makers of this lubricant.

THE GREEN ENGINEERING CO., of Chicago, reports closing several large contracts recently for Green traveling link grates, among them one for eight stokers for 300-h. p. boilers for the Oak Park Construction Co., to replace stokers of another make; also six stokers for 500-h. p. boilers for the Barrett Manufacturing Co., Peoria, Ill.; also link grates for the new plant of the Independent Light & Power Co., at Quincy, Ill., and for the Illinois Steel Co.'s new works at South Chicago.

WESTINGHOUSE, CHURCH, KERR & CO. report the receipt of orders recently as follows: Edison Electric Illuminating Co., Brooklyn, one 4,500 h. p. Westinghouse vertical cross compound corliss engine for its Bay Ridge station; Coney Island & Brooklyn Railroad Co., one 26 and 52 by 48-in. Westinghouse horizontal cross compound corliss engine for its South Brooklyn plant; Boston & Northern Street Railway Co., Lynn, Mass., one 30 and 60 by 48-in. Westinghouse horizontal cross compound engine of 1,620 i. h. p. capacity with a maximum of approximately 3,000 i. h. p.

THE BURT MANUFACTURING CO., Akron, Ohio, recently received its 12th order from the Baldwin Locomotive Works for exhaust heads. The order was for 12 heads, making a total of 33 in use by the Baldwin company, which indicates that the Burt exhaust head is all its maker claims it to be. The Burt exhaust head is an appliance to fit over the end of the exhaust steam pipe, designed to effectually prevent oil, wet steam or water from escaping to rot roofs and disfigure walls. A booklet describing the exhaust head will be sent by the Burt Manufacturing Co. to anyone writing for it.

WILLIAM C. BAKER, sole owner and manufacturer of the Baker hot water car heaters, advises us that several times within the past two or three years complaint has been received that the combination cocks furnished with the Baker heaters were defective and unsatisfactory. Having finally obtained one of the alleged defective cocks it was found that although bearing the registered trade mark "BakR", it was of spurious manufacture and an inferior article. An investigation was made, the spurious article traced to the manufacturer and an injunction against further infringement secured.

THE STERLING-MEAKER CO. placed its new single register the "No. 5" on the market about a year ago, it being shown only in a square case. This register is now offered in either round or square cases, the diameter of the round case being the same as the diagonal diameter of the square one, 11 in. The accuracy, simplicity of construction and power of endurance of this design have commended it very highly, and it is not too much to say that it has acquitted itself with great credit. The manufacturer has courted the most severe tests and reports that the register has been run at high speed up to two million registrations on several occasions.

THE H. W. JOHNS-MANVILLE CO. is in receipt of the following self-explanatory letter from Barney E. Oldfield, of Toledo, O., who on Saturday, June 20th, broke the world's automobile track records at Indianapolis: "In breaking the world's automobile record for one mile and five miles, today, at Indianapolis, my racing machine was packed with the Johns-Manville Co.'s 'Mobilene' packing. This packing successfully withstood the tremendous strain and pressure incident to this service and I hereby recommend it to whom it may concern." A copy of the letter, together with a newspaper clipping giving an account of Mr. Oldfield's achievement, are being sent out by the H. W. Johns-Manville Co. in a post card folder.

THE STANDARD ENGINEERING CO., of Cleveland, O., was recently incorporated for general engineering and contracting purposes, succeeding to the business formerly conducted by the Standard Engineering Co. of Detroit. The company is composed as follows: President, F. A. Little; vice-president, George L. Wells; secretary, A. J. Wells; treasurer, J. H. Tufel; consulting electrical engineer, W. E. Davis; consulting chemist, Henry L. Payne. These gentlemen are well and favorably known in their professions. They are prepared to do all classes of engineering, structural and architectural work, making a specialty of plans, specifications, surveys and superintendence for the construction of electric and steam railway systems, electric power and lighting plants, bridges, development of water power, etc., and they also make a specialty of investment re-

gold car heating company's main office is in the Garfield Building, Cincinnati, and it has a branch office in the Chamber of Commerce Building, Detroit, and another at Main and Canal Sts., Cincinnati.

THE GOLD CAR HEATING & LIGHTING CO. advertises that the sale of Gold Heating apparatus during the past year has been nearly double that of any year since the business was established. Among the orders for car locomotive and electric car heating equipments, which in the aggregate number 4,000 equipments in the United States alone, there may be mentioned the following electric railways: Brooklyn Heights, 200 equipments; Metropolitan, New York, 100; South Side Elevated, Chicago, 20; Scranton Ry., 15. The company also reports that last month an order was received from abroad calling for several thousand sets of its specialties. The principal office of the Gold Car Heating & Lighting Co. is at Frankfort and Cliff Sts., New York City.

THE WM. B. SCAIFE & SONS CO., of Pittsburg, Pa., sole manufacturer of the We-Fu-Go and Scaife water softening and purifying systems, has found it necessary to build an addition to its present plant at Oakmont, Pa., to accommodate increased business in this line, and has just completed the erection of a new shop 60 ft. wide by 100 ft. long, equipped with the latest improved machinery, which will be used exclusively for manufacturing the We-Fu-Go and Scaife systems, in addition to the present shops. The company has, at the present time, systems aggregating 95,000 h. p. under construction for steam boiler plants, in addition to plants for softening water to be used in manufacturing process, such as dyeing and bleaching in woolen and cotton mills, and for washing in laundries.

THE GOULD STORAGE BATTERY CO., New York City, reports among recent contracts and installations the following: Berlin Street Railway Co., Berlin, N. H., a floating battery, 220 cells, type O-515; San Jose Street Railway Co., San Jose, Cal., through Western Electrical Supply Co., 255 cells, type O-11, with 22 k. w. regulating booster; Newton & Boston Lines, Boston, Mass., removing battery which formerly floated at station to Lexington, Mass., adding cells of type S-611 in 617 tanks, and an automatic regulating booster of C. E. M. F. type with capacity of 50 k. w.; St. Louis Smelting & Refining Co., duplicating plant at Desloge, Mo., by installing 250 cells of type O-519, changing plates to form two batteries of 11 plates in 19 plate tanks, each battery to be equipped with a double 15 k. w. booster of C. E. M. F. type.

PAWLING & HARNISCHFEGGER, crane builders, Milwaukee, Wis., advise us that business conditions are excellent. They believe the volume of business to be contracted for during the rest of the year will be large and possibly equal that of the past six months. There seems to be no cessation in orders, which come from a constantly widening area and in many instances from industries that have not heretofore been much in the market. This firm contemplates erecting an entirely new plant on National Ave., near the city limits. The details of this plant are not entirely completed, though it is expected that operations will soon begin. The sales during June averaged one machine per day and are represented by the following: Pittsburg & Montana Coppr Co., Butte, Mont.; Chapman & Co., Pittsburg & Montana Copper Co., Butte, Mont.; Chapman & Co., Buffalo; New York Edison Co., New York City; Metropolitan Street Railway Co., Kansas City, two specials; The A. & F. Brown Co., Elizabethport, N. J.; Standard Oil Co., of New York, Atlas Works, Buffalo, two cranes; Kelly & Jones Co., Greensburg, Pa., two cranes; Standard Steel Works, Burnham, Pa.; Allis-Chalmers Co., Gates Works, Chicago; Edward Ford Plate Glass Co., Toledo; Ingersoll-Sergeant Drill Co., Easton, Pa., four wall cranes and one double extension crane; Lobdell Car Wheel Co., Wilmington; Atlantic, Gulf & Pacific Co., San Francisco; Gisholt Machine Co., Madison, Wis.; Singer Manufacturing Co., Elizabethport, N. J.; S. M. Jones Co., Toledo, two cranes; McConway & Torley Co., Pittsburg; Minneapolis Steel & Machinery Co., Minneapolis; Stacey Manufacturing Co., Cincinnati; Pfeiffer Stone Co., Batesville, Ark.; Ohio Quarries Co., Amhurst, Ohio.

NEWS NOTES.

FRANCHISES ASKED OR OBTAINED

WALLACE, IDAHO—Herman J. Rossi and associates were granted a 10-year franchise for an electric road in Wallace and its additions.

L'ANSE, MICH.—W. L. Mason, of L'Anse, has applied for franchises for a trolley line to connect Pequaming, Baraga and L'Anse with Keweenaw Bay. This is said to be a Detroit company.

Creaghead Flexible Brackets

ARE STANDARD

**CREAGHEAD
ENGINEERING
CO.**
ENGINEERS
and MANUFACTURERS

OVERHEAD LINE MATERIAL.

For Single
and Double
Wire.



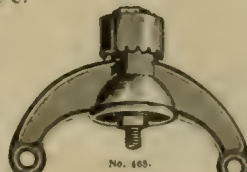
West End Cap
and Cone and
Solid Types of
Insulators.



Trolley Splice,
Strain Ear, Feeder
Ear, etc.



Solid Type
Insulators.



Ears for Round Figure S.
and Groove Forms of
Trolley Wire



No. 200.



No. 467.



No. 489.

Type D. For Single
and Double Wire.



No. 499.



No. 448.

Complete Equipment for
Overhead Construction.

THE CREAGHEAD ENGINEERING CO.

ENGINEERS AND
MANUFACTURERS

WRITE FOR
CATALOGUE

CINCINNATI,
OHIO.

STREET RAILWAY REVIEW

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The Convention City—Saratoga Springs, N. Y.

Where Will Be Held the Twenty-second Annual Convention of the American Street Railway Association, the Seventh Regular Annual Meeting of the Street Railway Accountants' Association of America and the First Annual Meeting of the American Railway, Mechanical and Electrical Association, September 1—4, 1903.

The village of Saratoga Springs is located near the eastern edge of the state of New York and is near the gateway of the Adirondack region. Its name is derived from the old Indian name—Se-rach-tague—meaning the hillside country of the great river. Although but a small village if classified according to its resident population Saratoga Springs is renowned throughout the world for the great number and peculiar qualities of the mineral springs found in its vicinity. As a summer resort it is one of the most famous in America and the constantly increasing influx of summer visitors has resulted in building of a number of commodious hotels until

Spring Park, the entrance of which is near Congress Hall. This park is a handsome reservation laid out with charming walks, flower beds, deer reserve, band stands and other attractions. An entrance fee is charged but once within the park all the features of the place may be enjoyed without further charge.

The sources of amusement at Saratoga are many, one of the principal ones being the fine drives into the surrounding country. The most popular drive is to Saratoga Lake situated about four miles from the village. On this drive the visitor passes Canfield's Place, notorious as a miniature Monte Carlo, and the Saratoga Race Track,



TYPICAL VIEW OF BROADWAY SARATOGA SPRINGS, DURING THE SEASON.

Saratoga now boasts the largest and finest collection of hostilities in the country. The mineral springs upon which the fame of Saratoga is based are found in a small valley extending from Balston Spa to Quaker Springs, a distance of about 17 miles. In the center of this valley is the village of Saratoga Springs near which are all of the most noted springs, about 15 in number. For several centuries the Indians had known of the "medicine waters" and had used them freely for the cure of many ailments. In 1774 the first hotel was built in Saratoga by John Arnold of Rhode Island and the beginning of Saratoga Springs as a pleasure and health resort date from that year. The more famous of the springs are located within a few minute walk of the center of the hotel district. Perhaps the best known and most largely patronized are the Congress Spring and the Columbian Spring, both located in Congress

which is one of the oldest and finest racing tracks in the country. Racing was established here in 1864 and the racing season generally brings together many of the best thoroughbred horses on the American turf. Other prominent features of Saratoga include the Saratoga Golf Club with grounds located about a mile from Broadway on Church St., the Saratoga Polo Club with grounds just north of the golf links, a speedway which rivals New York's Riverside Drive; Woodlawn Park, a magnificent tract of nearly 1,000 acres, the country seat of the late Judge Henry Hilton; Yaddo, the estate of Mr. Spencer Trask, and numerous other magnificent country seats.

The Convention hall at Saratoga is on South Broadway near Congress Spring Park. The building has been the scene of a number of notable conventions of both great political parties. It was built at a cost of \$100,000 and seats 7,000 people.



PANORAMIC VIEW OF FAIR GROUNDS

Electrical Transportation Features of the Louisiana Purchase Exposition.

Arrangement of Electrical and Transportation Exhibit — Plans for the International Electrical Congress — Details of the Intramural Railway.

There are probably few, even of those directly connected in electrical transportation, who fully comprehend the unparalleled advancements made in this field during the last decade, and for this reason the management of the Louisiana Purchase Exposition has exceptional opportunities to provide an interesting exhibit, which shall include all of the latest improvements and inventions, covering every phase of construction and operation of urban and interurban electric railways. Street railway men will find their interest centered principally in two buildings containing the seven classes of exhibits devoted to street railways.

Five classes are in the Electricity Building, and are:

Class 428. Apparatus for generating electricity; dynamos producing direct, simple or multiphase alternating currents.

Class 429. Motors for direct or alternating currents.

Class 430. Modifications of currents. Motor-generators. Rotary converters. Transformers.

Class 431. Application to transportation; electric motors for railways and roadways. Methods of control of cars and trains.

Class 433. Appliances and methods for the distribution of electric energy; conduits, cables, bonds, tools, wires, switches, insulators, insulating materials, lightning arresters, circuit breakers, rheostats, and complete switch boards, etc.

In the Transportation Building are two other classes:

Class 463. Traction railways, intramural, suburban, industrial, etc. Various types of tracks upon different kinds of roads; switches and crossings; turn tables, implements for track laying, cleaning, etc.

Class 464. Cars drawn by animals; locomotives and automobile vehicles; rolling stock for street railways operated by mechanical traction; braking appliances; equipment for using stored power (hot water, compressed air, electricity, etc.).

From the classification it will be seen that space in the Electricity Building has been provided for all machinery and devices used in the generation and distribution of electricity, including direct and alternating current generators, boosters, motor-generators, trans-

formers, rotary converters, direct and alternating current railway systems of car and train control, electric locomotives, trolley, third rail, contact and underground conduit systems, electric signalling apparatus, telephones and telegraph apparatus, complete station and sub-station equipments with switchboards, instruments, lightning arresters, circuit breakers, storage batteries, etc.

In the Transportation Building will be shown car bodies, trucks, tenders, passenger, freight and special cars, track sweepers, snow plows, methods of grading, bridging maintenance of way, ties, spikes, chains, fish plates and other parts of the track, switches, crossings, transfer tables, turn tables and signal systems. Besides mechanical parts, the exhibits will also cover general railway management, time tables, distribution of rolling stock, cleaning and disinfection, handling of traffic, passengers, freight, express, parcels, tariffs and post office business.

An outdoor transportation exhibit will be made and in addition to this an experimental or testing track 1,800 ft. long will be constructed. It is intended to have speed, braking, acceleration, signal system and other tests to ascertain the merits of various equipments.

Everything indicates that all of these classes will be well filled with exhibits of the highest class; St. Louis itself is one of the great street car manufacturing centers and the local exhibits will be of great merit.

The Transportation Building covers an area 525 x 1,300 ft., over 14 acres. On the east and west fronts are three arched openings, each 64 ft. wide and 52 ft. high. Through these archways 14 permanent railroad tracks will be laid from one end of the building to the other. On the north and south fronts there are also three massive archways. The building will contain about four miles of standard gage railroad track, and even with this trackage two entire bents of the building are left free of rails and afford an exhibit space of 270,000 sq. ft.

The Electricity Building covers an area of about seven acres, and as great a part of this as possible has been made available for exhib-



LOUISIANA PURCHASE EXPOSITION.

its. A traveling crane will cover the space on the west side of the building and under this will be the heavy machinery. The north end of the building has been assigned to the British, German, French and Italian commissions.

A Week of Electrical Congresses.

A few weeks ago the announcement was made that the Hon. David R. Francis, president of the Exposition, and Mr. Howard J. Rogers, director of Congresses, had appointed a committee to organize an International Electrical Congress, and to have supervision and direction of the special events which will take place during the week of electrical congresses, September 12-17, 1904.

The officers of this committee of organization are: President, Elihu Thomson; vice-presidents, Prof. H. C. Carhart, C. F. Scott, W. E. Goldsborough and Dr. W. S. Stratton; secretary, Dr. A. E. Kenelly; treasurer, W. D. Weaver; advisory committee, B. J. Arnold, B. A. Behrend, C. S. Bradley, J. J. Carty, A. H. Cowles, Prof. E. B. Crocker, Dr. Louis Duncan, H. L. Doherty, H. A. Fessenden, W. J. Hammer, Carl Hennig, Dr. L. B. Stillwell, Prof. C. P. Matthews, R. D. Mershon, K. B. Miller, Dr. W. J. Morton, Dr. E. L. Nichols, Prof. R. B. Owens, Dr. F. A. C. Perrine, Prof. M. I. Pupin, Prof. J. W. Richards, Prof. H. J. Ryan, W. S. Stanley, C. P. Steinmetz and A. J. Wurts.

According to the present plan the International Electrical Congress will comprise three elements: First, a house of delegates appointed by governments. Second, the main body of the congress divided into sections. Third, conventions of various electrical associations of the United States held simultaneously, which associations will assume the direction of the sections of the congress with which they are most closely allied.

The sections proposed for the main body of the congress are:

- A. General Theory: Mathematical and Experimental.
- B. General Applications.
- C. Electro-Chemistry.
- D. Electric Power Transmission.
- E. Electric Light and Distribution.
- F. Electric Transportation.
- G. Electric Communication.
- H. Electrotherapeutics.

It is believed that this is the first instance in which electricity has been given so important a recognition as that which will be accorded it at St. Louis. Electricity is constantly attracting more attention for the reason that it is brought more and more closely

in contact with the great mass of our population in its practical applications, and, because each year gives birth to the discovery of some new electrical phenomena to attract the attention of laymen and absorb the time and energy of specialists.

The electrical week at St. Louis will bring to the surface all that is best in the field of electrical engineering. A whole series of special demonstrations will be prepared by the exhibitors of electrical apparatus and appliances and by the exhibitors in allied lines. These special demonstrations will supplement the already fine presentation of the topic "Electricity" in the Electricity Building, in the electrical power plant of the Machinery Building, and in the electrical sections of the Transportation and Mining Buildings. The fact that such elaborate preparations are being made is due to the interest taken in the events of the electrical week by all of our national electrical societies, and by the further fact that the events of the week are to be crowned by the deliberations of the International Electrical Congress.

This congress is organized on lines more broad and more far-reaching than has been any assembly of engineers ever convened. Seven of the great national electrical organizations have already officially decided to hold conventions at St. Louis during the electrical week and in conjunction with the International Electrical Congress. This action on their part will insure a remarkable attendance of persons interested in electricity, and their interest will be stimulated and broadened when it becomes generally known that the national electrical organizations of Europe are signifying their intention of being represented at the electrical congress by delegations. In fact, in view of the interest which the rapid growth of electrical engineering undertakings in the United States has excited abroad, it is not too much to expect that from three to five hundred foreign electricians will meet with us in St. Louis.

The American Street Railway Association will be invited to hold its convention in St. Louis in 1904, during the week the International congress is in session, and to assume the direction of Section F, devoted to electric transportation. The Tramways Associations of Europe will also be invited to participate.

To young engineers this gathering should prove an inspiration. To see, to hear, and to come into contact with the men of Europe, world-famous in electrical science, as well as engineering, is an opportunity not to be disregarded. Such opportunities occur but rarely, and it is much to be regretted that the inspiration of the presence of the many eminent men who gathered together at the International Electrical Congress held in Chicago in 1893, through

and of circumstances, did not indicate our larger audiences. As soon as the work is changed as the electrical work is being organized with the greatest good to the greatest number in view.

The accompanying illustrations show the very advanced stage of the work on the Exposition. The Electricity Building is now

The panoramic view of the Exposition is taken from the Administration Building at the west end of the grounds. In the foreground stand the Mexican Building, and just beyond it the Machinery Building. Between the Machinery and the Transportation Buildings can be seen the white towers of the Electricity



ELECTRICITY BUILDING AT THE PRESENT TIME.

entirely completed, except for the groups of statuary which will surmount the corner towers and the balconies over the main and side entrances. This building is one of the most attractive at the Exposition, and has a place in the main picture which surrounds the Grand Basin and fronts on the cascades.

The Transportation Building is now about 30 per cent completed. Its main approach is illustrated in the special view taken on the

Building. To the left of the Electricity Building, in the background, is the Manufactures Building. The foreground to the left of the panoramic view is occupied by the central portion, now building, of the Transportation Building, while back of the Transportation Building are the towers of the Varied Industries Building. At the extreme left of the Varied Industries Building is one of the fire-engine houses which dot the grounds at many points. In the



TRANSPORTATION BUILDING AUG. 1, 1903.

first of August. It is a building finely proportioned for the service it is to render and possesses dignity in outline.

The Hall of Congresses, in which the International Electrical Congress will be held, is a fine large stone building on the Exposition grounds and contains halls amply large to accommodate the International Electrical Congress and the affiliated national electrical associations.

foreground, at the extreme left, is shown the skeleton work of the large fire-proof boiler plant which is being erected to house the steam generators for all of the power to be developed on the grounds.

Above the boiler-house on the hill, at the right, stands an ornamental building which bounds the western extremity of the colonnade surmounting Cascade Hill. Just at the right of the main

towers of the Machinery Building can be seen the Government Building on a hill in the far distance. It stands at the extreme eastern border of the grounds. Just to the left of the Government Building stand the obelisk towers and globes which are the characteristic elements in the architecture of the Mines Building.

It is believed that this panoramic view shows a progress that will

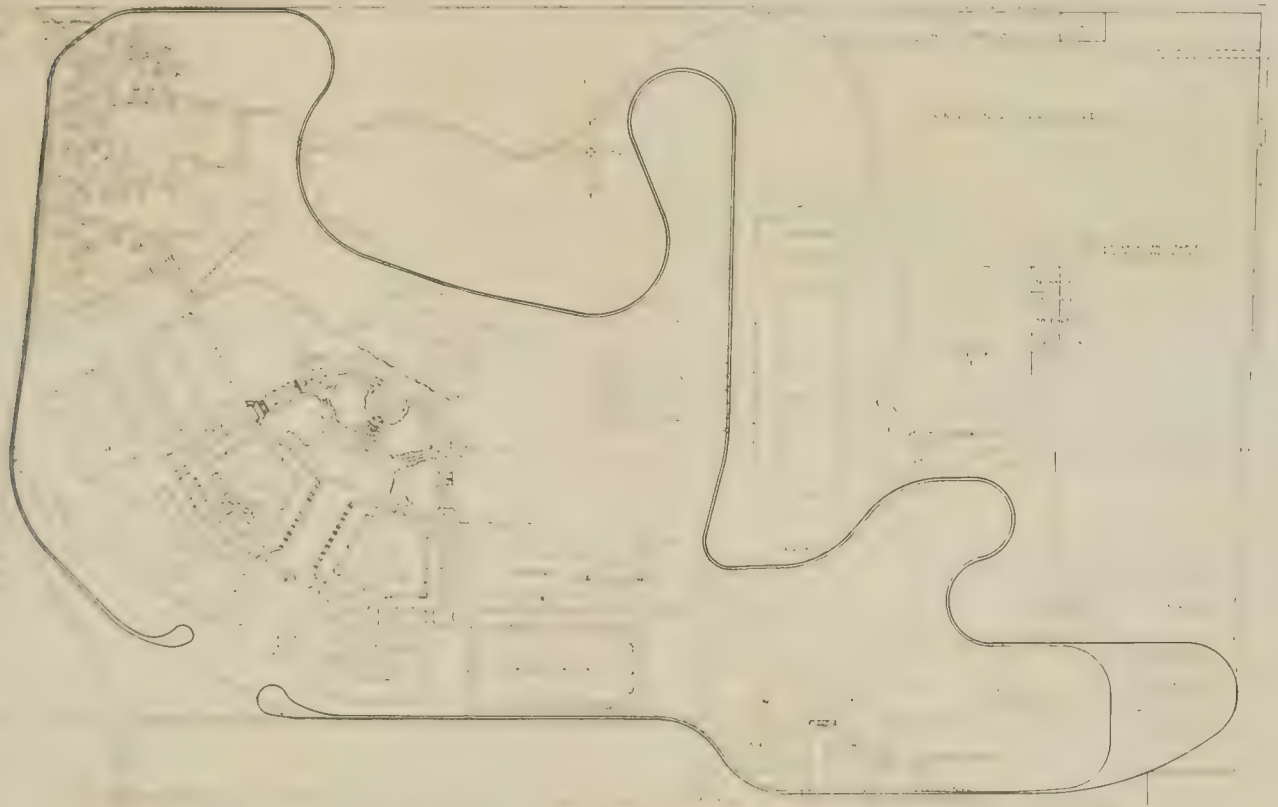
come as a surprise to many who are not intimately in touch with the St. Louis Exposition. It is hard to believe that any exposition could ever eclipse the great exposition in Chicago in 1893, and yet in St. Louis there is growing up an "Ivory City" which will eclipse the "White City" by about the same measure that the latter surpassed all its predecessors.

The Intramural Railway for the World's Fair.

BY RICHARD H. PHILLIPS, CHIEF CIVIL ENGINEER, LOUISIANA PURCHASE EXPOSITION

The exhibit area of the Exposition will be about 250 acres, as compared with 150 acres in Chicago in 1903, and the grounds will comprise nearly two square miles.

The initial loop of the Intramural Railroad begins at the west side of the Peristyle, which is at the north end of the Central avenue of the main picture. The line runs westerly, parallel to the



MAP OF EXPOSITION GROUNDS, SHOWING ROUTE OF THE INTRAMURAL RAILWAY

This territory is so much greater than was ever covered by any previous exposition, that it was deemed wise to construct a double track intramural railway which makes a complete circuit of the buildings.

Varied Industries and Transportation Buildings, crosses Skinner Road, and proceeds in a westerly direction, passing between the Exposition power house and Cupples' Building No. 2. (These are a part of the Exposition's permanent University Buildings.)



EMBANKMENT FOR INTRAMURAL
Crests will gain construction track down in place



TRACKLAYING NEAR TAMMA AVE

The out-going track passes to the west of the Athletic Field and terminates at the western part of the Washington University grounds, and the in-coming track on the east side of the Athletic Field. From a point southwest of the Athletic Field on Forsyth Ave., the road swings to the southwest, passing near the space allotted to the United States Government Grass Exhibit, and thence turning back east, leaving the Grass Exhibit on the left and Arrow



PILE DRIVING FOR TRACKS NEAR HORTICULTURAL BUILDING.

Head Lake on the right. One arm of this Lake will be devoted to the Philippines and the other to a display of the United States Life Saving Service.

Proceeding eastwardly, the Forestry Building and the French Pavilion will be on the left and the Agricultural Building on the right. On reaching Skinker Road, the track turns to the south, with a straight piece of track nearly one mile in length, passing the "Ship" concession, "Battle Abbey," the Refrigerating Plant, Agriculture and Horticulture Buildings, Stock Barns, and the Wireless Telegraphy Station. At the south side of the grounds, near the end of Skinker Road, the road doubles back, passing again the

Wireless Telegraphy Station, the group of Fine Arts Buildings, the Outside Mines and Mining Exhibit, before reaching the south-east gate and the section set aside for State Buildings.

From this point, the road follows the east line of the grounds northwardly, passing the following buildings in the order named: Indian Territory, Mississippi, Illinois, Ohio, Minnesota, Missouri, United States Government Main Exhibit Building, Engine House No. 1, Press Building, Manufactures Building, "Model City," turning the second loop on the east side of the Peristyle some 400 feet from the initial point.

Returning, the track follows the same route, except the portion near the Athletic Field, which divides, as already mentioned.

The railway will be about six miles in length, with a total of 13 miles of track. The road for the most will be on the surface enclosed by an ornamental fence, and at no point will the grade exceed 3 per cent. No curve greater than 20 degrees will be used, except the loops at each side of the Peristyle which are 150 ft. in diameter. On account of the rolling grounds five trestles will have to be constructed, the deepest across the ravines southwest of the Arts Building and the largest near the Government Building. Here the hill has a slope of about 80 degrees, but the track will be laid on a trestle 1,000 ft. long and a cut will be made into the upper plateau. The Division of Works will undertake this construction and has just let several contracts, one to the Southern Paving & Construction Co. for the grading and one to the Myers Construction Co. for the bridge and trestle work. The elevated portion of the structure comprises 6,650 ft. There are 17 regular stations.

The loops at each end of the Peristyle obviate the necessity of crossing under the main entrance. At the Suburban entrance and Parade entrance, under crossings will be made without excavation. Near the United States Government Grass Exhibit, the Horticulture Building, the southeast gate and the west end of the Transportation Building, viaducts will carry visitors over the track; all other crossings will be at grade.

Fifty cars will be operated. Ten of these will be open cars; the others will be closed cars, similar to those now being operated on the St. Louis & Suburban Ry. The latter cars weigh about 54,000 lb. and will seat 52 passengers. Each car is equipped with four 40-h. p. motors, and will have multiple-unit control. These cars have been ordered from the St. Louis Car Co. The contract for the 51 equipments have been let to the General Electric Co.

It is intended to have 17 trains of three cars each on the road, and the first ten are to be in operation on or before September 1st, next. The air brake equipment is of the Christensen type and will be furnished by the National Electric Co., of Milwaukee.

The trip from the west side of the Peristyle around the grounds back to the east side of the Peristyle, will be made in about 45 minutes, giving an approximate running schedule of about eight miles per hour.

Design of the Intramural for the St. Louis World's Fair.

A Discussion of the Original Design, With Estimates on Performance and Cost.

BY CHARLES V. WESTON, MEM. AM. SOC. C. E.

In connection with the brief general description of the Intramural Railway for the Louisiana Purchase Exposition which appears in this number of the "Review," it is believed that a discussion of the general considerations which governed the original design as submitted by Weston Brothers, of which firm the writer is a member, together with some of the principal details, will be of interest. The plan for the railway finally adopted differs in several respects from that first recommended, the principal changes being to build a greater portion of the road on the surface, which permitted a substantial reduction in cost, and to substitute a double track line with terminal loops for the single track loop first located. The change in alignment avoided carrying the intramural over the main entrance to the grounds and the consequent need for a station near this point of large capacity and of architectural design that would be in keeping with the adjacent fair buildings; in the alignment adopted the two terminal loops are either side of the Peristyle which leads to the Grand Basin. It will be noted also that the capacity of the

cars ordered is less than was at first contemplated, and that the motor equipments are lighter, the schedule speed having been reduced from 14 miles to eight miles per hour.

THE ORIGINAL DESIGN.

When the design of a transportation system for the Fair Grounds was taken under consideration by the engineers there were three points to be kept prominently in mind:

1. The greatest safety to passengers occupying vehicles, and to pedestrians who may be in the vicinity of the road used by these vehicles.

2. Efficiency of the service, in respect to frequency and speed and accessibility to the principal features of the Exposition.

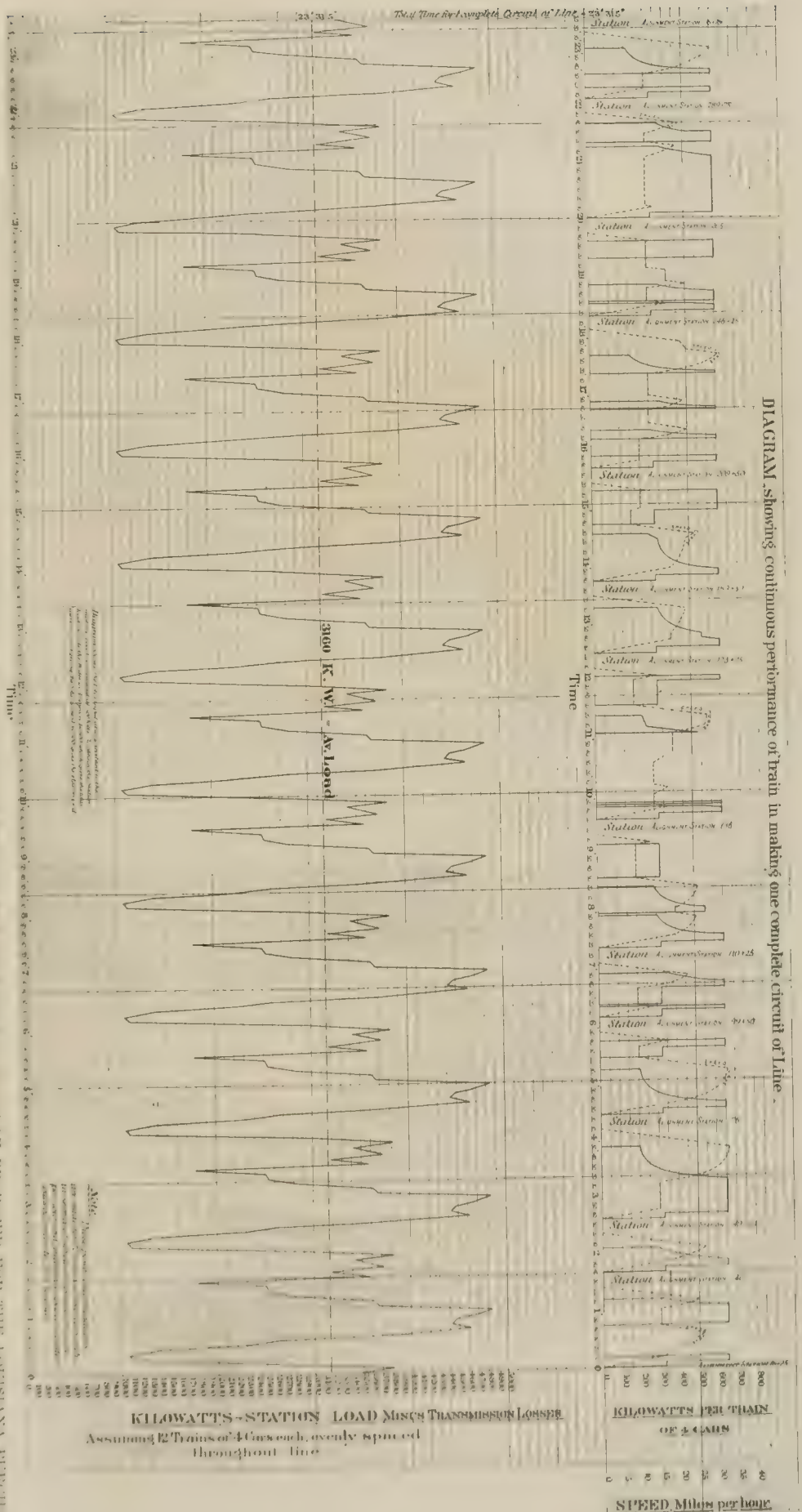
3. Financial investment required, cost of operation and maintenance and the possible net revenue, bearing in mind the salvage after the temporary purpose shall have been served.

Electricity was decided upon as the motive power because the

operation of electric elevated railways and of surface electric railways, constructed on a right of way from which other vehicles and pedestrians are excluded, has demonstrated that this method of operating passenger vehicles in congested districts, where speedy and frequent service is necessary, is the safest and most efficient mode of transportation known to man. The percentage of personal injuries to passengers carried in elevated railroad service is very small, the number of such injuries being approximately one person to each five hundred thousand carried, and a large portion of these injuries are trivial in extent. More persons are killed and injured from falling from buggies than by riding on elevated railroads. The operation of the Intramural Railway on the grounds of the Columbian Exposition at Chicago demonstrated the safety of the electrical propulsion of cars by the third rail system of contact, and conducting current. In fact there was not a single case of serious injury to passengers, and the entire expenses incurred on account of injuries and damages was \$27. The railway was operated during 180 days and carried 5,800,000 passengers, the maximum number carried in a single day being 125,000. The percentage of personal injuries due to the operation of surface electric railways where the third rail is used, and where the railway line is properly fenced to prevent pedestrians from entering and walking along the railway tracks, compares very favorably with the operation of the third-rail elevated railroads.

The alignment of the proposed railway (which is practically that decided upon, excepting the gap at the main entrance and the change which carries one branch of the line to the right of the Athletic Field, whereas the single loop line passed to the left) was made within reasonable walking distance of all of the principal points of interest, and 13 stations at which all trains should stop were conveniently located for easy access to the street car lines. Under maximum conditions of traffic it was proposed to operate 12 trains of four cars each at a little less than two minute headway, the time required to make a complete circuit of the 3.1 mile of railway being 23 1/2 minutes. The number of

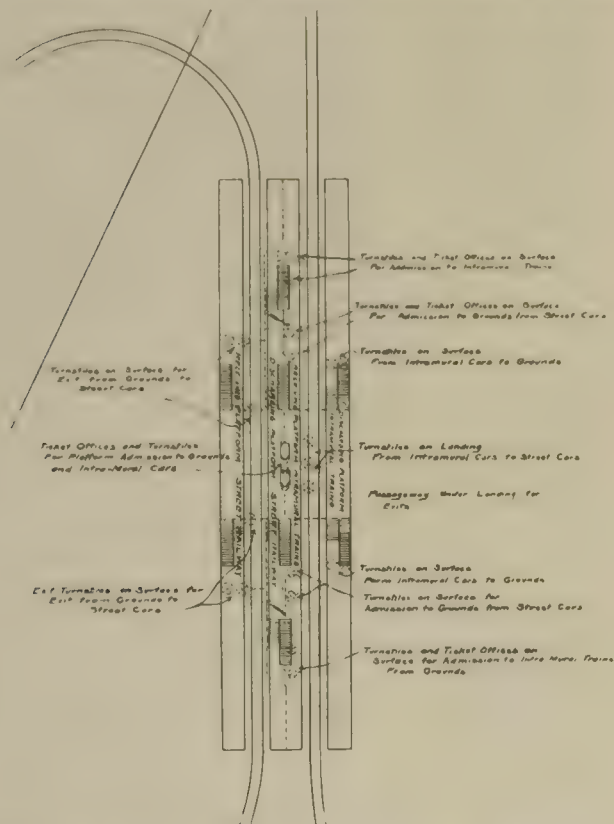
DIAGRAMS OF TRAIN PERFORMANCE AND POWER REQUIREMENTS FOR ASSUMED MAXIMUM SERVICE FOR INTRAMURAL RAILWAY PROPOSED FOR THE COLUMBIAN EXPOSITION



cars which would pass a given point in one hour would be 120 and the seating capacity of each car being not less than 75 passengers, the capacity of the railway as a piece of mechanism for transporting people would be 9,000 round trip passengers per hour. The schedule time, including stops at stations, was made 14 miles per hour, requiring acceleration to maximum speeds of 35 miles per hour. The maximum capacity of the railway with 12 trains of four cars each in service, for a 16-hour day would be 144,000 round trip passengers.

The cost to produce this electric railway including all the necessary appliances ready for operation was estimated to be approximately \$660,000. The cost of operation including the purchase of current was placed at approximately \$150,000, making the total outlay for construction and operation approximately \$810,000. The average salvage to be obtained from the sale of the structure and equipment was estimated to be not less than 40 per cent of the original cost of \$264,000.

The estimated number of passengers to be carried at 10 cents



GENERAL PLAN OF PROPOSED TERMINAL STATION AT SKINNER ROAD AND LINDELL BOULEVARD. STREET RAILWAY LOOP AT LEFT INTRAMURAL RAILWAY AT RIGHT.

each is 10,000,000, giving an income of \$1,000,000 from passengers. Adding the estimated salvage and deducting construction cost and operating expenses, gives the estimated revenue at \$454,000.

As finally located the railway line formed an irregular single track loop, the complete circuit of which was 29,200 ft.; 16,325 ft. of the railway being designed to be an elevated track, supported on a timber structure, and the remaining 12,875 ft. to be constructed at the surface of the ground. The line was so located that certain portions of it would be coincident with parts of the Belt Railway, which was to be constructed by the Exposition company to serve the buildings of the Exposition during the construction period. The portions of the belt railway tracks it was proposed to utilize for the purposes of the Intramural Railway, extend from a point near the Skinner Road, at the southwesterly corner of Forest Park, to a point in the rear of the Fine Arts Building, and for a short distance near the southeasterly corner of the Exposition site, the total length of the Exposition company's track to be utilized being 5,255 ft.

The following extracts from the specifications as submitted by the writer's firm will explain the character of construction proposed:

The elevated structure is to consist of a series of towers with deck

spans of Howe trusses between them, the towers being 12 ft. square and spaced 42 ft. between centers, each tower to comprise two bents of posts with three posts in each bent. The bents to be tied together with caps, sills, struts and tie rods, the bents resting on mud sills placed 6 ft. below the surface, or on pile foundations as the nature of the ground might require. For the elevated track, ties to be 6 x 8 in. laid with the 8-in. side vertical, spaced 16 in. between centers, and dapped 1 in. over the top chords of the track trusses, and each fourth tie bolted. Ordinary ties to be 8 ft. long with each sixth tie 9 ft. long to provide a support for third-rail insulators. Outer and inner guard timbers, 6 x 8 in., by not less than 20 ft. in length to be provided, and bolted to each alternate tie.

Surface track to be laid with 6 x 8 in. x 8 ft. ties spaced 2 ft. between centers, each fifth tie being 9 ft. long.

The track rails to be A. S. C. E. section, 65-lb. per yard, in 30-ft. or preferably 60-ft. lengths. Third or trolley rail to be A. S. C. E. section 100 lb. per yard in 30-ft. lengths, supported on insulated blocks so that the center of the head of the trolley rail is 20 1/4 in. from the gage side of the track rail and 11 3/4 in. above the top of the ties. Bonds to have a cross section area of 250,000 c. m. and be placed under the splice bars.

Where necessary to omit a section of the trolley rail, the gap to be bridged with a lead covered cable of 1,500,000 c. m. cross section. On and for 20 ft. each side of curves less than 1,200 ft. radius, steel rails of the same section as the track rails to be used instead of inner guard timbers for the inner rail, being bolted to the track rail.

Track rail bonds to be No. 0000 of the protected type placed beneath the angle bars.

The rolling stock recommended was 52 double-truck open cars of the cross-bench type to seat not less than 75 passengers each. Trucks to be of 4 ft. wheel base of the general design of the Brill No. 27 truck. Wheels to be all steel or with cast steel centers and steel tires. Axles to be 6 3/8 in. in the gear fit, 5 1/4 in. in the motor bearings, and with bearings 4 1/2 x 8 in. Van Dorn couplers to be used. Each car to be equipped with four 50-h. p. motors with electric train control, and with automatic air brakes.

The feed and return system of cables was designed to maintain a pressure of 500 volts at the motor terminals under conditions of maximum demand when the initial pressure is 600 volts. In determining the maximum demand for current it was assumed that there were 12 trains of four cars each evenly placed on the line in the position where they will take the maximum current, each car being equipped with four 50-h. p. motors. This involved 32 cables, of from 700,000 c. m. to 1,000,000 c. m. in cross section, and one of 300,000 c. m.; the lengths varied from 440 ft. to 3,937 ft.; the total weight of cables was 130,315 lb.

These estimated copper requirements could have been reduced, or entirely dispensed with, but it would be at the sacrifice of speed and ability to handle promptly and safely the maximum number of people possible with the system developed to the highest capacity.

One other point which the engineers especially emphasized, was the installation of a block system of signals set forth in the specifications as follows:

"The entire line shall be equipped with a system of automatic block signals, so arranged that the spacing of trains will be uniform and so that when trains are standing at stations they will be protected from following trains. These signals must be so arranged that when a signal blade is set at clear, giving a train the right to proceed into the block, the passage of the first wheel of the train over a fixed point in the track near the signal post will mechanically and automatically set the signal blade at danger, and the signal blade will remain set at danger against all approaching trains until the train which has actuated the signal on entering the block shall pass out of the block, when the signal will again be actuated and go to clear.

"The signals must also be so constructed that should a train violate a signal and enter a block which is occupied by another train, the air brake apparatus on the train so violating the signal will be automatically operated and the brakes applied in emergency application. Furthermore, should a train attempt to enter a block in violation of a danger signal and pass or partially pass the signal before the brakes could stop the train, the signal violated must remain at danger until both trains in the block have passed out of the block limits, in other words, the signal must remain at danger until every train in a block has passed into the block ahead."

11. Traffic.—The fluctuations of load maximum and minimum, and the average load, are indicated on this diagram.

The power determinations are made for twelve trains of four cars each in service at the same instant, operating at a schedule speed of 14 miles per hour and uniformly spaced on the line at intervals of 1 minute and 38 seconds. The maximum speed allowable is 33 miles per hour, rate of acceleration $1\frac{1}{2}$ miles per hour per second, rate of retardation $1\frac{3}{4}$ miles per hour per second. The allowable speed on curves is taken as follows:

- 1° to 4° curves, maximum speed 33 miles per hour.
- 4° to 8° curves, maximum speed 20 miles per hour.
- 8° to 15° curves, maximum speed 15 miles per hour.
- 15° to 20° curves, maximum speed 13 miles per hour.
- 20° to 30° curves, maximum speed 10 miles per hour.

The peak loads at the power house under this assumed maximum traffic and considering only the current input at motor terminals, as indicated on the diagram, would be 4,800 kw., the average load being 3,100 kw. All power determinations were made on the basis of 600 volts pressure at the generator terminals, and an allowable drop of 100 volts at the motor terminals. Taking into consideration the transmission loss, the actual maximum power house load would be 1.2 of that indicated on the diagram, or, approximately, 5,860 kw., and the average load would be approximately 3,800 kw.

The power house requirements for the assumed maximum conditions were greater than it was estimated they would be before the performance diagrams were worked out for the line as it is located. The heavy gradients and large amount of curvature were conditions which could not be avoided, and in order to develop the maximum efficiency of the railway as a machine for conveying passengers, a schedule of 14 miles per hour, with trains spaced approximately two minutes apart, must be maintained with the 48 cars in service. Operated at the 14-miles per hour schedule, 120 cars per hour would pass a given point, and assuming the seating capacity of each car to be 75 passengers and that each passenger made one complete circuit of the loop, the maximum capacity of the service would be 9,000 passengers per hour. It was considered very probable that should the Intramural Railway be constructed as located, there would be many days during the period of the Exposition, when for several hours at a time the demand would exist for a service of capacity greater than 9,000 round trip passengers per hour.

The estimate of the cost of building and equipping the railway, ready for operation, based on the plans and specifications outlined was as follows:

Elevated Structure.

| | |
|---|-----------|
| Foundation excavation 21,450 cu. yd. @ 50 cents..... | \$ 10,725 |
| Timber in structure 3,282,302 ft. B. M. @ \$35 per M..... | 117,882 |
| Metal, rods, bolts, etc., 1,018,741 lb. @ 5 cents..... | 50,937 |
| Track rails, 300 tons @ \$35..... | 10,500 |
| Track joints, 975 @ \$1..... | 975 |
| Track rail bonds, in place, 1,950 @ 70 cents..... | 1,365 |
| Conductor rails 100 lb. per yd., 232 tons @ \$35..... | 8,120 |
| Conductor rail joints, 520 @ \$1.25..... | 650 |
| Conductor rail bonds, 1,940 @ 70 cents in place..... | 728 |
| Cross bonds in place..... | 50 |
| Trolley rail insulators, 3,060 @ 60 cents..... | 1,836 |
| Guard rails (steel 65-lb. per yd) 45 tons @ \$35..... | 1,575 |
| Tangent track laying, 11,340 ft. @ 40 cents..... | 4,536 |
| Curved track laying, 4,264 ft. @ 90 cents..... | 3,838 |
| Placing trolley rails, 15,600 ft. @ 10 cents..... | 1,560 |

\$215,277

Eight Elevated Stations.

| | |
|---|-----------|
| Timber required, 667,672 ft. B. M. @ \$35 per M..... | \$ 23,368 |
| Metal bolts, rods, etc., 68,768 lb. @ 5 cents..... | 3,438 |
| Screens, wire, 6 ft. high, 2,800 lin. ft. @ 36 cents in place.. | 908 |
| Exit turnstiles, 64 @ \$20 each..... | 1,280 |
| Entrance turnstiles, 32 @ \$50 each..... | 1,600 |

\$ 30,594

Surface Railway Complete.

| | |
|---|-----------|
| Grading, 6,934 cu. yd. @ 25 cents..... | \$ 11,735 |
| Ties, 9 ft. long, 1,052 @ 60 cents..... | 631 |
| Ties, 8 ft. long, 3,067 @ 50 cents..... | 1,534 |
| Track rails, 65 lb. per yd., 160 tons @ \$35..... | 5,600 |

| | |
|---|-------|
| Joints, angle bars and bolts, 620 @ \$1..... | 620 |
| Conductor rail, 100 lb. 74 tons @ \$35..... | 2,590 |
| Joints, angle bars and bolts, 277 @ \$1.25..... | 347 |
| Guard rails, 65-lb., 22 tons @ \$35..... | 779 |
| Track rail bonds, 1,240 in place, @ 70 cents..... | 868 |
| Trolley rail bonds, 554 in place @ 70 cents..... | 378 |
| Cross bonds..... | 30 |
| Trolley rail insulators, 1,935 @ 60 cents..... | 621 |
| Ballast, 4,200 cu. yds. @ 50 cent..... | 2,100 |
| Track laying, 8,300 lin. ft. @ 10 cents..... | 830 |
| Fencing, 8,300 lin. ft. @ 8 cents..... | 664 |
| Cattle Guards (est'd) 8 in place @ \$10..... | 80 |
| Road crossings (est'd) 4 @ \$15..... | 140 |
| Subway crossings (est'd) 2..... | 1,200 |

\$ 20,738

Six Surface Stations.

| | |
|---|----------|
| Timber in place, 248,000 ft. B. M. @ \$35..... | \$ 8,880 |
| Metal, bolts, nails, rods, etc., 6,600 lb. @ 5 cents..... | 330 |
| Screens, 3,720 lin. ft. @ 36 cents..... | 1,339 |
| 12 entrance turnstiles @ \$50..... | 600 |
| 12 exit turnstiles @ \$20..... | 240 |

\$ 11,389

Electrifying Belt Railway Track.

| | |
|--|--------|
| Ties, 9 ft. long, 710 @ 60 cents..... | \$ 420 |
| Ballast, 2,625 cu. yd. @ 50 cents..... | 1,312 |
| Track rail bonds, 700 @ 70 cents..... | 490 |
| Conductor rails, 100-lb., 80 tons @ \$35..... | 2,800 |
| Conductor rail joints, 175 @ \$1.25..... | 217 |
| Conductor rail bonds, 350 @ 70 cents..... | 245 |
| Conductor rail insulators, 710 @ 60 cents..... | 426 |
| Cross bonds..... | 20 |
| Guard rail, 65-lb., 24 tons @ \$35..... | 840 |
| Laying conductor rail, 5,300 ft. @ 10 cents..... | 530 |

\$ 7,306

Block Signal System.

| | |
|---|-----------|
| 14 blocks with overlaps, automatic central for 52 cars..... | \$ 16,000 |
|---|-----------|

Feeder System and Conduits.

| | |
|---|-----------|
| 130,000 lb. bare copper cable, in place @ 15 cents..... | \$ 19,500 |
| 44,000 ft. pump log conduits, in place @ 10 cents..... | 4,400 |

\$ 23,900

| | |
|---|-----------|
| 52 cars complete, @ \$6,000 each (est'd)..... | \$312,000 |
| Engineering supervision and administration expense..... | \$ 20,000 |

Summary.

| | |
|--|-----------|
| Elevated structure, complete..... | \$215,277 |
| Elevated stations..... | 30,594 |
| New surface railway..... | 20,738 |
| New surface stations..... | 11,389 |
| Electrifying service track..... | 7,306 |
| Block signals..... | 16,000 |
| Feeder system..... | 23,900 |
| 52 cars complete..... | 312,000 |
| Administration, engineering and supervision..... | 20,000 |

Total cost, exclusive of power.....\$657,204

In connection with the design of the Intramural Railway proper there were prepared plans for street railway terminal stations at De Baliviere Avenue and at Lindell Boulevard. These plans are shown in the accompanying illustrations. The estimate of cost given does not include the construction of the suggested street railway terminal stations, but does include that portion pertaining entirely to the Intramural Railway.

Messrs. Schmidt and Gallatin, who submitted a plan for a moving platform in the subway between the Williamsburg Bridge and Bowling Green, in New York City, announced their acceptance of the condition imposed by the Rapid Transit Commission to indemnify the city for all the money expended by it in that connection, and it is expected that they will be awarded the contract to equip that portion of the subway system with what is called a "continuous train."

A New Single-Phase System of Electric Traction.

Westinghouse Installation for the Baltimore, Washington & Annapolis Electric Ry.

In the adaptation of alternating current to railway traction there is a radical difference between the system employed on the various foreign roads, and one that is to be used in this country, this difference lying essentially in the use of a single phase, series wound motor in place of the three-phase induction motor, with generators, transmission lines, trolley, car equipment, etc., modified to the single-phase system.

This motor, which is designed to have practically all of the functions and merits of the ordinary direct-current railway motor, and

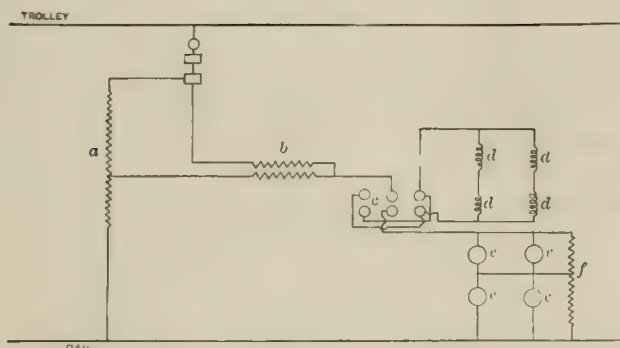


FIG. 1.—DIAGRAM OF WIRING.

a. Auto-transformer. b. Induction regulator. c. Reversing switch. d. Fields of motors. e. Armatures of motors. f. Equalizing transformer.

avoid many of the limitations of the direct-current and induction motors has been developed by Mr. B. G. Lamme, acting chief engineer of the Westinghouse Electric & Manufacturing Co.

The first application of this system is to be on the Baltimore, Washington & Annapolis Ry., which as projected will extend from the suburbs of Washington, D. C., a distance of 31 miles to Baltimore, with a branch from Annapolis Junction to Annapolis, 15 miles.

The credit for the great success of the present railway system in almost universal use is not due to any inherent advantages of direct-current, but to the series type of motor, coupled with the fact that heretofore no suitable single-phase, alternating-current motor has been perfected. The greatest advantages of the direct-current

be single-phase, and the motor should have the variable speed characteristics of the series direct-current motor.

The polyphase motor is essentially a constant speed machine, does not possess any true variable speed characteristics, and requires two or more trolley wires.

A new type of motor therefore is necessary, as none of the alternating-current motors in commercial use is adapted for the speed, torque, and other requirements of first class railway service.

The type of motor designed by Mr. Lamme for the Washington, Baltimore & Annapolis road is similar in general construction to a direct-current motor, but with its magnetic circuit laminated throughout, and with such properties that it can successfully commutate alternating current. It is a plain series motor, and can be operated

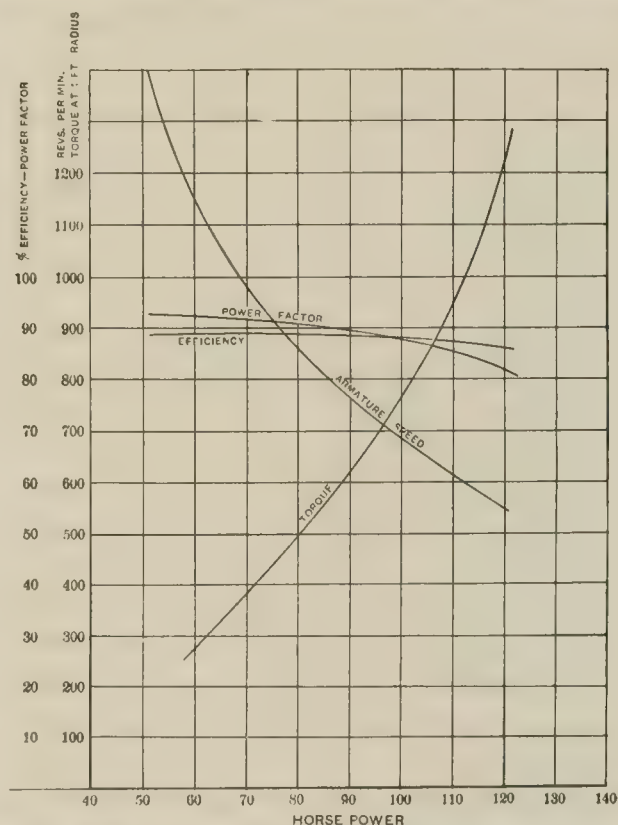


FIG. 2. WESTINGHOUSE ALTERNATING CURRENT RAILWAY MOTOR NO. 91. SINGLE PHASE. 220 VOLTS.

on either alternating or direct current and will have the same torque characteristics in either case.

In the operation of this road single-phase alternating current will be supplied to the car at a frequency of 16.23 cycles per second, or 2,000 alternations per minute, the current from the overhead trolley wire being normally fed in by one trolley at approximately 1,000 volts.

The alternating current to the car is carried through a main switch or circuit breaker on the car (See Fig. 1), to an auto-transformer, d, connected between the trolley and the return circuit. At approximately 300 volts from the ground terminal a lead is brought out from the auto-transformer and passes through the regulator, b, to one terminal of the motors. For starting and controlling the speed, an induction regulator, b, is used with its secondary winding in series with the motors. This secondary circuit of the regulator can be made either to add to, or subtract from the transformer voltage, thus raising or lowering the voltage supplied to the motors. The regulator therefore does double duty. The controller for the

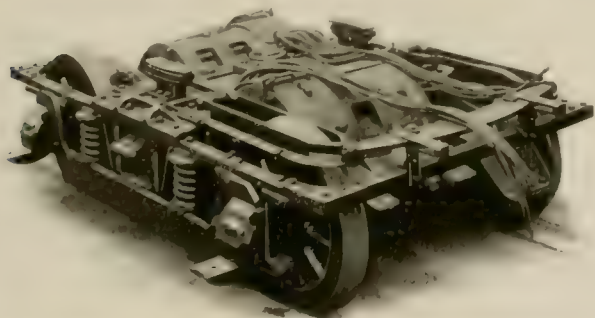


FIG. 3. NEW SINGLE PHASE ALTERNATING CURRENT RAILWAY MOTORS ON TRUCK.

are a series wound motor, giving a variable speed, and its use of a single-circuit, necessitating only one trolley and one trolley wire.

The new system, similar to that of steam roads, a much higher voltage than that practicable with the present direct-current system is essential and must be provided for. It is evident that an alternating current railway system, to equal the direct current, should possess the two principal features of a variable speed motor and a constant speed motor, and in order to succeed, should avoid as far as possible the disadvantages of its rival. The system must, therefore,

direct-current motor merely lowers the voltage supplied to the motor, but an alternating current regulator can be connected for an intermediate voltage, and can either raise or lower the motor voltage. In this way the regulator can be made relatively small, as it handles only the variable element of the voltage, and the maximum voltage in the secondary winding is but half of the total variation required.

In the equipments in question, the range of voltage at the motor is to be varied from approximately 200 volts up to 400 volts or slightly higher. The transformer on the car will supply 315 volts, and the secondary circuit of the regulator will be wound to generate slightly more than 100 volts when turned to the position of its maximum voltage. This voltage of the regulator is about one-fourth of that of the motors at full voltage.

There will be four motors of 100-horse-power on each car, the full rated voltage of each motor being approximately 200 volts. These will be arranged in two pairs, each consisting of two armatures in series and two fields in series, the two pairs being permanently connected in parallel.

Since voltage control is used, there is no necessity for series-parallel operation, as with direct-current motors. To ensure equal voltage to the armatures in series, a balancing or equalizing action is obtained by the use of a small auto-transformer, *f*, connected permanently across the two armatures in series with its middle point connected between them. The fields, *d*, are arranged in two pairs.

The induction regulator or controller resembles an induction motor in general appearance and construction. The primary winding is placed on the rotor, and the secondary or low voltage winding on the stator. The rotor also has a second winding which is permanently short-circuited on itself. The function of this short-circuited winding is to neutralize the self-induction of the secondary winding as it passes from the magnetic influence of the primary. The regulator is wound for two poles, and therefore is operated through 180 degrees, to produce the full range of voltage for the motors. One end of the primary winding of the regulator is connected to the trolley, and the other to a point between the regulator and the motors. It thus receives a variable voltage as the controller is rotated. There are several advantages in this arrangement of the primary in this particular case. First, the regulator is worked at a higher induction at start, and at lower induction when running, the running position being used in these equipments for much longer periods than required for starting. Second, when the motors are operating at full voltage the current in the primary of the regulator passes through the motors but not through the auto-transformer of the secondary of the regulator. This allows considerable reduction in the size of auto-transformer and regulator.

The fundamental difficulty in the operation of a commutator type of motor on single-phase, alternating current lies in the sparking of the brushes. This difficulty has been overcome in the present instance by so constructing the motor that the secondary or short-



FIG. 1. CONCRETE MIXING PLANT DETROIT, MICH.

with two fields in series and two pairs in multiple. This parallels the fields independently of the armatures, *e*, with the result that one reversing switch may serve for the four motors and one balancing transformer may be used across the two pairs of armatures.

The armature and field being connected in series, the entire current of the field passes through the armature as in ordinary series direct-current motors. The motor has eight poles and eight field coils, the latter wound with copper strap. The speed is approximately 650 revolutions at 200 volts.

The general arrangement of the auto-transformer, regulator, motors, etc., is shown in Fig. 1.

circuit current in the armature coil is small, and the commutating conditions so nearly perfect that the combined working and secondary currents can be commutated without sparking. This condition being obtained, the motor operates like a direct-current machine and gives no trouble at the commutator.

An extended series of tests was made with these motors at the Westinghouse shops at East Pittsburg, both in the testing room and under a car. Fig. 2 shows curves of the speed, torque, efficiency and power factor plotted from data from brake tests, the average power factor being approximately 86 per cent.

In the Washington, Baltimore & Annapolis contract the guarantee

given by the Westinghouse company is that the efficiency of the system shall be at least equal to that of the direct current system with rotary converter sub-station. The advantages claimed for the system may be thus summarized:

The rotary converter sub-station, an undesirable feature, chiefly on account of the cost of the apparatus and building, and the attendance required, is dispensed with.

By the use of alternating current the limits of voltage are at once removed, as transformers can be used for changing from any desired trolley voltage to any convenient motor voltage, and variations in supply voltage are easily obtained. The motor operates at relatively good efficiency at any speed within the range of voltage obtained. No rheostat need be used under any conditions, and the lower the speed at which the motor is operated, the less the power required from the line, while the least power is required at start, as the motor is doing no work and there is no rheostatic loss. The losses at starting are only those in the motor and transforming apparatus, the total being less than when running at full speed with an equal torque. This system, therefore, permits maximum economy in power consumed by motor and control, all economy in control not possible with the polyphase railway motor, as it is the equivalent of the direct-current shunt motor, with which the rheostatic loss is even greater than with the direct-current series motor.

The controller, a so-called "induction regulator", a transformer

Md., will be 133 ft. x 203 ft., and will contain three 24-pole, 1,500-kw., single-phase, Westinghouse alternators, operating at 83 r. p. m. and delivering current at 15,000 volts. These will be driven by cross-compound, Hamilton-Corliss engines. In addition there will be two Westinghouse 100-kw. exciters, 250 r. p. m. and 125 volts, a large switchboard with electrically operated oil-switches, circuit-breakers, lightning arresters, etc.

There will be nine transformer sub-stations distributed along the line. Each station will contain two Westinghouse 250-kw., oil-cooled transformers, supplying approximately 1,000 volts to the trolley line. This voltage is by no means an arbitrary limit, but was deemed sufficient, though a much higher voltage could be employed.

The cars, about 60 ft. long and weighing about 50 tons each, will be supplied with M. C. B. high-speed trucks, and it is expected that a normal speed of 40 to 45 miles per hour will be attained, with a possibility of 60 miles.

A branch line from Washington to Laurel, Md., 14 miles, is now being operated by direct-current, and will be taken over by the Washington, Baltimore & Annapolis company. Current for this line will be furnished by two Westinghouse 200-kw., 550-volt, 500 r. p. m., single-phase rotary converters located in the power house at Hyattsville. This apparatus is also a new departure, especially since it shows the possibility of operating the new system with the existing direct current equipments, which are to be retained.



FIG. 2. CONCRETE MIXING PLANT, DETROIT, MICH.

with the primary and secondary windings on separate cores, avoids the difficulties of the direct-current controller, being entirely non-sparking, and is adapted to handling very heavy currents.

As a frequency of 2,000 alternations per minute is used, the lighting of the cars and sub-station was at first considered a serious difficulty. This is overcome by the use of very low voltage lamps, allowing the use of a thick filament with considerable heat inertia.

Westinghouse multiple-unit control and air brakes will be used, the air compressor being driven by a small alternating current series motor.

The generating station, now under construction at Hyattsville,

PORTABLE CONCRETE MIXING PLANT.

The accompanying illustrations were furnished by the courtesy of Mr. John Kerwin, superintendent of tracks of the Detroit United Ry. Co., and show a construction train especially designed for placing concrete on street railway tracks, which is throughout the invention of Mr. Kerwin and was built under his direction in the track department shops of the company.

It will be observed that the train comprises three cars and on each of these is laid a track, the rails being connected with fish plates. The small car seen on the middle flat car, Fig. 1, is drawn

by a cable which is controlled by a lever placed near the operator. The small car loads one cu. yd. of stone, $\frac{1}{2}$ yd. of sand and $\frac{1}{2}$ barrel of cement. The sand is placed in the car first and the cement spread on top of it. The car is then run back into the rear car at the train and the loading is completed with broken stone. The rear car carrying the stone is provided with a false bottom high enough to allow the small car to pass under. The men then raise this false bottom which permits the stone to drop into the measuring car. When once loaded the small car is drawn forward and up the incline shown in Fig. 1 and dumped into the concrete mixer at the front of the first car.

The boy standing on the front of the platform of the mixer operates the water valve and the tank on the opposite corner contains just the proper quantity of water to wet down one batch of concrete. A batch of concrete can be mixed with this apparatus in five minutes. When mixed it is dumped as shown in Fig. 2, onto a platform car which is drawn by a horse to the point where the concrete is put on the track. The bottom of this is of gravel wagon bed construction so that any portion desired may be dumped first.

The mixing of the concrete is done in a revolving drum which is 8 ft. in diameter and 4 ft. in length. Only nine men are required to operate this concrete train and Mr. Kerwin reports the saving by its use amounts to about \$20 per day.

When the sand and stone cars are empty they are drawn away and two other loaded cars take their place.

STREET RAILWAY CONVENTIONS.

The Street Railway Association of the State of New York will hold its twenty-first annual convention at Syracuse, N. Y., October 6 and 7, 1903. The conventions of this association are usually held in September, the date being changed this year in order not to conflict with the Saratoga conventions. President, G. Tracy Rogers; secretary, H. A. Robinson, 621 Broadway, New York.

The eleventh annual convention of the Pennsylvania Street Railway Association will be held at the Park Hotel, Williamsport, Pa., on Wednesday, Sept. 23, 1903. The officers of the association are: President, E. H. Davis; general manager of the Williamsport Passenger Railway Co.; secretary, Charles H. Smith, superintendent Lebanon Valley Street Railway Co., Lebanon, Pa.

July 20, 1903, there was organized at Oklahoma City, O. T., the Southwestern Electrical Association of Oklahoma and Indian Territory to embrace the electrical interests of the southwest. It is intended to hold semi-annual conventions, the first of these being called for Oct. 9-10, 1903, at Oklahoma City. The program is to include papers on telephone, electric light and street railway subjects. The membership fee for the Association is \$10, reduced to \$5 for charter members joining before the October convention. This membership fee includes the current year's dues. The officers of the Association are: President, Charles W. Ford; secretary, G. W. Gooper.

The Union Internationale de Tramways et de Chemins de Fer d'Interet Local under date of July 20th issued the announcement for the next convention which will be held in Vienna in 1904, in the first part of September. The exact date has not yet been fixed. The questions set for discussion are as follows:

- 1, Funds for replacement; 2, Control of transfers; 3, Economies in current consumption for cars; 4, brakes for electric tramways; 5, Protection of aerial conductors from contact with telephone, telegraph and other wires; 6, Use of trail cars on urban lines; 7, Advantages and disadvantages of electric traction for light railways (Chemins de fer d'interet local.); 8, Current for light railways; 9, Superstructure for light railways. The questions which are to be discussed in the forms of papers are: 10, Legislation affecting tramways and light railways in different countries of Europe; 11, System of accounting and monthly report of operation; 12, Inspection and maintenance of electrical installations; 13, The use of automobiles on tramways and light railways.

Responses to queries should be addressed to the secretary-general, No. 6 Impasse du Parc, Brussels, Belgium, not later than Oct. 30, 1903. The officers of the association are: President, Leon Janssen, and secretary general P. t'Serstevens.

OILING ROADBEDS IN CALIFORNIA.

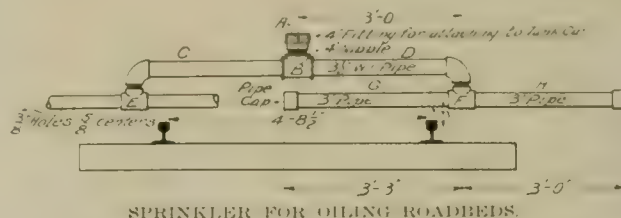
In southern California there is scarcely any rain from April to October and in consequence the roads, unless liberally sprinkled, become very dusty. Electric cars moving over these roads raise such clouds of dust that it is almost a torture to ride in them. To remedy this condition the management of the Pacific Electric Railway Co., of Los Angeles, recently began to use crude oil for laying the dust and has met with such success that the system is being oilled as fast as possible.

Mr. S. McClure, roadmaster for this company, has devised a sprinkler which can be attached to tank line cars, which are hauled over the road by one of the track department cars.

The sprinkler is made entirely of pipe and fittings and although very simple is giving good results. It consists of a fitting A which connects to the tank car. Below this is a tee B with $3\frac{1}{2}$ -in. wrought iron pipes C and D running from it. These pipes have elbows at the outer ends and below these are tees E and F with 3-in. pipes G and H. The pipes G and H are capped at the ends and are drilled with a single row of $\frac{3}{8}$ -in. holes on the under side, spaced $\frac{5}{8}$ in. on centers. There is a space 7 in. long over the rail which is not drilled; this is to prevent oil from getting on the rail.

The tank cars are provided with steam heating coils and before starting out the oil is thoroughly heated. This makes it flow more readily and it is found that the oil spreads much better when so heated.

From one to three cars are taken out at a time. Each is provided with a sprinkler but only one car is in service at a time. The flow of oil is controlled by the valve on the tank car. The pipes G and



SPRINKLER FOR OILING ROADBEDS.

H are about 3 in. above the rail and have guy wires attached at their free ends, to keep the pipes lined up.

It will be seen from the sketch that the ends of perforated pipes overlap each other. This is to make sure that the entire surface of the roadbed is covered.

When oiling, the train is run at a speed of about four miles per hour. It has been found that this speed gives good results as it is not high enough for wind currents to blow the oil on the rails or in other places where it is not wanted.

Observations made thus far show that a tank car containing 6,500 gallons will cover on an average about two miles of single track. The distance covered depends somewhat on the amount of water present in the oil.

Some runs have covered much greater distances. Two observations were:

| | |
|-------------------------------|------------|
| 6,500 gallon car covered..... | 3.27 miles |
| 6,500 gallon car covered..... | 2.06 miles |

| | |
|---|---------------|
| Some observations on speed have been made and the results were: | |
| 21,500 ft. of single track oiled in..... | 1 hr. 16 min. |
| 11,000 ft. of single track oiled in..... | 30 min. |
| 11,730 ft. of single track oiled in..... | 34 min. |
| 9,500 ft. of single track oiled in..... | 25 min. |
| 13,600 ft. of single track oiled in..... | 43 min. |
| 10,000 ft. of single track oiled in..... | 32 min. |

It is the plan of the company to oil the roadbed twice each year, once in June and again in August.

Aside from the laying of dust this treatment has other advantages. It preserves the ties, holds the dirt in place, and during rains lessens the amount of dirt washed away.

The Los Angeles Railway Co. is also oiling its roadbed. This company operates wholly within the city limits and its tracks are 3 ft. 6 in. gage. It is estimated that 40 barrels of oil will cover one mile of single track.

The company owns its own oil wells and the cost is of course small, but even at 75 or 80 cents per barrel the cost of putting a roadbed in good condition is much less than sprinkling with water, when one sprinkling is barely sufficient for one day. J. E. B.

The Machinery of the Claim Adjusting Department.

Showing the Organization of the Claim Department and Illustrating the Forms Used—Specification of Accidents—Methods of Dealing with Parties Injured—Records of the Claim Department.

BY T. E. MITTEN, GENERAL MANAGER INTERNATIONAL RAILWAY CO., BUFFALO, N. Y.

It might possibly be considered almost a mis-application of the term to use the word "Machinery" in connection with the workings of a claim adjusting department, for of all the departments of a well-ordered electric railway organization none is less amenable to the application of hard and fast set rules and modes of procedure, and none is more thoroughly dependent upon the purely personal element for the fullest realization of its chief purposes than the claim department. The term machinery is here used to designate the system, including the assortment of blanks, by which the personal element can be properly regulated, ordered, directed and checked.

The laws of most of our states place upon electric railway corpor-



T. E. MITTEN.

tations certain obligations and duties toward the other users of the public streets, but these statutes also in general, place upon the other such users, including both pedestrians and vehicles, certain duties in the direction of protecting themselves from injury through the presence of electric railway cars in the public streets. It is to be assumed when injury or damage is caused by the cars, through the failure of the company's agents to exercise proper care, that the company is entitled to make a just and reasonable recompense for such injury. It is in the adjustment of such legitimate claims that the company's department had one of its chief duties. But it has unfortunately come about, in recent years, that the scope of the company's department has had to be considerably enlarged in order to protect the company from the vicious raids made upon its treasury in the form of excessive and unreasonable claims for damages, where damages have actually occurred, and in the form of fraudulent and illegitimate claims for damages, for which the company is in no way responsible, and for alleged damage which never occurred.

In the preliminary treatment of damage cases no distinction can be made as between cases for which the company is or is not legally responsible. The first and foremost requisite of any system in the

claim department must be the getting of an intelligible report of the occurrence, together with the names of all possible witnesses, to some designated official, presumably the claim agent or his deputy, in the shortest possible interval of time. In these cases, minutes very frequently mean dollars, and in the immediate transmission of this report there must be absolutely no distinction made, no matter

INTERNATIONAL RAILWAY COMPANY.

| TELEPHONE REPORT OF ACCIDENT | | Date | Time |
|--|-------|----------|-------|
| Local Time | _____ | _____ | _____ |
| Police No. | _____ | Case No. | _____ |
| Exact Place of Accident | | | |
| _____ | | | |
| Direction of Travel | | | |
| _____ | | | |
| Direction of Wind | | | |
| _____ | | | |
| Nature of Vehicle Involved in Collision | | | |
| _____ | | | |
| Weather and Road Conditions | | | |
| _____ | | | |
| Nature of Wreckage | | | |
| _____ | | | |
| Report Made by (How Available to Public) | | | |
| _____ | | | |

NOTE: Employees when reporting accidents by telephone will be required to answer the above questions.

BLANK I (SIZE OF ORIGINAL 8½X5½ IN.)

how serious, nor how trivial, nor how genuine, nor how fraudulent the case may appear. The system must provide means by which the claim department shall receive prompt and complete report of every mishap or occurrence out of the ordinary, which may take place in or upon the company's property, whether it be car, truck, or building.

The following is an exposition of the system upon which the claim department of the International Railway Co. is organized:

The company's book of rules for trainmen provides that, immediately upon the occurrence of any accident, mishap or other happening out of the ordinary, in or near a car, the conductor must first secure the names and addresses of everyone concerned in the case, together with the names and addresses of all persons who actually witness or could have witnessed the affair. As soon as he has satisfied himself that he has obtained all the available names and addresses, and after he has taken such steps as may seem required for the immediate care of any persons who may be severely injured,

Name,

Residence,

Place of Business,

BLANK IF SLIP FILLED OUT BY WITNESSES (SIZE OF ORIGINAL ENVELOPE)

the conductor proceeds to the nearest available telephone and places himself in communication with the claim department, this telephonic report being taken down at the office of the claim department in the form of Blank I. If an inspector or other employe of the company is in the vicinity of the accident, his instructions require him to take such steps as may seem best to relieve suffering and to avoid unnecessary delay to traffic. It may here

in which amounts expended on account of old claims arising because of accidents in the given years are entered); "Total for Month" (dollars); "Accidents Reported, Year to Date," (number); "Accidents Occurring During the Years," (subdivided in seven columns for entry of expenditures on account of old claims); "Year to Date," (dollars).

It is believed that the scope of the claim department should also extend to a systematic effort for preventing accidents. To this end the claim department keeps in very close touch with the transportation department, and the reports of the claim agent are given careful consideration by the superintendent of transportation. Each day, when the conductors' reports of accidents are received from the station masters, the preliminary pencil reports previously mentioned are immediately sent to the transportation department, and are there filed, so that the transportation department knows of all accidents, with their causes, practically as soon as the claim department. On these reports the claim agent makes notation in red pencil of such changes or recommendations, as he may deem proper, in the line of prevention of similar accidents. A meeting of the inspectors is held every Sunday morning, at which meeting these reports of accidents are carefully scrutinized and discussed and such action taken in the line of prevention as may suggest itself. The transportation department in turn notifies the claim department what action, if any, it has taken on each case in the line of cautioning or disciplining employees responsible, or in the line of preventing

future occurrences of a similar nature. All these reports and checks are in the line of keeping the entire system of all departments keyed up to proper pitch.

The claim department keeps a card index, by name, of all conductors and motormen who have been concerned in accidents, on account of which suits are pending, and before any employe can secure a discharge from the company's employ he must report at the claim department and see if his name is in this card index. If it is, he is, requested to leave his probable future address, so that if he is ever wanted as a witness in court the company will have some means of locating him.

The company does not employ a doctor regularly, but engages doctors, of good reputation, to investigate and report upon cases, when necessary. For making such report as to bodily injuries the physician uses a blank which bears a number of figures, as shown in Blank VI, and designates by pen marks the exact location and nature of the injury. The claim department aims to foster and preserve cordial relations between the company and all reputable lawyers and physicians in the city and with the city emergency hospitals, and cheerfully pays all ambulance charges for calls in electric railway cases. It is the desire of the company to merit and secure the co-operation of the reputable legal and medical profession and of the hospital attendants in the line of protecting persons injured by its cars from the overtures of unprincipled and disreputable practitioners.

The Successful and the Unsuccessful Claim Agent.

Portraying the Qualifications Necessary for a Claim Agent—Kindness, Patience and Tact More Effective Than Bluff and Bluster—When to Settle and When to Contest Claims—Form of Release.

BY DR. H. B. ROCKWELL.*

On either side of the doorway that leads into the Senate Chamber at Washington is a curiously carved wooden box containing snuff and placed there for the use and benefit of the distinguished men who preside over the nation's affairs, and amongst the appropriations made each year by Congress there is found this item: "Five pounds of Copenhagen snuff, \$30.00," and thus is perpetuated a custom adopted by our forefathers and by them considered essential, the utility of which, in these modern times, has entirely disappeared. Almost as incongruous is the maintenance and enforcement in all its details of the doctrine of "Master and Servant," which was promulgated hundreds of years ago by our English forefathers, and in spite of changed conditions is in force today.

That the master should be held responsible for the negligent acts of his servants is altogether proper and right, but why should street railway corporations be held accountable not only for the negligent acts of its servants but also for the carelessness of the general public? I venture to say that out of every hundred accidents reported to the claim department of street railways, ninety are caused by the carelessness of the subsequent claimant for damages. The purpose and scope of the law, as it was originally framed, were evidently to safeguard the rights and correct the wrongs of the public. I wonder what the respected and respectable framers of that law would say if they could see and know how its application has been distorted from its original purpose until its chief object now-a-days is to engender in the minds of a certain class of people a sordid greed of gain that undermines the manhood of those who profit by it and works a deal of hardship to street railway corporations.

If I were asked what qualities were most essential to the successful adjustment of damage claims, I should say, ranging them in the order of their importance: Kindness, Patience and Tact. I know there are some adjusters who depend for their success upon an exhibition of Bluff and Bluster, who assume that every claimant is a fraud and who bring to bear upon all cases alike a sledge hammer style of argument. I admit that there are exceptional cases where it is necessary to use a vigorous and strenuous style of argument in

resisting vicious and fraudulent claimants, but, applied as a general principle such a method is dangerous and expensive.

When called upon to adjust an accident case, the party with whom you desire to effect a settlement should be approached in a courteous, dignified manner. Make use of a little judicious flattery (though this can easily be overdone); try to disabuse his mind of the prejudice he has conceived against the railway company; get into sympathy with him; but do not get into an argument, especially if the claimant is a woman, and after you have succeeded in dissipating the bitterness existing against the company, either real or fancied or assumed, gradually work around to the object of your visit. Try to impress upon the claimant that you are his friend and that you are working for his interest as well as the company's, and finally ask him what he conscientiously thinks he is entitled to. In nearly every instance his reply will be: "What will the company give?" and right here adjusters are apt to make a mistake. They either mention a ridiculously small amount that angers the party, or else they commit themselves to a considerable amount from which it is impossible afterwards to recede. Tell him that you do not feel competent to place a figure upon his damages; that you do not know the value of his time nor what his expenses have been, and by the exercise of patience you can nearly always obtain an expression of the amount for which the party is willing to settle. It may be a thousand dollars (it usually is), while you know the actual damages have not exceeded ten, still you have obtained a substantial victory if you succeed in getting him to "name his price." Then settle the case with a lead pencil; itemize the articles that go to make up the bill of damages, and be liberal about it. If forty dollars is demanded for a suit of clothes that you know would be dear at ten, put it down forty. If he says the doctor has made twenty visits and you know he has made but five, put it down twenty. Hedge a little in estimating the loss of time. If he asks for four months' wages, tell him you do not believe he will be laid up that long. Tell him that he has a strong constitution that will bring him through. (Most people like to be told that they have a strong constitution.) He will be sure to speak of his bill for medicines. Put that down at ten dollars. Be sure to add something for the wife's or daughter's services as nurse. You may need their co-operation. Then ask him in your blindest, sweetest tones: "Is there anything else?" and while you

*Dr. Rockwell is manager of the Electric Railway Pool, of Boston, which consists of some thirty or forty independent electric roads in New England and the Middle West connected together for the purpose of mutual protection against loss to improper damage claims.

are waiting for a reply, foot up the figures, take the money from your pocket, count it slowly and aloud, or, better yet, hand it to him and let him count it, and the chances are more than even that you will have settled a troublesome case in which the liability is clear for two or three hundred dollars, that would have cost as many thousand if the assessment of damages had been left to a jury.

I think that all will agree that the most favorable time to settle an accident case is immediately after it happens. The man who arrives at the scene of an accident with a ten dollar bill in one hand and a release in the other is sure to save money for the company he represents. Settle quickly the minor injuries, the cuts and bruises, the torn coats and the lost bonnets, taking a full release in all cases. Do not settle for too small a sum—make the amount something nearly adequate to the actual damage sustained. It will have a most favorable effect on the jury, if for any reason the release should be contested. Whenever it is possible, send your serious cases to a hospital for two reasons: They will have better care and the discipline of the hospital will keep out curious friends and neighbors who are prone to offer their advice as to the question of settlement. If the accident has resulted fatally, see that a carriage or ambulance is provided and pay the bill, whether you are liable for the accident or not, but do not send any flowers and do not attend the funeral. Flowers sent by an over-zealous superintendent have cost thousands of dollars. You cannot fool the people, not even the common people. They see through your artifice. The long ears of hypocrisy are plainly visible among the lilies. Treat the bereaved with courtesy and kindness but do not exhibit an officious manifestation of grief. There are two classes of cases in which quick action is usually to be avoided: death cases and very serious injuries. The time to make an attempt to settle a death case is a few days after the funeral, and it is usually best to deal through some friend of the family. This statement as to time applies with as much force to the lawyer, runner and solicitor as it does to the claim agent. In an accident that occurred on one of the suburban lines out from Detroit, where a man who was driving on the track at night was run into and killed, the leading attorney of the town attended the funeral and when an opportunity was given to "view the remains" this learned expounder of the law leaned over the coffin and kissed the corpse, and at the same time handed his business card and address to the widow. He not only failed to gain his all too obvious point but the woman was so disgusted that it made a settlement of the case a few days later a very easy proposition.

The reason for delay in settlements where the injuries have been of a very serious character is that the party is suffering and is apt to measure his damages by the amount of his pain. Moreover, a release taken at such a time is apt to be contested on the ground that the party was not in the full possession of his senses and therefore incompetent to sign a release. Such cases, however, should be seen frequently and at the first favorable opportunity an effort should be made to settle the claim.

The most serious question that presents itself to the claim adjuster, and which he is oftentimes obliged to answer upon very short notice, is, what class of cases it is best to settle and what to contest in the courts. I have formulated a number of rules which I have tried to follow as closely as possible and which I have no doubt will provoke considerable criticism, especially from the legal fraternity, but which I have found to stand me in good stead in a great many trying positions.

First, settle all claims where the liability is undoubted and unquestioned. I know of no exception to this rule. It may be urged that sometimes the demand is exorbitant and unreasonable, but how are we to decide what claims are unreasonable and exorbitant, and who is to be the arbiter in this matter? The numerous verdicts rendered in the "tunnel accident" against the New York Central demonstrate the unwisdom of leaving these questions to a jury. Time and patience and tact will, I am satisfied, in all cases work out better results than those obtained from the decision of a jury.

Second, settle all cases where the liability is in doubt and where the case is likely to get to the jury on "questions of fact", provided such cases can be settled for a reasonable amount, and just what is a reasonable amount should be left to the judgment of the adjuster.

Third, settle all cases where there is "no liability" provided the injuries are of a serious character and the settlement can be made for a nominal sum.

Fourth, contest vigorously those cases where there is evidence

of fraud or where there is a question as to whether or not the accident actually happened.

A few words as to the matter of releases.

The release should be brief and easily comprehended and as free as possible from technical verbiage. The following is the form of release that I have used for a great many years and is perhaps as good as any:

"In consideration of the sum of..... Dollars (\$.....) to me in hand paid this day, I hereby release, acquit, and fully discharge the from any and all claims, suits, actions or demands that I have, or may have against said as the result of injuries sustained by me on or about the..... day of 19....

This release is not to be construed as an admission of liability on the part of said....., and is to be binding upon me, my heirs, executors, administrators and assigns.

As witness my hand and seal this.....day of

Witness:[SEAL.]

It is important to have the party with whom you are settling read the release, or, if he is ignorant, read the release to him and then explain that it is not an ordinary receipt for the money, but is an absolute release of all claims against the street railway company.

If he is a foreigner and does not understand the English language, have the release translated and in addition have the interpreter sign an affidavit that he has properly translated the release and that, in his opinion, the party signing understands its nature and is satisfied with the settlement.

The adjuster of accidents depends for his success not upon an "estimate of values" as does the adjuster of fire losses, but upon an intimate knowledge of human nature. He is not settling for broken legs or broken arms, but it is his constant effort to get into closer touch with the imagination of the party aggrieved, and he will have reached the "summum bonum" of his aspiration when he succeeds in instilling into the mind of the claimant a willingness to eliminate the preconceived and exalted notions that he holds upon the subject of "pain and suffering", and the disposition to accept as a reasonable settlement such an amount as will fully compensate him for damages actually sustained.

FORT WAYNE & SOUTHWESTERN'S CLEAN ACCIDENT RECORD.

The east division of the Fort Wayne & Southwestern Traction Co. was opened to traffic Dec. 14, 1901, and the officials of the road point to the fact that no passenger has ever been injured on this interurban line. There has been but one accident in which anybody was seriously hurt, it being a collision between a car and a cab, and the most severe injury that has befallen anyone connected with the road was a fractured ankle sustained by a trainman. The general manager, S. L. Nelson, who recently resigned to go to Galesburg, Ill., gave all the credit to the employees, whom he considered a fine lot of men, whose work has always been in the company's interest.

TWO VACANT SCHOLARSHIPS.

The American Railway Master Mechanics' Association, through its secretary, James W. Taylor, advises us that there is one vacancy in the scholarships of the association at the Stevens Institute of Technology, Hoboken, N. J.; also that it has been invited to select a candidate for one of three scholarships offered by Joseph T. Ryerson & Son, Chicago, covering a four-year course at Purdue University, La Fayette, Ind. The date set for the entrance examination at Stevens Institute is September 14-17, inclusive, and at Purdue University September 7th, and intending applicants should write Mr. Taylor at once. Regarding the Joseph T. Ryerson & Son scholarship, it is announced that the recipient will be allowed \$600 per annum for tuition and living expenses. The object of the course is to afford a technical education that will fit the recipient for the management of a machine shop or factory using iron and steel.

The Application of Mill Construction to Car Houses.

Showing the Advantages of Slow Burning Mill Construction for Street Railway Car Houses—Details of This Construction as Applied to the Car House of the Columbia Electric Street Railway, Light & Power Co., of Columbia, S. C.

BY J. O. DE WOLF, OF W. B. SMITH, WHALEY & CO., OF BOSTON, MASS., AND COLUMBIA, S. C.

In the February number of the "Street Railway Review" there was published an illustration of the car house of the Columbia Electric Street Railway, Light & Power Co., of Columbia, S. C., and brief reference was made to the fact that it was of "Mill construction." This construction, now so generally used in modern

burning construction offers so many advantages for retarding fire and facilitates in so large degree the fighting and extinguishing of fire when once started, that it is found to well suit the purposes for which it is used.

By reference to the accompanying plans it will be seen that the



CAR HOUSE AT COLUMBIA, S. C.—SLOW-BURNING MILL CONSTRUCTION.

factory buildings, has many points that will, it is believed, interest the readers of this paper in a more extended description of it.

As applied to factory purposes this style of building is known as "Slow burning mill construction" and has for its main objects, economy of construction and safety in case of fire, and to these ends the energies of the mill engineers and the factory insurance com-

Columbia car house has pilastered brick walls 30 in. thick up to the first floor; above that level the pilasters between the windows are 24 in. thick. The brickwork above and below the windows themselves is only 12 in. thick. The floor beams are 12 x 17 in. and are spaced 10 ft. apart. These carry the floor which is of three thicknesses, the main planking 3 3/4 in. thick; on top of this 1 7/8 in. of



LEFT SIDE FRONT VIEW OF GROUND FLOOR—RIGHT SIDE.

panies have been devoted. It is not claimed that such a structure will prove to be as well as a fire proof building of the type so familiar in our modern offices, but for most manufacturing purposes the latter would be prohibitive in price, and as will be explained, the slow

W. B. Smith, Whaley & Co. are leading mechanical and electrical engineers and architects, and Mr. De Wolf's suggestions concerning the application of slow burning mill construction to electric car houses are the result of their own practical consideration by the firm's mechanical and electrical engineers. [Ed.]

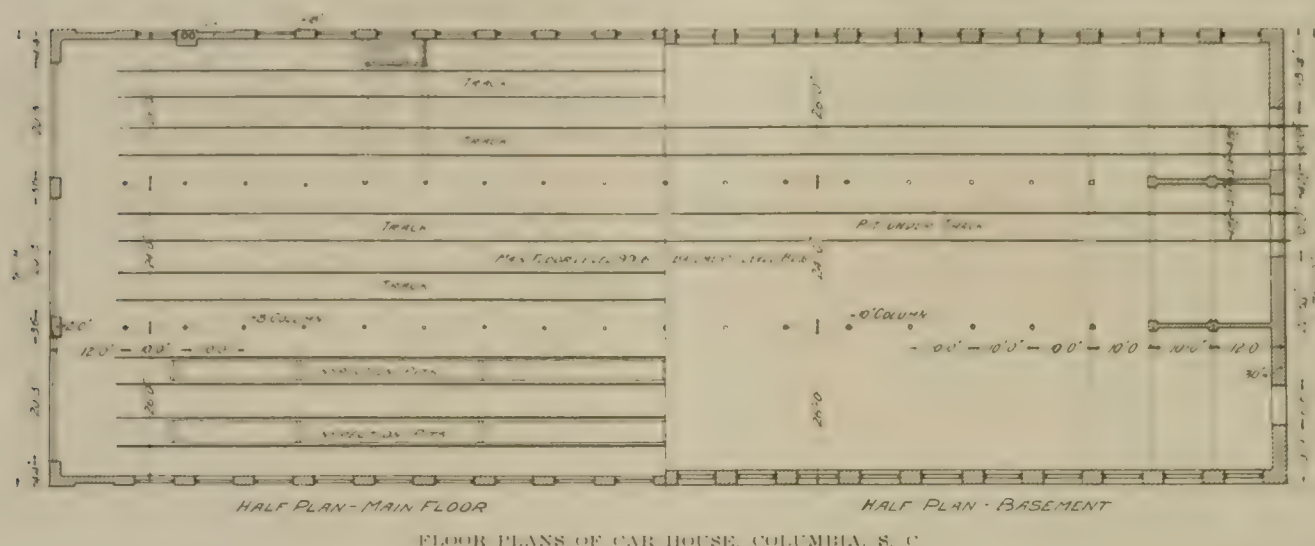
plank, and the top, or finished floor, of 1 7/8 in. stock. More will be said about floor construction later.

The roof is carried on 10 x 12 in. beams, 10 ft. on centers, supported by the pilasters between the windows and by two rows of columns between the car tracks. The roof plank is 3 in. thick, slopes 1/2 in. per foot from the center toward both sides of the building, and is covered with tar and gravel roofing.

It will be noted that the house is 76 ft. wide and that the length of all floor and roof beams is about 24 ft. Sometimes it is advisable to

use beams a little shorter, or even longer, than this but in most cases it is found that this is about the best length as regards economy of construction. If longer spans are required the size of the

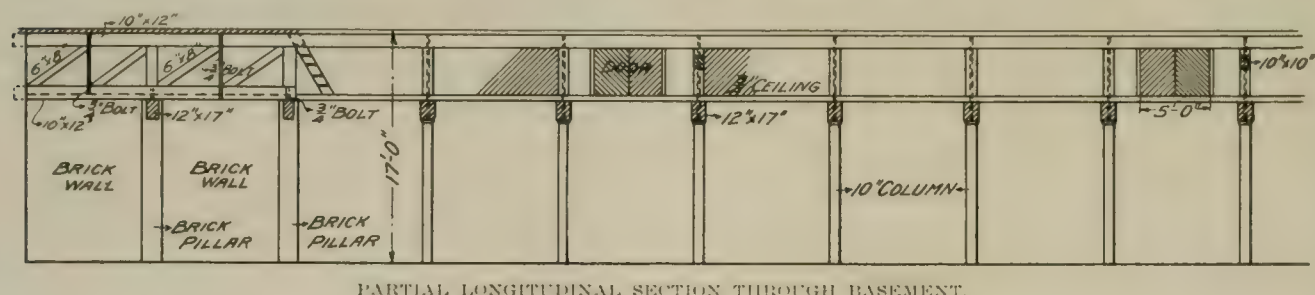
of this car barn are 10 in. in diameter in the basement and 8 in. in diameter on the first floor, as the latter carry no load except that of the roof. If the building were more than two stories in height the



FLOOR PLANS OF CAR HOUSE, COLUMBIA, S. C.

creased on account of the additional load that they have to sustain and there is apt to be difficulty in obtaining such lengths of large timber without paying a very high price. The timbers are generally unprotected although in some cases they are plastered. If this is

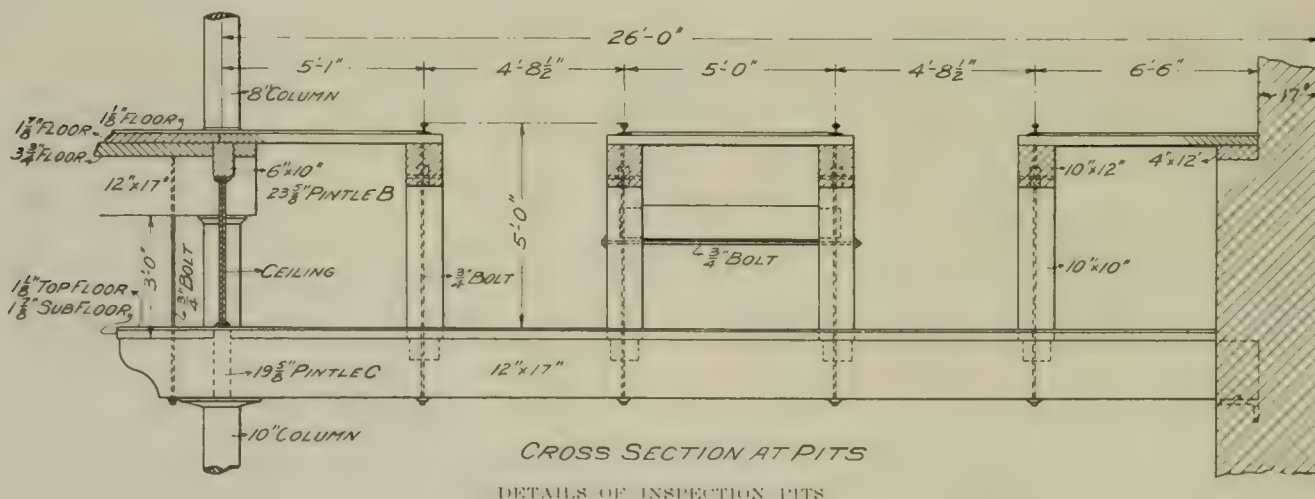
columns on the lower stories would be still larger than these, the size depending in all cases on the load they are designed to carry. A great many tests have been made on the strength of mill columns and it is now considered good practice to allow a load of



PARTIAL LONGITUDINAL SECTION THROUGH BASEMENT

done care must be exercised as dry rot will follow if any airtight covering is put on timbers before they are thoroughly seasoned. Ordinary plastering is sufficiently porous if without a skim coat, to permit seasoning. Whenever it is desired to paint the wood work

about 600 lb. per sq. in. of the sectional area of hard pine columns of ordinary length with flat ends. This gives a factor of safety of a little over six based on a crushing strength of 4,000 lb. per sq. in. Square columns are of course a little cheaper and possess considera-



DETAILS OF INSPECTION PITS

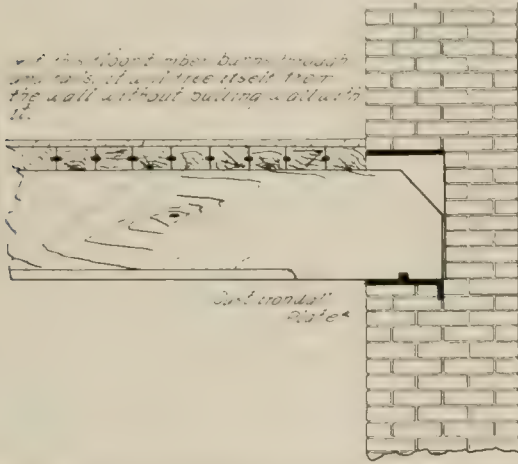
time should be allowed for seasoning before paint is applied, although whitewash or cold water paint may be applied at any time.

Among the important details of this construction are the columns and the method of supporting the beams on them. The columns

ble more strength than round ones turned from the same timbers, but the latter are more generally used as they obstruct the light less. It is generally considered the best practice to bore a hole about $1\frac{1}{2}$ in. in diameter from end to end, through the center of all columns.

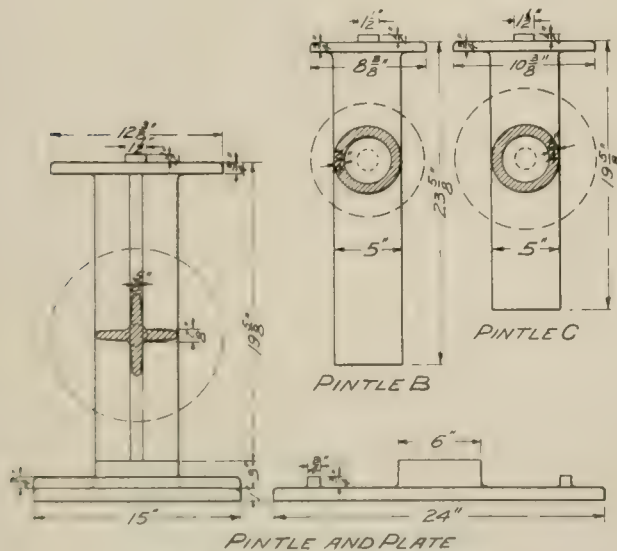
and to connect this with half-inch holes through the sides at each end so as to prevent undue checking while drying.

Both ends of the columns are carefully cut off. The bottoms of the lower columns rest on cast iron plates, which are generally set on brick or concrete foundations, and the tops of the columns have cast iron caps. These caps furnish supports for the floor or roof timbers above, and also for the pintles on which rest the columns of the next story. It is necessary to use pintles as the columns



CAST IRON WALL PLATE TO SUPPORT FLOOR TIMBER

themselves cannot go down through the floor, for if they did, whenever the floor was wet, water would run down along the columns and soon cause the lower ends to decay. Different shapes are used for pintles, but generally they are either circular or cross shaped in section. The top of the pintle is formed into a plate that gives a bearing for the base of the column above. Sometimes the caps, pintles and bases are all cast in one piece; if this is not done the joints where they come together should be faced off so that a true bearing perpendicular to the axis of the column may be given wherever there is a joint. The length of the column caps varies with the



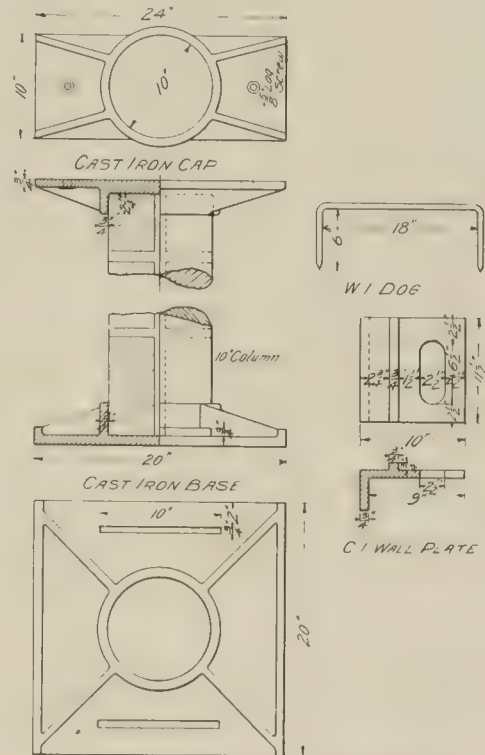
DETAILS OF PLATE AND PINTLES

size of the timbers, but should be so designed as to give a bearing of from 8 in. to 12 in. for the end of the timber. Holes are provided in the caps to lag screw them to the underside of the beams, and wrought iron dogs should also be put in the upper side to securely hold the ends of the two timbers together; these dogs are set into the beams so that they do not interfere with the floor plank.

When the ends of timber are supported on a brick wall there is an iron plate built into the brickwork. One form of such plate is shown; this has a projection on its under side to hold in the wall, and on the upper surface is another and smaller one to hold

the timber. This securely fastens the beams and the walls together and is considered better than passing the beams through the wall with a nut and washer on the outside. A space of 1 in. is left around the sides of the beams so that they may dry out.

In connection with floor construction reference should be made to some of the different methods that are in use. On top of floor beams there is always a heavy floor, the plank of which should be grooved and splined. The thickness of this plank floor varies with the load that is to be carried, and the stiffness and freedom from deflection that is required; generally it is 3 in. or 4 in. Hard pine is the best for this floor though sometimes spruce plank is used. The top flooring is usually of a harder wood, maple being used a great deal for this purpose. The top floor can be laid either at right angles to the main floor or parallel with it; this point is generally determined by the use to which the floor is put, the direction of travel and wear on it, and the ease with which boards may be taken up without disturbing the machinery, when necessary to patch it. Between the heavy plank floor and the finished floor some engineers place an intermediate floor which adds materially to the stiffness of the entire floor as it can be laid diagonally to the



DETAILS OF BASE, CAP AND PLATE.

others. In mill work tarred or rosin sized paper is generally placed between the floors to prevent water leaking through when they are washed.

Basement floors, and sometimes those of the first story when there is no basement, may be laid directly on the ground, or if that is wet, upon a cinder or stone filling. It is desirable to use a layer of cold tar concrete under such a floor. The plank can be 2 in. thick, preferably coated with tar on the under side, and across these planks the top or finished floor is laid and nailed in the usual way. In case no top floor is to be used, sleepers to which to nail the plank can be set in the concrete, but if a top floor is to be laid it is often unnecessary to use any sleepers underneath the plank.

No description of the roofing will be given except to say that a pitch of about $\frac{1}{2}$ in. per foot is very commonly used and the roof is usually covered with a four or five ply tar and gravel roofing. Prepared roofing is coming into use more and more, and seems to be well adapted for many places, but if it is to be used, it would probably be better to make the pitch a little greater than $\frac{1}{2}$ in. per foot.

Reference has been made to the thickness of the brick walls in this case. In the case of a mill of six or seven stories, the plasters at the lower story would be much thicker, but the details of this construction will not be gone into now, nor will any detailed reference

be made to be inspection and repair pits as they are shown in the cuts.

The windows used in this car house are 6 ft. 6 in. wide, about 10 ft. high, of the center mullion type with sliding sashes and pivoted transoms. This is about the size that is used in mill buildings although sometimes they are a little wider, depending on the length of the bays. Pivoted transoms swing about a horizontal axis, the top swinging in and out materially in the ventilation of the room.



BASEMENT USED AS REPAIR SHOP.

Space occupied by inspection pits on floor above shown in upper left hand corner of engraving.

Ribbed glass is often used in transoms as it throws the light toward the center of the building better than plain glass, and prevents the glare of the sun that renders curtains necessary; this is not as important in car barns as in a factory. Ribbed glass is also frequently used in all the window sashes, although there is some opposition to it from the operatives as they cannot see out through it. This can be overcome by using plain glass in the lower panes of the lower sash and ribbed glass in those above. In special places

where it is desired to get as much light as possible into the middle of the building, and especially if the height of the story is low, prism glass can be used; it adds greatly to the light but costs more than the ribbed glass.

It is not possible in such an article as this to go minutely into all the details of "Slow burning mill construction" but simply to give a general idea of some of the principal features. Every building of this sort involves special points that need careful study from an engineer or mill architect familiar with the subject, in order to secure the best results that are possible, and it is urged that such services always be employed.

Having thus described something of this construction some of the reasons for it and advantages of it from the insurance standpoint will be briefly given. A point of great importance is to make each floor continuous and avoid openings through which fire can travel from one floor to another. The different floors and rooms are separated by fire doors or hatchways, automatically closing, and the stairways if not placed in fireproof towers are encased in incombustible partitions. Safety and ability to resist fire is given by using timber in large and solid masses so as to expose as few projecting corners as possible to the flames. It is shown by the records of the insurance companies that, with hardly an exception, floors have never been burned through by a fire in a factory constructed on these principles. Iron posts are crippled by heat but wooden posts of suitable size have never been burned off, though they have resisted fire that has destroyed granite posts a foot square.

It will be noted that this construction interposes no obstructing timbers to prevent the water being efficiently applied to the fire. In the joisted floor or roof construction fire may burn on one side of the beams even with water playing on the other side, and soon burn them sufficiently on account of their small size to cause them to break. With mill construction the under side of a floor or roof offers no obstruction to prevent the fire being rapidly swept away between the timbers by the sprinklers or hose streams, and all possible safeguards such as automatic sprinklers, stand pipes, hydrants and hose connections, are provided to facilitate the fighting of fire if it breaks out.

In brief, as stated at the beginning, the main objects of this kind of building are economy of construction, safety against fires, and facility for fighting and extinguishing them, thus reducing the fire loss.

The Best Form of Car for Average City Service.

BY T. J. NICHOLL, VICE-PRESIDENT AND GENERAL MANAGER, ROCHESTER RAILWAY CO., ROCHESTER, N. Y.

As regards the best form of car for city service it is evident that almost every city requires a modification of details as regards size, to suit local conditions. The population, its relative density; the

whether the main streets are long, through thoroughfares or short and parallel with others; and the width of streets, all have a bearing on the general design of car which would be best suited to meet



ROCHESTER RAILWAY CAR

layout of streets and avenues,—that is, whether they radiate from a common center like the spokes of a wheel or the ribs of a fan, or

the particular requirements. For service in Rochester, where the lines radiate from a common center, I am convinced that the best

length of car is about 30 ft. inside measurement between end posts, and here we cannot use a car that is wider than 8 ft. 2 in.

The length of the principal lines will have an important influence on the desirable form of car. If the layout of the city is such as to require the average rider to make a transfer from one car to another in order to reach his destination, more particular attention should be given to securing rapid entrance and exit of passengers;



INTERIOR OF ROCHESTER CAR.

that is, platforms should be large and end doors should be wide. If the average length of haul is fairly long, more attention should be given to the comfort of passengers, as, for instance, forms of seats—cross seats seem more desirable—large windows, and other conveniences of this nature, all of which will be appreciated by the company's patrons.

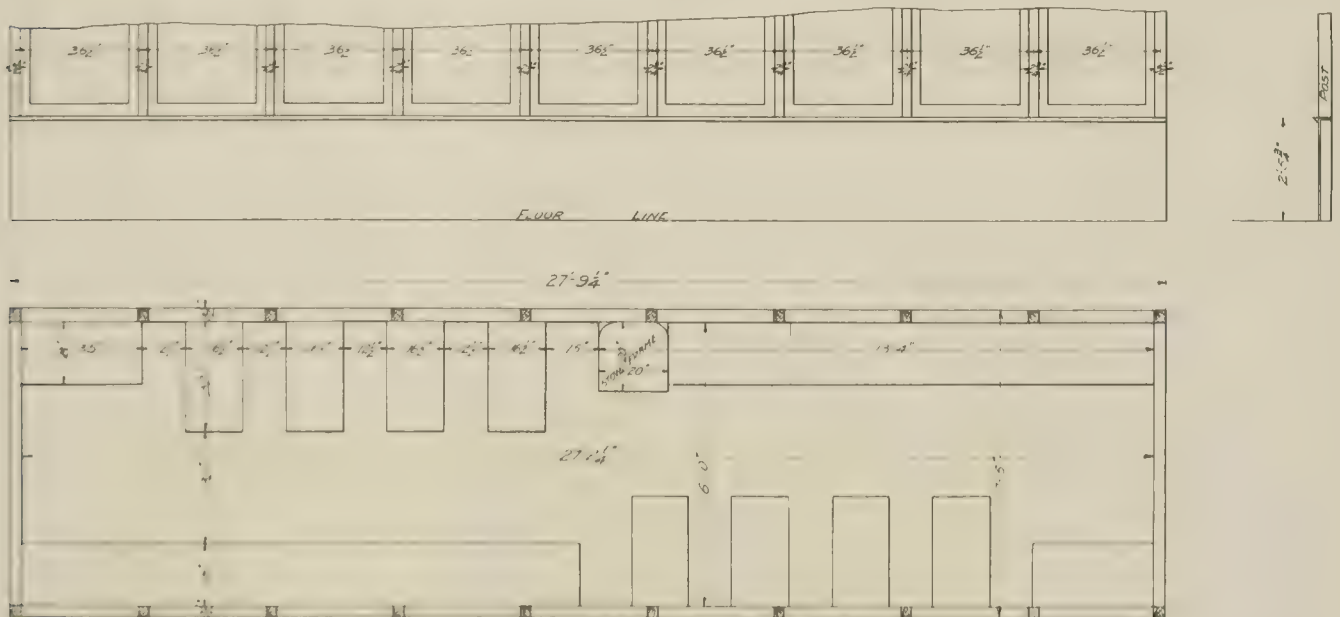
For Rochester we prefer a 5-ft. platform with well rounded front, so as to give room for controller and brake staff. Each platform

For Rochester I prefer double ended cars; that is, each end to be used alternately as the front end, but when the streets of the city are so arranged as to permit of a belt or loop arrangement,—that is, the cars going out on one street and back on another, or going around a loop or Y—the single-ended car is much to be preferred, as with this form of car every convenience is provided at the proper end for the special purpose for which it is intended. For instance, the front end of the car is arranged for the comfort and convenience of the motorman, and the easy movement of passengers without interrupting him. The life-guard is a permanent institution, and built in such a way as to make it the most efficient at all times. The back end of the car is provided with large platform expressly for the convenience of passengers in going out and in, and not made for the double purpose of the convenience of the motorman at one time and for passengers at another. By the use of the single-ended car, also, the heating arrangements can be very much better taken care of, and with more economy. The belt arrangement is particularly desirable in a city of narrow and cramped streets.

A good form of seating double-ended narrow cars is half cross and half longitudinal, as shown in the accompanying sketch. This arrangement accommodates both the long and short distance rider. Good, well-made wooden seats and backs are all right for short distance riding, and they are more easily kept clean than any other form of seat. Rattan is also good, but liable to discolor with age, and is slippery to sit on. Plush is probably the best for long riding. Ventilators should be large and arranged the same as in steam railroad construction, so as to give ventilation without draft. Doors and also end windows should be curtained, so as to enable the motorman to see clearly at night without interference because of reflection from car lights.

Push buttons are a convenience to the public if kept in order, but being so liable to get out of order at any time, they cause greater inconvenience than if they were omitted altogether.

I recommend heating by stove or hot water in preference to electric heating from the point of economy. All cars should be equipped with circuit breakers in preference to hood switches and fuses. Double trucks of any one of the standard make are undoubtedly preferable to single trucks for city service when cars are long enough and they should be equipped with four motors if possible, as too



PLAN AND ELEVATION OF ROCHESTER CAR

should be protected by vestibule, but the vestibules should be on the extreme ends only, with both sides of each platform open and protected by some good folding gate. The window in the vestibule should be made to slide easily and to the left, on account of brake handle. This rounded form, while protecting the motorman and giving him plenty of room in stormy weather, gives him a clear vision of both sides of the car. The car should have double sliding doors at the ends, or one side door at each end.

much traction is lost by using only two motors on double-truck cars.

The accompanying reproductions from photographs of our latest standard car will show at a glance what I consider to be the best form of car for service in such cities as Rochester. This car was built out of an old car, spliced from 18 ft. to 28 ft. 6 in., saving only the roof, ends of car and windows, all the rest being new. We have treated a great many cars in this way, and they have given most excellent satisfaction, both to ourselves and the public, at a much

...for the new cars, and we feel that having been built by ... under the most careful management, they will be more ... It will be noticed that the windows in this car are made ... down out of sight, and the window space is covered with a ... that completely hides the window when down, in this way ... giving the car the appearance of an open car in summer, while it can ... be changed to a winter car when desirable.



CONDUCTORS' CAR EARNINGS REPORTS.

BY W. B. BROCKWAY.

That blank used by all electric railway companies upon which their conductors report the results of the car operation is known by many names; trip sheet, day card, trip card, conductor's report and other names used locally.

In many ways this blank is one of the most important of the large number needed to show the income, expenses and statistics of



W. B. BROCKWAY.

a business which is so much composed of details that it cannot be confined into few forms. Yet it is one which, in the main, receives more ill treatment and misunderstandings in comparison to its importance than any other.

The principal reason for this is that it is, with few exceptions, placed in the hands of a conductor who has, at the best, been only partially "broken in" and has emerged from his short period of instruction in a more or less confused state of mind. Instruction relative to his daily report is but a part of a great deal of information literally pumped into him and is mixed up with all the other things he must do, liberally interspersed with what he must not do and capped with a neatly bound book of many pages of fine print containing the rules which he is supposed to commit to memory. So that when he is "accepted" and put on his car with the company's money going into his pocket he looks with considerable doubt at the blank with many columns upon which he is to write the story of how and when he got the money and lots of other things for which as a rule he can see no need. Of course in time most of this confusion wears off but part of its place is taken by a dread of the short list so that even after months of use there still lingers a feeling that if the accounting of the company did not require this report the work of a conductor would be happier. But the company does need this information and very much; so it is best for the company to make the conductor's work as easy as possible.

In this connection the company is the only one to decide what it needs to know by this means, but sometimes information is asked for which it also grants in another way so that either the one way or the other is superfluous, in which case better results may be obtained for the rest of the information asked on the conductor's report if the unnecessary part is eliminated. In other words only such things that are entirely and only in the conductor's knowledge should be required from him.

The more simple this form can be made the more correct the information given is liable to be and in like ratio will the error list right itself. But the duty to the company requires that what

is asked should always be given. It does neither the conductor nor the statistics good to ask questions which are not answered as it always leads the conductor to doubt the importance of the other questions and encourages carelessness in replying to them.

There seems to be a growing tendency in the present methods of operation to make a larger effort toward the proper instruction of the men before they are permitted to take their cars. The expense of this instruction is well directed and cannot fail of good results. Very frequently a different point of view is gained to the conductor and if—when desirable—a reason or two as to why certain questions must be carefully answered is explained to him the resultant answers will nearly always be more intelligent.

To most men just broken in to duties with which they are unfamiliar the explanation will come as a revelation that their cash report is nothing more than a daily letter from themselves to the Auditor telling carefully what they have done and in a measure how it was done; that certain questions are asked and answers required and to have the "letters" all alike they are in printed form and called a trip report, but all the attributes of a letter are there, even to the date and the signature. This explanation has been in service under the direction of the writer and the result has nearly always been a relieved countenance and more intelligent work. It is in such ways as this that best results will be obtained, and the importance of the information contained in this source of the income is worth all the time and effort put into it to make it clear and accurate. So much statistical information is worked out from the report of the conductor that its accuracy must be made positive. Cross checking costs in wages of clerks in the same proportion that the conductor's returns are habitually in error and it usually follows that carelessness in one branch of the service is closely related to "taking it for granted" in another. Thus it is not always easy to see how far reaching the confusion of a partially informed conductor may go either in the expense to correct his work or in its effect upon the other conductors with whom he is in daily contact.



NASHVILLE RAILWAY & LIGHT CO.

Fifteen double-truck and 10 single-truck cars which were ordered by the Nashville Railway & Light Co. last spring have been put in service. Both bodies and trucks were built by the J. G. Brill Co. Each of the double-truck cars will seat 4 persons and the seating capacity of each single-truck car is for 32 passengers. The double-truck cars are furnished with No. 67 General Electric four-motor equipments, with K-6 controllers; Christensen air brakes, in addition to hand brakes; Hale & Kilburn No. 99 B "Walkover" seats; Pantasote curtains, with Hartshorn rollers; New Haven fare registers, and Hunter illuminated signs. Each car has 12 electric heaters. The single-truck cars are 34 ft. 1 in. over all. They are not provided with air brakes, but are equipped with No. 67 General Electric double motors and K-10 controllers. Each single-truck car has eight electric heaters.

Reconstruction work on the Broad St. line has been completed, as has that on Deaderick St. and Public Square. Double tracking of the West Nashville line with 70-lb. rail is progressing satisfactorily. On account of trouble in securing men to lay the granite blocks on Bridge Ave. that work has been delayed. The company is rapidly receiving from the Tennessee Coal, Iron & Railroad Co. the 2,400 tons of 70-lb. T-rail ordered last spring. This, with 200 tons of high 80-lb. T-rail and 250 tons of 70-lb. T-rail received from the Lorain Steel Co., and 400 tons of 70-lb. T-rail from the Carnegie company, makes a total of 40 miles of new heavy rail received and now being shipped for reconstruction work at Nashville.

The company recently inaugurated a system for wiring houses free for customers entering into a contract with it for electric lighting. The customer pays the cost of wiring and the company allows rebates on his net bill until the cost of wiring has been repaid to him. The company has also commenced free renewals of ordinary incandescent lamps, with the result that it is receiving more business than it can conveniently handle until its new plant begins operations.

The company's Fourth of July traffic established a new record, there being 127,250 fares collected, the receipts amounting to \$3,756. The Glendale line handled nearly 42,000 people. Nearly 50,000 transfers were included in the fares collected.

Sanitation and Disinfection of Electric Railway Cars.

BY ADDISON W. BAIRD, M. D., NEW YORK CITY.

Modern research has done much to clear away the old time uncertainties regarding disease. Laboratory investigation, bedside observation and careful experimentation have been employed to demonstrate the causes of many maladies that formerly were looked upon as mysterious in their origin. More than all else this study has given us valuable information in the matter of the prevention of disease. In fact, we have a new phrase: "Preventive Medicine";



ADDISON W. BAIRD, M. D.

and another title is proposed, that of "Doctor of the Public Health."

If a doctor working in the interest of the health of the general public and endeavoring to prevent sickness were allowed to choose only one measure or weapon, he would unhesitatingly say: Cleanliness! For it is more and more evident that much can be done to check the spread of many diseases by the exercise of a few reasonable precautions. In all cities the health authorities enforce certain regulations which to a large extent preserve the safety of the inhabitants; but it is beyond their power to compel observance of the rules of hygiene at all times and in all places. Hence it becomes the duty of all who come into contact with the public in a semi-official way to lend their co-operation. Especially are the officers of street railway lines in a position to extend their aid, first by maintaining the cleanly condition of their cars; and second, by promptly disinfecting any car in which a person suffering from any contagious disease has been transported.

As I have said, the manner in which many diseases are conveyed from person to person is pretty clearly understood at the present time. We hear much about germs and bacteria and microbes, which are all classed under the general term "bugs," by certain frivolous minded people. Take for example, typhoid fever, which is caused by a microbe or germ. This germ is found in the body discharges of any individual suffering from the disease, and it may be transmitted to others in various ways; by uncleanly hands or utensils in the sick room; by laundry articles carelessly handled; by flies that first walk about on soiled matter and then alight on foodstuffs; and most readily through drinking water when the source of supply has become contaminated. Typhoid fever is called a transmissible disease, but it is not contagious; with such a malady we need not concern ourselves in connection with street car traffic.

We do consider, however, the class designated contagious diseases. These are of very great importance. Small-pox, scarlet fever, measles, chicken-pox, whooping cough and the like demand our attention because they are easily acquired by simple contact or by exposure to the sick. Whenever disease is made that the victim of contagious disease has ridden in a car, it should be withdrawn from service and made to be disinfected. The withdrawal should be immediate, if it can be made, of less importance to other passengers of the road.

Formaldehyde gas is a disinfectant of marked power and is the most useful means of destroying germ life. This gas is non-poisonous to man, although very irritating to the eyes and air passages; it can be cheaply produced and may be rapidly generated from a 40 per cent watery solution in an easily managed apparatus. Indeed, since formaldehyde has become available the older methods and measures—such as chlorine gas, sulphur fumes and the use of various antiseptic fluids—have been discarded.

For managers especially interested in this subject it is suggested that the car barn be provided with an air-tight room in which to place any car that has carried a case of any contagious disease. Such a car should be shut up in this chamber and gas from a formaldehyde machine forced in. Three or four hours are required to permit the fumes to penetrate every crevice and fabric. After that time, by opening an air duct below and an uptake in the roof, the gas would be driven off; and the car having received no injury and being thoroughly purified, could be immediately returned to service.

Tuberculosis in the form of consumption is familiar to everyone and it is a disease that has received a great deal of attention during the past twelve months. It has been well named the "great white plague," for it is the cause of one-seventh of all deaths taking place throughout the world. In the United States alone over one hundred thousand die of consumption every year, and the disease is very prevalent in all centers of population, particularly in the larger cities. In Greater New York there exist today over thirty thousand cases. Consumption occurs most frequently in persons between the years of fifteen and forty; but it may appear at any time of life from earliest infancy to advanced old age.

In efforts directed towards the prevention of consumption, not only have the health authorities in most cities and towns endeavored to carry out certain measures looking to that end, but various charitable and newly-formed associations have united to combat its spread. The campaign is largely one of education, and the key note is cleanliness! And again, I say that it is the privilege of those who meet the general public in a semi-official capacity to co-operate in this work; and that the street railway companies are in duty bound to assist.

As with some other disorders, so with tuberculosis of the lungs, we find the old-time mystery of the underlying cause has been cleared away. Formerly it was thought that a child of a consumptive father or mother was sure to develop the disease later in life; that it was in the family or in the blood, as the saying goes—a matter of heredity. That is not so. It is true such a child may be endowed with a poor stock of vitality and be very prone to become consumptive later in life, but does not start out with seeds of the disease in the system. On the contrary, all uncertainty about consumption has been removed, because we now know: First; the disease is *communicable*, that is to say, it can be communicated from person to person, although it is not contagious in the sense that small-pox or scarlet fever or measles may become epidemic; second, it is *preventable* by the exercise of reasonable care and observance of a few simple precautions. These two points especially concern us in the consideration of our topic; but I may as well state another that is well worth remembering: Consumption is *curable* in the majority of cases, especially if treatment is undertaken at the outset—completely and lastingly curable.

Let me briefly explain why consumption is communicable and also preventable. The sole cause of the disease is a microscopic organism called the *bacillus tuberculosis*. There are, by the way, thousands of micro-organisms or microbes, some of which are called the "good" microbes because they play a very active part in various processes of nature that are of benefit to the earth and to all living creatures; there are also many microbes that cause disease—pathogenic, we call them. The bacillus tuberculosis is found among the disease-producing bacteria; bacillus means, literally, a little rod; and the plural form of the word is bacilli. If we examine these bacilli at different stages in their life history, we find that they exist in two forms; in the first or ac-

the state, they appear as rod-shaped bodies, these rods increase in size and reproduce themselves by division; their growth and multiplication being extremely abundant under advantageous conditions; or second, if the surroundings are not favorable, they tend to dry up and become inactive; and in this resting stage they form extremely small round bodies, called spores. From the lungs of a consumptive person these germs may be coughed up in numbers almost incredible; it is estimated that from one individual two or three thousand millions may be cast off every twenty-four hours. It is possible for some of them to enter immediately the bodies of men or animals and there produce centers of disease; or the spores may be blown about for days and even for weeks in the dust of streets or houses, ready to blossom forth under conditions adapted to their growth. A temperature of about that of the human body, moisture, and a suitable "soil" for foodstuff, such as the body tissues, constitute the necessary elements.

Thus it will be seen that what we term the direct cause of consumption is a particular micro-organism or germ; and this germ may enter the system in three ways. Inhaled through the air passages (and this is the chief mode of entrance); swallowed, and through scratches and wounds in the surface of the body. The indirect causes of consumption are numerous and the conditions that predispose to the disease are of interest in relation to this subject of street car disinfection. Persons who have had pneumonia, grippe, typhoid fever and other serious maladies; those who have prolonged attacks or who suffer from chronic bronchitis or catarrh; those who have chronic heart or liver or kidney troubles are apt to succumb to consumption. Children, after measles, scarlet fever, whooping cough, diphtheria or any such disorders often contract the disease. Those who live in dusty, dirty, dark and damp places; those who work in factories or apartments where the atmosphere is dusty and smoky; clerks and others employed in offices, stores and shops where the air is stale and stagnant; all these are liable. Overwork, exposure and excesses of all kinds; insufficient food or food of poor quality and poorly cooked; neglect of personal cleanliness; these are also contributing factors in causing consumption.

Now it is perfectly possible for a consumptive to enter a car full of people, to be careless in his habits and to expectorate freely on the floor and so leave countless germs and spores ready to be inhaled by his fellow passengers, many of whom may be precisely in the state of health or be living under the exact conditions to be-

come victims. As a matter of fact, this is the manner in which the disease is commonly spread.

Understanding, therefore, that consumption is communicable; that it is principally acquired by breathing in of germs; and that it is preventable to a large extent, what action are we going to take in the interest of the public? For one thing, we must get hold of the consumptive and tell him, first, last and all the time, that it is wrong for him to expectorate on the ground or on the floor; indoors or outdoors; in public or in private; on pavement or in street cars; because from any of these places the bacteria or spores may be blown about and inhaled by others. He must find some means to take care of his sputum; the authorities should provide spittoons at convenient points, but there are a variety of pocket spittoons and paper receptacles to be had in the shops. Occasionally somebody says: "The consumptive is a sick man. Why do you trouble him?" Sure enough he is a sick man, but he may also be a source of danger to other people if allowed to continue his untidy habits. Already manners are improved in this respect and there is a distinct lessening in the amount of spitting in public. Perhaps this is due in part to the Board of Health notices which have been conspicuously posted in cars and other places, and partly the result of numerous arrests that have been made for this offense. I think it far preferable to enlighten the people on the need of cleaner ways and endeavor to educate them in tidier habits.

But in spite of all the care in the world, street cars are bound to contain more or less dust and dirt, and it follows that they must receive proper attention. Regular and frequent cleanings are necessary. The method by which cars are cleaned is not a matter of any great consequence, provided the work is thoroughly done. The best way to collect and dispose of dry dust and dirt is by the vacuum air process; the recently introduced machines are very rapid and efficient in action. For the proper washing of car interiors, common soap-and-water cleaning of the kind to satisfy a New England housekeeper is entirely adequate. The use of any patent soap or much-lauded washing compound or the addition of an evil-smelling antiseptic fluid is quite needless. Unremitting and thorough washings are much better than dependence on germ-killing substances, and painstaking scrubbing and wiping is far more reliable than any soap or cleaning powder of supposed marvelous qualities.

Purchasing and Accounting for Supplies on Electric Railway Systems.

BY W. H. STAUB, PURCHASING AGENT, THE UNITED RAILWAYS & ELECTRIC CO., BALTIMORE, MD.

The purchasing department of an electric railway system is unquestionably a most important one, for on this department devolves much responsibility in the purchase and proper accounting of the supplies required for the successful operation of the road.

Our experience has been that the best results in handling this department have been obtained by the concentration of all its supplies at one point. This being possible, all supplies should be received and issued at this point, and the purchasing agent of the company should make his headquarters there, for in this way he comes in touch with and sees personally the supplies he is purchasing and he also has a better idea of their values, the latter being a great benefit.

In addition to buying supplies, the purchasing agent should also be the disbursing agent, being responsible and having jurisdiction over all materials and supplies from the time of their purchase and receipt until issued to the different departments of the company for construction work or for operation.

A system of this character undoubtedly lessens "the leaks" it is almost impossible to overcome in the rehandling and recharging of supplies a great number of times, which is necessary where sub-storerooms are run, supplied from the main storeroom, or direct, and where the purchasing agent's responsibility ceases after his purchases are made.

During my early railway experience, having been connected with one of the smaller companies before the consolidation of all into one system, I had charge of the issue of orders for supplies in the

general manager's office, who did the purchasing. As the company grew it became necessary to carry a stock of supplies for operation, to obviate tying up in the repair shops or barns, cars which were needed for the proper running of its lines, so a storeroom was inaugurated.

The first method employed by us was to have a main storeroom and sub-storerooms at the repair shops and at each of the power stations, these being for the convenience of the different departments in handling the supplies required by them for their operation.

The supplies carried in these sub-storerooms were replenished from the stock in the main storeroom, as required from day to day, but the goods remained charged against the main storeroom until actually issued from the sub-storerooms, when entries were made crediting the sub-storeroom stock, and also the account with the main storeroom, charging the proper construction or operating accounts.

The disadvantages of this system soon became apparent, especially in connection with the sub-storerooms in the several power stations, for the reason that not having permanent storekeepers in these, and the station forces having access to them at all times, they would take supplies and fail to make a memorandum, so that the proper charges and credits could not be made immediately, in consequence of which the latter were not distributed against the proper months, and when the end of the year came, and with it the taking of our inventory, this being done once a year, we in-

variably found shortages, and the usual explanation was given that the supplies had been used and not recorded. In this manner, in settling up for the year, the month of December was charged improperly for supplies used, which should have been distributed in construction accounts or operating expense over other months.

We endeavored to eliminate this condition, but, finding it almost impossible, we finally discontinued the sub-storerooms at our power stations and adopted instead, in connection with them, our present

by a clerk to fill. This order is on a blank 4x21 in., and besides the company name and the date bears the following: "Storekeeper: Please deliver to bearer, for" with six ruled lines for entering materials wanted and signature. If the supplies called for are in stock they are delivered to the boy, a receipt being taken on this order, on the back of which the storeroom clerk making the delivery places his initials, this precaution being taken in case any contention should afterwards be made regarding the delivery.



INTERIOR OF STOREROOM OF THE UNITED RAILWAYS & ELECTRIC CO., BALTIMORE

system of having the power houses draw their supplies as required, which are charged directly into operating expense in the month they are drawn and used. This plan we have found much more satisfactory.

The sub-storeroom was continued at our repair shops until about two years ago, when we removed to our new repair shops and were then enabled to merge the stock of it with that of the main storeroom, so that since then the deliveries of all supplies for construction or operating have been made from our main storeroom. This was a source of great satisfaction to us, for it eliminated all the extra bookkeeping and clerical work made necessary by a sub-storeroom, saved extra handling and brought all supplies under my personal charge.

The shops department being closer to the storeroom in its detail

These temporary orders are all confirmed the following morning on formal requisitions, forms M-1 and M-3, by the head of the department, for all supplies drawn the preceding day.

We have found that the private telephone system in our shops and connecting with the storeroom saves much time between those departments, and has more than paid for itself on the item of "Labor" in the time it has been in service, about one year.

We also have what we call a stock requisition, form M-32, which is a blank 7½x5½ in., reading as follows:

THE UNITED RAILWAYS AND ELECTRIC CO. OF BALTIMORE.

.....Department. No.

.....Station. Date.....190..

Mr.

Please order the following material for

Req. No. Signed.

Date

This form is used in case a department desires the storeroom to carry in stock certain special materials, so they will be on hand when required, at which time they are drawn in the usual manner.

This stock requisition form is also used by the shops department in covering itself for the supplies required for the account of "Stock Supplies Assembled by Shops," this account covering the materials expended by the shops on armature coils, field coils, etc., which are made by it, and then returned to the storeroom at cost, including labor, for stock. The shops bill these materials against the storeroom in the same manner as if purchased from any outside concern, and when these supplies are required they are issued to the shop department in the usual manner.

Continuing my remarks on issuing supplies, if the material required is not in stock, the same procedure is followed regarding issuing requisitions as if it were. All requisitions are turned over to the storekeeper, who has them checked, separating the ones covering supplies issued from those which could not be filled. He enters the latter every morning on form M-18, which is a blank 11x17 in., ruled for columns, headed as follows: "Req. No.," "Material," "Where delivered," "Ordered from," "Price," "Order No.," On this blank are included all regular stock supplies to be ordered, and after this has been done this form comes to me and the names of the concerns to whom the orders are to be issued are then filled in on it.

Whenever the occasion demands, or as often as it is deemed necessary, an inquiry sheet, form M-23, is sent out for quotation.

The United Railways & Electric Co.
OF BALTIMORE
CAR REPAIR.

No.

Mr. Purchasing Agent.

Please deliver to bearer to be used for

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FORM M-1 (SIZE OF ORIGINAL 7X12 IN.)
FORM M-3 OF SAME TENOR FOR ELECTRIC MOTOR REPAIRS

workings than the other departments, I will give our system of purchasing and handling supplies for it (though the other departments are handled in the same manner) as an illustration.

For instance, the shops require certain supplies for work. The foreman of the shops department requiring the material calls up the clerk having charge of issuing orders on the storeroom over a private telephone system, our shops having one with which all its sub-departments are connected, and also the storeroom. This clerk makes out an order, which is known as form M-25, and sends it to the storeroom by a boy who does nothing but look out for such orders, and when the order is received at the storeroom it is taken

... .., and after the date and ad-
dress of the invoice.

Customer: Kindly quote me your lowest price delivered at
for the following material:

Please reply by return mail, advising how soon delivery of the
material can be made after receipt of the order. Yours truly,

Purchasing Agent

The form containing the items for which orders are to be drawn
is then turned over to the order clerk. All orders, form M-10, are
drawn in triplicate, the original is sent to the concern receiving the
order, the duplicate goes to the auditor with the account marked
thereon to which the material is to be charged, and the triplicate is
retained in the purchasing department for its records.

If the concerns receiving orders are slow in shipment a "puncher,"
form M-40, is sent. This has been a very useful form.

Supplies on being received at the storeroom are recorded in a
receipt book by the receiving clerk, then put in stock, or delivered
to the department for which they were ordered, and the requisition,

One method for accounting for distribution of supplies is as
follows: The main account of our storeroom designated "Sup-
ply," everything being charged to this, with few exceptions, such
as "Printing and Stationery," "Maintenance of Real Estate," etc.,
these items being charged direct to operating expenses under their
proper headings.

Each department has its own operating account; for instance,
all supplies for the overhead line department are charged to "Over-
head Line Repairs," while those for the shops department are
divided among three accounts, "Car Repair," "Electric Motor Re-
pair" and "Car Painting," and so on with the other departments.

The requisitions of each department are of a different color, so
that they can be readily distinguished. The department account is
printed at the top, as shown on forms M-1 and M-3, and space is
also provided for the sub-account of the main account, this being
inserted after the words "to be used for."

All requisitions are signed by the heads of the respective depart-
ments and forwarded to me direct. After all the items called for
on requisitions have been delivered they are then turned over to
the storekeeper to be priced. When this has been done they are
given to the proper clerk, who makes the extensions and records

Form M-10 3-15-1901 6 BK

Always show "ORDER NUMBER" on each invoice.

THE UNITED RAILWAYS AND ELECTRIC CO. OF BALTIMORE.

OFFICE OF THE PURCHASING AGENT,
(Columbia Ave. Opp. Carroll Park.)

Order No.

190

M

Please fill the following order for account of this Company, and send bill for same promptly to
Purchasing Agent.

Mark: The United Railways and Electric Co., of Baltimore.

Deliver to

Purchasing Agent.

INSTRUCTION TO FIRMS: The FREIGHT CHARGES MUST BE PREPAID on all material purchased F. O. B. BALTIMORE. Mail bills immediately
upon completion of order DIRECT TO PURCHASING AGENT. Bills are audited and paid on or about the twentieth of each month. Bills received after the first of
be held over until next month. Render Monthly Statements direct to Auditor, Continental Building.

FORM M-10, DUPLICATE AND TRIPPLICATE COPIES DO NOT CONTAIN THE INSTRUCTIONS TO SHIPPERS AS TO PREPAR-
ING FREIGHT CHARGES AND SHOWING ORDER NUMBER, BUT HAVE A LINE READING "REQ. NO.
ACCT. AUDITED. 190 ..." (ORIGINAL 8 1/2 X 6 IN.)

which has been held uncompleted until this time, is checked as
being filled.

I have made it a practice to personally open all mail of the de-
partment, in this way keeping in touch with the necessary details
of the other departments and outside concerns. All bills for sup-
plies are received and the prices on them checked and approved by
me.

They are then turned over to the bill clerk, who checks the ex-
tensions and the items on the bills with the order stubs, and the
receipt of the material with the storeroom receipt book before men-
tioned. If everything is found correct, they are recorded in the
bill book, form M-27, then turned over to the storekeeper for his
information as to prices, which he notes in a price book, and re-
turned to me for my "O. K." as to "prices, quantity and quality."
They are then ready to be forwarded to the auditor for auditing
and payment. The book, form M-27, referred to, has pages 16 x 21
in., ruled for columns, headed as follows: "Date Received,"
"Ledger Folio," "Date of Invoice," "From Whom Received,"
"Order No.," "No. of Packages," "Weight or Quantity," "Descrip-
tion of Supplies," "Gross Price," "Amount," "Discount," "Net
Amount," "Total Amount of Invoice," "Additional Discount, Per-
cent," "Amount of Discount," "Actual Cost," "Credits."

them in the distribution book covering supplies issued, form M-10,
under the proper account heading. The pages of this book are
18 x 17 in., making when open a sheet 36 x 17 in. The column
headings are: "Date," "Requisition No.," "Weights and Measures,"
"Price," "Amount," "Totals," "Car Repair," "Car Painting," "Car
Cleaning," "Electric Station Expense," "Electric Station Oil,"
"Electric Motor Repair," "Electric Lighting," "Miscellaneous,"
"Overhead Construction Repair," "Printing and Stationery," "Stable
Expense," "Salt, Snow and Ice," "Track Repair," "Track Bonding
Repair," "Coal Oil and Lamp," "Tool Account," "Advertising Ex-
pense," "G. O. Park Expense," "Lakeside Park Expense," with
three additional columns having no printed headings.

They are then forwarded to the auditor, who enters them in the
department distribution book under their proper sub-account.
When all requisitions have been recorded for the month, the distri-
bution book is totaled and checked with the auditor, after which a
cross entry, form M-17, is made, crediting "Supply" with the total
amount issued, and charging the different construction or operat-
ing accounts with their amount of the whole, this being done on
the books of this department and by the auditor on the general
books of the company. Form M-17 is a blank 8 1/2 x 14 in., ruled for
journal entries, the names of the different accounts to be charged

being printed in alphabetical order. These include the 10 accounts shown on form M-10 and 9 others, among which are "Bridge Repair," "Elevated Structure Repair" and "Maintenance of Real Estate."

After all entries, both debit and credit, have been made for the month, our department books are checked in dollars and cents with the general books of the company.

All departments draw their supplies when required by them dur-

THE UNITED RAILWAYS & ELECTRIC CO. OF BALTIMORE.

Baltimore 190

Gentlemen

Please advise when shipment will be made of the following articles due on orders which are urgently needed. If unable to ship at once, state when shipment will be made in column under head of Remarks.

Respectfully

ADDRESS ALL COMMUNICATIONS FOR THE
DEPARTMENT TO
COLUMBIA AVENUE
OPPOSITE CARROLL PARK

E. H. Smith
P. releasing agent

| DATE OF ORDER | QUANTITY OF ORDER | ARTICLES | REMARKS |
|---------------|-------------------|----------|---------|
| | | | |

FORM M-40 (SIZE OF ORIGINAL 8X10 1/2 IN.)

ing the month, except the shops, where the material is issued for each job as required, consequently they accumulate no stock.

Every ten days the supplies needed by the operating barns are forwarded to them from the storeroom on a supply car furnished by the shops department, the motorman belonging to the latter, while a man from the storeroom goes as conductor in order to facilitate the proper delivery of the material.

Such items as car wheels, lumber, iron and steel are charged against the storeroom, but stored in the shops for the convenience

"New Cars," "Chain," "Carpet," "Sundries," "Credits," "Shop Scrap Material," "Scrap Car Wheels." Other principal accounts are similarly subdivided. The blank is 17 x 20 in.

All brass and copper scrap accumulated by the several departments is turned over to this department and stored in bins built in the storeroom until sold. All the iron and steel scrap is sent to the company's yard and stored until disposed of. Sales of scrap on hand are made, when it is considered advisable to sell, to the highest bidder, and the proceeds credited to the account affected, whether construction or operating, excepting in the case of the shops department, which is allowed stated credits each month on its operating accounts, these amounts being charged to an account known as "Shop Scrap Material," consequently when the shop's scrap is sold it is credited to this account.

At present no stock record of any kind is being kept, the supplies being put in the storeroom in their accustomed places and issued without any record being made except on the requisitions. It has been computed that we have nearly thirty-five hundred items in our storeroom, and it is extremely difficult for any man to carry in his head the location of every one of these, and if the stock of any one item is wanted it has to be counted. It is our purpose to inaugurate a card system for stock record, giving a complete history of materials from the time they are ordered and received in the storeroom until issued, so all arrangements are being made for starting this the first of the coming year, when our annual inventory of stock is taken.

The storeroom will be laid off in sections, these being lettered for designation and the bins of each numbered. The idea in having the bins divided into sections and numbered in this manner, instead of having them numbered in rotation throughout the storeroom, was to keep the bin numbers from running into large numbers, we thinking the arrangement of sections more satisfactory.

It is proposed to use a standard index card, 8 x 5 in., form M-44,

| | | | | | | | | |
|-------------|------------|------------------|-----|----------|--------|-------|-------|---------------|
| Bin. No. | Article | Size | | Max. | Cr. | | | |
| Section | | | | Min | | | | |
| Date Issued | Where Used | Requisition Dept | No. | Quantity | Weight | Price | Value | Acct. Charged |
| | | | | | | | | |

FORM M-4 CREDIT SIDE (ORIGINAL 8X5 IN.)

FORM M-41 CREDIT SIDE (ORIGINAL 8X5 IN.)

of that department. A record is kept of the drawings from each of these items for each day, and every ten days the department covers by requisitions its total drawings for this period. This arrangement is very satisfactory and enables us to carry a good stock of each, as no charges are made against operating expense until this material is used.

In order that the general manager may know how the different departments are using supplies, a memorandum statement, form M-37, is made out for him in detail every ten days, showing what the

to be kept in the department office, giving the section and bin number for each item in the storeroom, showing on one side when orders are placed, and the material received, and on the other side when issued and to what account charged; in fact, a complete history of each item in the storeroom, with value of it.

In each bin a card, form M-43, will be kept. This is a manila shipping tag, 3 in. wide by 6 in. long, ruled in the columns on each side, one side to show goods "Received" and the other to show goods "Issued;" the column headings on each side are: "Date,"

| | | | | | | | | | | | |
|----------|-----------|----------|--------|----------|-----------|-------------|----------|--------|-------|-------|--------------|
| Bin. No. | Article | Size | Max. | Dr. | | | | | | | |
| Section | | | Min | | | | | | | | |
| ORDERED | | | | RECEIVED | | | | | | | |
| Date | Order No. | Quantity | Weight | Date | From Whom | Description | Quantity | Weight | Price | Value | Frgt. Charge |
| | | | | | | | | | | | |

FORM M-4 DEBIT SIDE (ORIGINAL 8X5 IN.)

FORM M-42 DEBIT SIDE (ORIGINAL 8X5 IN.)

supplies issued amount to, compared with the same period of the previous year. This information is also used by the departments, as it enables them to see what is being expended, and also to make any curtailments which appear necessary by reason of this comparison.

Form M-37 has the various accounts shown on forms M-10 and M-17, under "Car Repair" are the items: "Car Wheels," "Brake Shoes," "Iron and Steel," "Lumber," "Glass," "Car Box Oil," "Curtain Cable," "Brass Castings," "Malleable Iron Castings," "Steel Castings," "Sweepers," "Machine Bolt,"

"Quantity," "Weight." At the top on each side are spaces for six entries, as follows: "Section," "Bin No.," "Article," "Max.," "Min.," "Size."

On this card will be noted what material is put in the bin and also what is withdrawn, the difference between these being the stock on hand, which must agree at all times with the card in the office covering the same item.

After the card system is in effect the information given by it will be very valuable, for at a glance it will show the maximum and minimum amount which should be ordered and carried in

that this feature in itself will be a desirable one, for under our present system it is necessary to estimate the quantities of each item to be ordered and carried in stock.



W. H. STAUBER

A good idea of the interior arrangement of our storeroom may be had from the accompanying illustration.

THE THIRD-RAIL SYSTEM.

BY L. E. GOULD, ELECTRICAL ENGINEER, STERLING, DIXON & EASTERN ELECTRIC CO.

Suppose we are confronted with a clean card for the construction and operation of an electric interurban railroad. This road must have the capacity to handle both local and express passenger cars as well as a freight traffic. Then let us consider the relative advantages and disadvantages of third rail and overhead trolley construction for such a road, these at the present time being the two most practicable methods of railway power distribution.

With the traffic as stated the motors on a car may draw from 600 to 1,200 amperes. Such an amount of current in attempting to pass the small area of contact between a wire and one, or even two, fast moving trolley wheels, causes severe arcing. Trolley wheels wear out in a week's time. The wire becomes pitted and weakened wherever a severe arc has been formed. This is first noticeable at points where the heaviest current is needed as at curves on grades. At high speed the trolley wheel cannot easily be made to confine itself to the wire, but on striking a rough section or a hanger out of line will leave the wire and either damage the trolley pole, the overhead works or the car roof. This it seems, happens more often on "big days" and at a time when the conductor is well forward in the car collecting his fares.

A car driven by current collected by a third rail shoe with 20 to 30 square inches of sliding contact area between it and the conductor rail is never bothered on this score. Service is not interrupted by broken wires or trolley wheels or jumping poles. The cast steel shoe with its life of 20,000 car-miles needs no attendance whatever. With a carefully constructed rail the shoe will slide smoothly and quietly at any speed which the motors can impart to the car. With a well designed and well built third rail system having plenty of cattle guards and fences there can be no possible danger at all to the passengers from contact with the live rail.

Accurate figures showing the cost of interurban third rail maintenance are not to be had by the writer, but this cost, it is certain, is very low as compared with that of the overhead trolley. The third rail being of more stable construction requires much less care, its care in fact being only that which the track section gang gives to the road bed and running rails, namely the keeping of the rails free from water, gravel and weeds. A third rail having a well designed insulator under it requires practically no repairs. The usual section men will very quickly accustom themselves to working about the live rail, and can inspect and care for it, thus effecting a saving in the price of labor as against the wages of experienced linemen required for trolley repairs.

A third rail distribution system having an equivalent copper cross sectional area about 10 per cent greater than with trolley can be built for the same cost per mile. This estimate includes the crossing cables and connections. If we can now agree as to its advantage over the trolley for interurban work let us next consider some of the details of the third rail proper.

The types of rail sections proposed for the third rail work are many. There has been proposed a channel section with the web

mounted vertically, the shoe being so arranged as to press against the inside of the web, where the rail would be clear of snow and ice. Also there has been proposed a square section of some metal having a higher conductivity than steel. But T-rail sections are found to be most generally used; undoubtedly this is because of the questionable single advantage of any other section over the standard rail, while the standard T-section has many advantages over all the rest. The standard section is more readily and cheaply obtained. When repairs or changes are to be made, parts of a standard section rail are usually to be had from the track rail stock, if speed is the greatest factor to be considered in the repair work. Standard sections are easily handled, have a proportionately broad base and surface for the sliding contact shoe. They may in time of need be bonded with a track bond and spliced with a track splice. The third rail should be built of as highly conductive metal as is permissible. A soft steel rail containing a very low percentage of carbon may be procured at a price about the same as that of high carbon track steel. The conductivity of such steel compares with that of copper as about 1 to 7.5, while on the other hand the ratio of conductivities of higher carbon track steel and copper is approximately as 1 to 12. Third rail steel should be cut in 60-ft. lengths, thus saving construction expense for bonds and joints, and insuring a smoother contact surface for the shoe.

The number of designs of third rail insulators on the market is large. This is because every engineer wishes some change in the design of even the more accepted forms. An insulator to serve its purpose well must present a broad base to the tie. Must be a mechanically strong column, that it may safely hold the heavy rail in gage and elevation, must possess a top surface which will sustain the rail from lateral movement, yet allow it to move freely along its longitudinal axis. Insulators must have a large creepage surface of well sheltered insulation. Several years ago when third rail construction was based less on experience than at present, insulators having wood for the insulating material were much used; some cheaply constructed roads of today use the same type. Such a wooden insulator has a metal cap on which the base of the rail rests; this cap fits over the top of a block of paraffined wood, the wooden block being either spiked directly to the tie or mounted in an iron base which is in turn spiked or lagged to the ties. Such insulators when first installed will show a comparatively small leakage. They are mechanically weak, however, and the sun and water act quickly on the paraffine, thus rendering the wooden block a very poor insulator. Wooden insulators on becoming very weak will often leak enough current to ignite themselves. The writer has taken insulation readings on a single insulator in use showing a leakage of one ampere and over. On different sections of third rail mounted on wooden insulators, the insulation resistance per mile will vary several thousand ohms under similar atmospheric conditions. This is undoubtedly due to the different amounts of moisture in the individual insulator and the supporting ties.

A type of insulator very largely used in elevated work, has for its insulation reconstructed granite or tiling. Such insulators are satisfactory when so built that the stoneware is in solid mechanical contact with the metal base, and this base is of generous proportions. Their great drawbacks are their high first cost.

The Aurora, Elgin & Chicago Railway Co. has in use on a large portion of its line the so-called Gonzenbach type of third rail insulator. This insulator is quite different from any other style in common use. It consists of a cylindrically shaped base of malleable iron spiked to the tie. Upon this base is loosely seated an inverted saucer or petticoated cap of an insulating material, such as is used in line fittings. This insulating cap is covered in turn by a similarly shaped cap of malleable iron. The top cap with its petticoat protects the insulating material, keeping it dry and free from sleet, ice and brine. The rail fits loosely between two ears cast upon the side of the top cap, ridges being cast on the seat to lessen the friction when the rail slides from expansion. The writer has taken insulation readings of portions of rail mounted upon this type of third rail chair, the resistance between the third rail and the return rail in some long stretches running as high as 100,000 ohms per mile. Due to its simplicity the cost of such an insulator is practically the same as that of one of the wooden type.

The sacrificing of good insulation to save in first cost will prove later on to have been poor engineering as may now be seen on any wood-insulated rail, if we but read the amperage constantly consumed when no lights are burning and no cars are out.

The third rail on surface roads is located about 27 inches to one side of the running rail. Elevated practice places the two rails

but 20 in. apart. The contact surface of the third rail is raised about 5 in. above the grade of the track rail.

The third rail should be well surfaced, with the proper inclination given to it at all breaks. This slope for high speeds should be about one-half inch in ten feet, the total depression of the end of the last rail being about two inches or just enough to allow the shoe to come in contact directly back of the tip. To obtain a smooth third rail, all joints should be butted closely together with the bolts drawn up tightly. In this way the rail may be anchored in the middle of a section and the expansion then taken care of at the crossings. As an alternative, expansion joints may be put in in an extra long section. All splices should be inspected when first built so that any roughness may be smoothed off and quiet running of the shoe thus insured.

Painting the third rail and insulator castings has been done as a means of insulation and preservation of the steel. The rails before being painted should be cleaned with steel brushes to remove all scale, and then dusted with brooms.

At turnouts a pony rail of small section should be placed opposite the frog. This rail should be of such length as to insure no breaks in the current when a car passes. Rail and cable as small in section, as mechanical strength will permit, should be used for such work. At special work and road crossings care should be exercised in the preliminary work so that as great a length of rail as possible may be placed. Many times the right of way agent, having had no third rail experience and not understanding the value of an extra foot of rail at a crossing just long enough to be spanned by one car, will forfeit short sections of third rail that he may hasten his contracts. Such a proceeding will be sadly regretted by the management at a later date.

The bonds for electrically connecting the conductor rails should have a capacity approximately equal to that of the steel. Among the many types of bonds the one most satisfactory and most generally used in third rail work is made by fusing a number of thin copper ribbons into terminals of cast copper. These terminals are expanded by hydraulic pressure into holes punched or drilled through the thickest portion of the foot of the rail. The many thin ribbons of copper being bent into the shape of a horseshoe below the joint allow much room for expansion and so avoid any undue strain upon the terminals. Two bonds placed on opposite sides of the rail should, for safety's sake, be used at each joint. Great care should be taken to have a perfectly clean and solid connection between the steel and copper. A malleable cast joint plate which wedges between the head and foot of the rail adds to the conductivity of the joint. This style of plate, having two bolt holes, is found to be very satisfactory in keeping the rail in good surface at the splice.

On some of the third rail surface roads the cables which connect the sections at road crossings and switches are found to be a bug-bear; for this reason good material, careful engineering and painstaking construction work should be used with the connecting cables. The sectional area of the cable should be slightly greater than the combined bonding at the third rail joint. Whenever there is any possibility of heating a paper insulated cable should be used; otherwise rubber insulation which is less easily affected by moisture is satisfactory. The cable should consist of a sufficient number of wires to insure flexibility, these wires with their insulation being inclosed in a lead case. For mechanical protection a layer or two of jute should be woven over the lead. Cables must at all times be kept tightly sealed against moisture and great care taken that no kinks occur. The lead sheath should not be grounded to the track with a copper wire, as this, through electrolysis and corrosion, will give a weak point and a chance for a breakdown in the lead sheath.

A satisfactory cable terminal should be placed at either end of every cable. Such a terminal must keep the cable insulation absolutely dry, even under a test of submerging. The terminal must have a large, well joined contact between itself and the cable wires. It should be capable of being easily removed in case of repairs, and must be strong enough mechanically to stand the handling when the cables are distributed. A good plan in cable construction is to build a cable house at some good distributing point. Here the heavy reels may be easily unloaded and the cables cut and headed under cover, because under no consideration should cable work continue in damp weather. Lead for the connection may be kept continually heated here in a brick furnace, and much time and expense saved in many ways. When a sufficient number of cables have been made up and tagged they may be taken out on a flat car and

dropped off at the proper points, as indicated by the tags. A strip of hemlock board should be placed over the cable in the ditch. This protects the lead sheath from injury due to digging of any sort. The cable terminals are held in place by a cast iron or wooden pipe, this pipe being fastened vertically to half a track tie buried in the embankment.

A good method of connecting the cable with the rail is by a special design of stub end bond. The terminals of these bonds are compressed into the foot of the rail in a manner similar to the fastening of the standard third rail bonds. The remaining end of the bond having been leaded into a lug, which is planed so that it will fit very closely to the top of the cable terminal, being held in place by one or more cap screws. Cable terminal bonds should be about 30 in. long to allow for expansion of the rail besides allowing the terminal to be placed far enough away from the rail to clear the snow plow. This type of connection insures flexibility, and the rail may be easily disconnected for repair or testing.

One road places its cables above the crossings on poles. This requires more expensive construction, but provides an easy method of insulation. Still other roads place their cables in wooden boxes filled with asphaltum, a crude method, but said to have been successful for the length of time it has been tried.

By a close and careful study of the sub-station arrangement both third rail and third rail cable may be decreased in size as the feeding distance increases, and thus a large cost in material saved. As the third rail with its cables is the feeder itself, its area of cross section may be calculated in a like manner to any other d. c. feeder.

At every sub-station the rail should be broken and switching arrangements provided for cutting off either end of the line or both. The rail must be well protected with a good design of circuit-breaker on account of the excessive magnetic kick on breaking.

The more common type of third rail shoe is cast iron with a chilled wearing surface. Such a shoe is hung from a wooden bar bolted to the journal boxes and held in contact with the rail by gravity. The links which hold the shoe in place are so designed that in event of the shoe getting caught the links themselves will break first and the shoe drop off, thus avoiding any chance of dragging a broken shoe and injuring the rail or forming a short circuit with the truck. The links are of cast iron and slotted so that a vertical play of about four inches is allowed, two inches above and two below the running position of the shoe. One type of shoe which is now being installed has the shape of a large hinge fastened to the suspension bar. A spring is provided to keep the shoe always in contact. The third rail shoe in general must be designed to allow for small deviation from gage and elevation and must at all times ride in smooth, close contact with the conductor rail, whether held there by gravity or by springs.

Some of the latest third rail construction has the rail covered by a protecting covering of wood, this being done to keep the rail free from snow and sleet and as a means of protection from personal contact. Whether this advantage is worth the extra expense of covering the rail or not is yet to be shown. It may be found, however, that snow and ice will become so tightly packed under the covering as to tear off the shoes or break the covering away from the third rail.

The difficulty experienced with sleet is yet to be satisfactorily overcome. An application of brine, followed by a steel brush, is now the best remedy, but complaint is made that too much brine injures the steel work of the road. Scrapers made by casting thin leaves of steel into a head block are used by some of the elevated roads and are found to do fairly good work in keeping the contact surface clean. Also wire brushes applied by pneumatic pressure, governed by a motorman's valve, are used by some elevated roads.

To protect the passenger at stations all third rail should be placed on the opposite side of the track from the depot platform. At all crossings of country highways cattle guards should be installed. The most satisfactory kind is made of vitrified tiling, as these may be laid directly upon the track ballast. The right of way should be securely fenced on both sides and wing fences provided at all highway crossings.

The high tension distribution for a third rail system differs in no way from that of the trolley, except that the poles are used for the feeder wires alone, having no trolley brackets to support. When carefully built the third rail method, as herein described, will challenge any type of power distribution yet in successful operation as a carrier of local and express passenger and freight traffic.



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PERSONAL INJURY CLAIMS.

In this number of the "Review" will be found two papers bearing on the subject of the claim department of street railways. One of these, by Dr. H. B. Rockwell, analyzes the qualifications necessary for the successful claim adjuster and the other, by Mr. T. E. Mitten, describes in detail the method of reporting accidents and adjusting claims in vogue on the system of the International Railway Co., of Buffalo.

It is significant that the functions of the claim department of a street railway company are rather devoted to the adjusting of exorbitant demands and fighting fraudulent claims than to the settlement of fair and legitimate obligations. In fact, all personal injury claims may be divided in three classes: the legitimate claims in which the liability of the company is unquestionable, the exorbitant claims, and claims which show evidence of fraud. With the first class of claims but little difficulty is experienced. There is no doubt but that railway corporations are willing to treat the victim of an accident for which the company is responsible not only with fairness but with liberality, and it will unquestionably be to the advantage of a company to treat legitimate claims liberally as its reputation for fairness in cases of this kind will not only elicit popular approval but will also weigh in the company's favor in the case for damages which reaches a jury. Were the legitimate claims for damages the only ones encountered there would be but little necessity for establishing a claim department, but it is an unfortunate fact that public service corporations are considered in the eyes of not a small class as legitimate prey and even the average jurymen with the most honest intentions is apt to show unwarranted liberality in the assessment of damages against a railway company.

In case of exorbitant claims where the liability of the company is unquestioned it is very desirable to make a settlement without resorting to the courts owing to this tendency of juries to assess damages at a very high figure. If such claims can be reasonably adjusted out of court it will mean a saving of money to the company. While liberality to the most extreme extent is advisable, by submitting to extortion a company opens the door to future unreasonable demands which, in the long run will prove more costly than fighting such a case in the courts.

The fraudulent claims arising through fake accidents or claims in cases where no accident actually happened are the most costly and troublesome ones with which street railways have to contend, and it is in cases of this character that the disreputable lawyer and doctor find a promising field of operation. The columns of the "Review" for years past attest the number of illegitimate claims which are constantly made against railway companies, and the only policy to be pursued in such cases is to contest the claim showing evidences of fraud to the fullest extent. Every large city contains a horde of lawyers and doctors who are utterly unscrupulous, and who are constantly on the watch to harass street railway companies with threats of lawsuits and who, by means of manufactured evidence, are ever ready to magnify the most trivial mishap into an accident calling for heavy damages. It is the possibility of interference by unscrupulous lawyers which makes it important for a company to settle all claims for damages as promptly as possible. Trivial accidents frequently occur in which the damages sustained are practically nothing and for which an offer on the part of the company to settle for a few dollars would be considered entirely satisfactory to the party injured, and there is frequently no idea of demanding damages in the mind of such a party until he is approached by a shyster lawyer who artfully appeals to his cupidity or sympathizes with his supposed injuries until the party feels he is really entitled to considerable in the way of damages. At this stage the unscrupulous doctor is called in who is ready either to greatly magnify the injuries received or if necessary to discover injuries that never existed. An exorbitant demand is then made on the street railway company, which, if not paid, results in a lawsuit with attendant heavy expenses. It will often be possible to compromise such a case for less money than it would cost to contest it, but as a swindle of this sort successfully carried out will almost invariably lead to similar attempts subsequently, the only safe policy to be pursued is to fight such cases to the end.

The operation of the fake accident worker is but a short step further than the kind of accident claim just described, and it is noticeable that the tendency of street railway companies in recent years has been to push such cases vigorously and to convict the guilty parties in the case of illegal claims. The lax enforcement of the laws against chumperty and maintenance and the growing practice of

a certain class of lawyers to take accident cases on contingent fees have been the causes of bringing many damage suits which would not otherwise have been thought of. A year ago an effective remedy was suggested editorially by the "Review." This is to make the attorneys' fees and costs of all action a part of the judgment. If where the plaintiff failed in his suit judgment were rendered against him for all the expenses, including records, briefs, abstracts, counsel fees, etc., to which the other side has been put, fraudulent suits would not be lightly entered into. Such a reform could not be effected without overcoming strong opposition, and would require united effort on the part of all who suffer from present conditions.

The subject of "Champerly and Maintenance" is to be discussed before the American Association and the experience of those interested in the claim departments may result in a plan for a legal reform campaign that will check the promotion of fraudulent suits.

SINGLE PHASE RAILWAY MOTORS.

In the "Street Railway Review" for October, 1902, was published a general description of the single phase alternating current system designed by Mr. B. G. Lamme, of the Westinghouse company, which is being installed on the Washington, Baltimore & Annapolis Ry., and in this issue will be found an article giving the particulars of the system in more detail than has heretofore been published. It seems inevitable that the alternating current must eventually come into use for long distance and heavy railroad work, not only for transmitting energy in large amounts over long distances but for the conversion of electrical to mechanical energy upon the cars. The advantage of eliminating rotary converter sub-stations with their complicated and expensive machinery and high cost for attendance is too thoroughly understood to require any arguments, and the simplicity of the system devised by Mr. Lamme at once indicates the possibilities of a large saving both in first cost and in the operating expenses over the systems using sub-stations and direct current distribution.

The idea of using series motors with alternating current has been suggested frequently but the vicious and destructive sparking at the commutators of such machines has heretofore been an unsurmountable objection. If this difficulty has been successfully overcome the new system presents an alternating current motor having the same characteristics as the direct current series motor with the addition of variable voltage control without the use of either controllers or resistances. Should the claims of the Westinghouse company for this system be substantiated large equipments can be efficiently operated at practically any speed and any torque with the entire absence of all controller troubles incident to direct current equipments.

The great flexibility offered by this single phase system is not to be found in any of the alternating current railway systems now in use abroad. The foreign roads using alternating current are the Valtellina Berlin-Zossen, Burgdorf-Thun, Stanstad-Engelburg, Gornegrat and Lugano railways. All of these use the polyphase induction motor system. This system with its constant speed motors is generally considered by American engineers to lack the two most essential features desirable in traction service, namely, the single phase current requiring but one trolley wire and the variable field which makes the series motor automatically adjustable for load and speed conditions. It is claimed that in the Ganz system about half of the energy of the moving car is returned to the line when braking, the other half being dissipated in the motors and rheostats. While this saving is theoretically possible it is not accomplished in practice.

While the efficiency of induction motors at synchronous speed is very high, their efficiency at lower speeds is somewhat less than the ratio which the lower speed bears to the synchronous speed. If the motor is running at half synchronous speed its efficiency is less than 50 per cent of the maximum, and at one-fourth speed would be 25 per cent. With a motor having two synchronous speeds the efficiency at each would be the same and at one of these speeds is half that of the other it will be seen that for speeds less than the lower synchronous speed the efficiencies would be based on the proportion of these speeds to the lower synchronous speed, thus making them double what they would be in a motor having but one synchronous speed.

It will thus be apparent that polyphase induction motors are not efficient for traction service work requiring stops where there would be practically no time to run at full speed with the highest efficiency, nearly all the work being done at low speeds in accelerating the train as the motor is cut off practically as soon as the maximum

speed is attained. For runs of long duration without stops, at steady speed, the induction motor is very efficient, but it lacks many of the desirable features necessary for railway work. At speeds materially different from synchronous speeds the efficiency of the induction motor falls off very rapidly, while the efficiency of the single phase series motor remains high over a large range of speeds. The induction motor cannot exceed a definite synchronous speed while the series motor can run efficiently at such speeds as may be necessary to maintain the schedule. Should there be a delay for any cause it is impossible to increase the speed of the synchronous motor so as to make up lost time.

The single phase system of the Westinghouse company has therefore many theoretical points of advantage for railway work and its value in practical service will soon be demonstrated.

ST. LOUIS ELECTRICAL CONGRESS.

The announcement of a comprehensive International Electrical Congress to be held in St. Louis during the week of September 12-17, 1904, in connection with the World's Fair is of special interest to the American Street Railway Association from the fact that the Association has been invited to assume the direction of one section of the Congress, that of Electric Transportation. The plan for this Congress includes three branches; a chamber of delegates appointed by various governments, the main body of the Congress divided into sections, and conventions of the various electrical organizations in the United States held simultaneously with the Congress. In scope the proposed Congress will be far more comprehensive and influential than any previous electrical congress and its transactions will undoubtedly form an important publication showing the developments of all departments in the electrical field.

The American Street Railway Association, owing to the development of the industry which it represents, has attained a prominent position among technical organizations, as is evidenced by its invitation to preside over one of the sections of this International Congress. Official invitations are also to be issued to all the tramway associations of Europe to participate in the Congress and the prominence of the occasion and the publicity which the work of the Congress will receive will undoubtedly add to the prestige of the associations connected with it. The American Street Railway Association has a number of important matters before it which are ripe for discussion among which the subject of standardization is a prominent one. Before another year has elapsed the subject of alternating current traction systems will have come up for serious consideration and the application of electricity to trunk lines and suburban divisions of existing steam roads must soon engross the attention of the Association. The experience of foreign tramway managers and the exchange of ideas with workers in the same field abroad cannot fail to be both interesting and beneficial to all who participate in the Congress.

A number of the prominent electrical societies have already arranged to hold their conventions in St. Louis during the week of the Congress and it is understood that the American Institute of Electrical Engineers, the Electro-Chemical Society, the National Electric Light Association, the Association of Edison Illuminating Companies, the Pacific Coast Electrical Transmission Association and the American Electrotherapeutic Association, will all in this manner take part.

There are weighty reasons why the American Street Railway Association should be adequately represented at the Electrical Congress, and the invitation to take charge of the electrical transportation section will undoubtedly receive the best consideration at the Saratoga meeting. The principal objections that have been urged against holding the 1904 convention in St. Louis at the time set for the Congress are that the date is earlier than it is convenient for street railway managers to leave home, that the street railways of St. Louis will be too busily occupied with handling the Fair traffic to care to entertain the Association, and that the street railway exhibit while now second only to the electrical departments of the great international expositions themselves would be lost in a World's Fair. The first two of these objections may seem trivial when it is remembered that the A. S. R. A. meeting this year is during the first week of September, and that there will be a great sufficiency of entertainment at the exposition city without need of calling upon the local traction companies.

Of the objections we have heard to St. Louis as the meeting place for 1904 the most serious are those connected with the exhibits. No association in this country has in connection with its annual meetings such comprehensive exhibits as has the A. S. R. A., and these

machinery and supplies are justly regarded as one of the most important features of the street railway convention.

We cannot, of course, compare the A. S. R. A. convention exhibit with the World's Fair, for the latter will include probably all of the interest and a vast deal besides, but the exhibits of interest to street railway men at the Fair of necessity will be scattered through the Electricity and Transportation sections and cease to be an exposition of electric railway material for electric railway men. Neither must the A. S. R. A. fail to consider whether, in view of the fact that all of the prominent exhibitors at its convention will be represented at the Louisiana Purchase Exposition, the A. S. R. A. exhibit would approach those of past years should the convention in 1904 be held elsewhere than in St. Louis.

Irrespective of what action the American Street Railway Association may take as to fixing the place and date of meeting for next year, we are satisfied that its best interests require that it be represented at the Electrical Congress. If the convention proper be taken elsewhere, the Association should be represented at St. Louis by a strong committee, of say fifty, who in conjunction with the officers and executive committee of the association could act for it, assume the direction of the electrical transportation section of the Congress, and in effect constitute a special convention to be held in St. Louis.

THE THIRD RAIL SYSTEM.

Since the introduction of electric traction the overhead trolley has held its own against all other methods for conducting the current from the power house to the cars along the line, and while the underground conduit has found favor in a very few large cities, where the density of traffic is sufficient to warrant the enormous outlay required for this construction, the third rail system is the only one which gives promise of interfering with the monopoly of the single overhead trolley. The third rail system comes as the result of the use of larger cars, or of trains, and higher speeds, and its use has largely increased during the last year or two.

On interurban and long-distance railways where competition with steam road service requires the use of heavy trains at high speed a point is soon reached where the overhead trolley wire and wheel have not contact area sufficient to transmit the current required and a trolley wheel cannot be used more than a few days before being ruined because of arcing. The third rail system has been found to fill every requirement satisfactorily up to any speed which it has been possible to attain and for this reason it is likely to come into very extensive use as the development of long-distance electric lines increases. There are many roads, however, on which either the overhead trolley or the third rail system would meet the requirements of the service and on such roads the relative advantages and disadvantages of third rail and trolley construction are important. From the standpoints of convenience of operation, safety and speed the third rail system has been found to be entirely satisfactory. The multiple unit system of control is in successful use on many of our elevated railroads handling enormous crowds daily without the slightest trouble or interruption to traffic, and the third rail shoes operate for long periods of time without renewal and at any speed desirable without serious arcing. The question of safety to the general public hardly arises as all third rail construction must be on private right of way which should be fenced in so that the public does not have access to it, and there is apparently no more danger to passengers from the third rail than from the trolley wire, if there is as much, because a broken trolley wire might come in contact with a passenger while a third rail never could except through trespassing on the roadway.

A number of important questions in regard to the details of third rail construction are considered in an interesting article by Mr. L. E. Gould, electrical engineer of the Sterling, Dixon & Eastern Electric Ry., which is published elsewhere in this issue. The section and chemical composition of the conductor rails, kinds of insulators, methods of bonding, method of making feeder taps, arrangement of special work, road crossings, contact shoes and other important details of third rail work are fully reviewed by Mr. Gould. The difficulty of keeping the conductor rail free from snow and sleet has been discussed considerably at times and has perhaps been magnified to a greater extent than is justified by facts. The simplest way to avoid this trouble is to keep the cars moving, which means that with a short headway little trouble from this cause will be experienced. It

is only on roads having a long headway where this trouble is at all serious and it may be readily overcome by the use of sleet cutters of various kinds. On the elevated roads of Chicago and Boston practically no delay is ever occasioned from this source and the trouble which occurred one morning last winter on the New York elevated roads took place when the roads were first run by electricity and before the cars had been equipped with sleet cutting devices.

It is significant that there has been but little change in the character of third rail construction since this system was first installed with the exception of the improvement in the insulation of the conductor rails and fittings.

NEW STATE ASSOCIATIONS.

The growth of the street railway business and the appreciation of the importance of interchange of ideas and promotion of common interests is evidenced by the organization of two new State associations of electric railway, light and power interests. The Colorado Electric Light, Power & Railway Association was organized August 12th at Denver. Colorado Springs will be the headquarters of the organization, and annual meetings will be held covering two days commencing on the last Wednesday in October. Technical papers on subjects allied to the industries will be presented and the social features will form attractive items of the meetings. The Southwestern Electrical Association of Oklahoma and Indian Territory is another new organization formed July 29th at Oklahoma City, to embrace electric railway and other electrical interests. This association will hold semi-annual meetings at which papers on electric lighting, railway and kindred subjects will be read and discussed. We heartily welcome these new associations in the electrical field and trust that the street railway companies in their respective territories may be fully represented in their membership lists. The proceedings of progressive societies of this character cannot fail to be instructive and valuable and we trust that they will maintain the high degree of merit which has been established by many of the older state associations.

THE PARIS TUNNEL ACCIDENT.

The terrible accident which occurred in the Paris Metropolitan railway tunnel, of which a brief description is given elsewhere in this number, seems to be chiefly attributable to a most lamentable lack of discipline on the part of the trainmen and emphasizes the necessity for strict discipline for electric railway employees. While the use of fireproof cars and every other known safety device is desirable for electric cars operating in tunnels, it does not seem possible that such a catastrophe could occur in this country on any road where moderately good discipline is enforced, even with cars of ordinary combustible materials. According to the testimony of one of the directors of this road there were printed instructions to isolate any motor which burned out. This instruction was disregarded. Then the driver of the disabled train was warned by the station master at Les Couronnes that the train was on fire and could not reach the shops in time, but no heed was paid to this warning. When the explosion occurred and the passengers in the tunnel started to leave by the entrance way to the station all might have been saved, but the reports state that the entrance was impassably blocked by incoming passengers who refused to move until they got their money back, and this blockade continued until the smoke from the burning train entered the station and forced the crowd to seek safety by going back through the tunnel. There was apparently no effort made on the part of the trainmen to help the passengers and no attempt was made to block other trains in either direction. Two trains ran into the burning cars and the only one who seems to have shown any responsibility was the motorman of one of these trains who backed his train to a place of safety. Any organized effort of the employes or the leadership of one cool-headed man could have undoubtedly averted the panic and consequent loss of life.

C. N. DUFFY GOES TO NEW YORK.

Mr. C. N. Duffy, secretary and auditor of the Chicago City Railway Co., has tendered his resignation to take effect Aug. 31, 1903, to become comptroller of the Interurban Street Railway Co., of New York, and its allied companies, the Metropolitan Street Railway Co. and the Metropolitan Securities Co., assuming his new duties immediately after the A. S. R. A. convention.

The Section Fare System as Used in Australia.

BY C. E. BADGER.

In Great Britain and the colonies the demand on the street railways for cheaper fares has been met, not by extending the transfer privileges, but by the establishment of the "Section" system, whereby the passenger is enabled to ride a short distance, varying in length in different cities and on different lines in the same city, for a penny, a longer distance for two pence, still longer for three pence, while to go from one end of the line to the other requires four to six pence. Naturally the sections are longest in the residence districts.

Whether this system is applicable to American lines, I shall not attempt to say, but it gives general satisfaction where used, and has many novel and interesting features. Doing away, as it does, with the vexatious transfer seems to be a recommendation which ought to commend it to careful consideration.

The city of Brisbane, Australia, which has a population of 110,000 and is the capital of the state of Queensland, is served by the Brisbane Tramways Co., Ltd., a London corporation, managed by Mr. J. S. Badger, formerly with the General Electric Co., who has succeeded in eliminating most of the objections to the section system. The lines of the Tramways company comprise about sixty miles. Sixty to eighty cars are operated according to demand. The cars, which with the exception of four, have all been built in the company's own shops, are of two types; a standard combination car, suitable to a semi-tropical climate where open cars may be used all the year round, with closed center and open ends, two cross seats on each end, seating 34 passengers, and 9-bench and 12-bench open cars. The combination cars and 9-bench cars are mounted on single trucks, the larger cars on double trucks.

The construction of the entire plant follows the best American practice, the power house containing one of the General Electric 400-kw. generator direct connected to a vertical compound engine; three G. E. 300-kw. generators belt driven by cross compound engines built by Robey & Co., Lincoln, Eng.; one G. E. 75-kw. monocyclic machine driven by a 100-hp. Westinghouse compound engine. The last named engine is used almost entirely for lighting purposes, furnishing current for lighting the government railway station and yards, though it also drives a 62-kw. 500-volt machine which is utilized for light loads, particularly on Sunday mornings.

The accompanying map shows the ramifications of the system, the section point being indicated by cross lines, the length of the section varying from about 1.2 miles, from the New Farm terminus up to Valley Junction to about 1.2 miles between Valley Junction and the Custom House. The section from the Custom House to North Quay is of the same length.

It should be remembered that in speaking of "penny sections" the English penny (1d.) equivalent to two cent American money, is meant.

Fig. 2, which is drawn to a scale of $\frac{1}{2}$ in. per mile, shows the length of ride given on different lines for the 3d. fare, that being the maximum fare from the center of the city to any terminus. The cars of all lines except line C to 13 (see map) pass between North Quay and Valley Junction through Queen St., the principal business thoroughfare of the city. The car routes are made as long as possible, and are run through from terminal to terminal. For instance, 1 and 2 routes on Fig. 2 are known as the Clayfield-Gladstone Road line, cars running from Clayfield to South Brisbane cemetery, a distance of $7\frac{1}{2}$ miles; 3 and 4, 5 and 6, 7 and 8, etc., are through lines.

During rush hours short run cars are operated on certain lines for one or more sections. For instance, on line 8, from the Custom House to Guthrie St., two sections, and on line 10 from North Quay to Vulture St., one section.

As stated, the fare from A to terminal 1, 3, 5, etc., or in the other direction from B to 2, 4, 6, etc., is the maximum fare, 3d. For a distance of two sections or less a fare of 2d. is required, the 3d. fare being collected for all distances further. Overlapping sections, indicated in Fig. 2, are established for convenience where it is desirable to reach a popular corner for a penny fare.

The fare is collected when the passenger boards the car, the conductor giving in return a check ticket punched to indicate in which direction and to what point the passenger is entitled to ride. It will be noticed that there is no space for punching the date or hour. This is entirely covered by the numbering at the head of the ticket, which taken in connection with the conductor's way-bill enables the company's inspectors to board the cars at irregular intervals to inspect the tickets to detect at once any attempt at beating. So complete is this system that a check ticket picked up in the

street bearing no mark except the punch mark, to indicate date or time of issue can be traced back to the conductor, time of issue and direction in which the passenger was traveling.

These check tickets, a sample of which is here reproduced, are of three denominations and colors: 1d., red; 2d., white; 3d., blue. The sample shown is for what is known as the West End-Hamilton line, extending from 3 (Ascot race course) to 4 (West End). The punching is very simple, one punch telling the whole story. This 2d. ticket indicates that the passenger was entitled to ride over any portion of the sections from North Quay to Valley Junction.

The 1d. and 3d. tickets are similar excepting that the small rec-

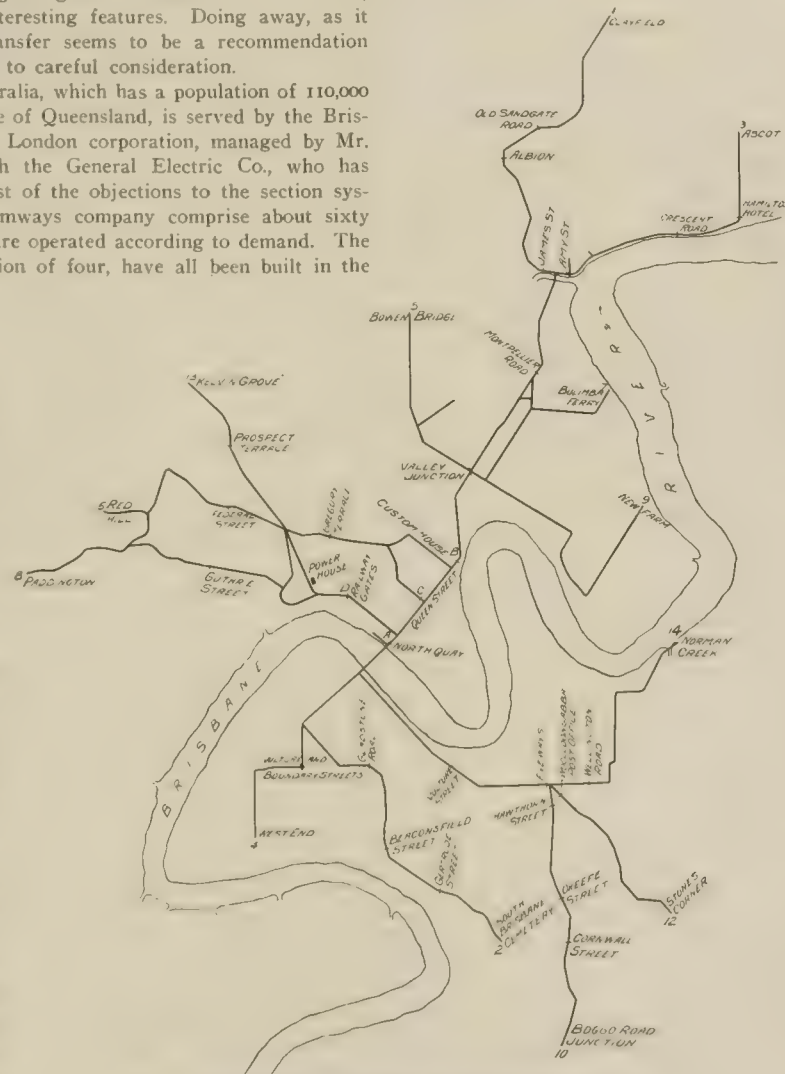


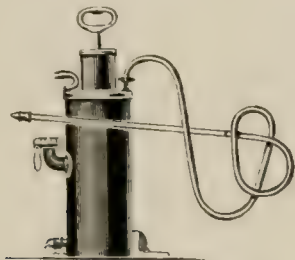
FIG. 1. MAP OF CAR ROUTES, BRISBANE, AUSTRALIA.

The material used for cleaning the brass work of the cars costs about 9d. (18 cents) per gallon, and is made up as follows: Paraffin, 1 gallon; naphtha, 1 quart; turpentine, $\frac{1}{2}$ pint; ground bath brick, $1\frac{1}{2}$ lb.; ground pumice stone, $\frac{3}{4}$ lb.; whitening, $1\frac{1}{2}$ lb.

Soft cotton wipers and best gray rope waste cost about £1 14s. and 14s. 6d. per cwt., respectively (or 7 1-3 cents per pound for wipers and $3\frac{1}{8}$ cents per pound for waste).

Disinfecting.

With reference to disinfection, the insides (seats and floor), together with the roof, top seats, stairs and platforms are sprayed



SPRAYER FOR DISINFECTING CARS. HAND CARRIED WITH SHOULDER STRAP AND 8 FT. OF TUBING. WEIGHT, 30 LB.

with diluted perchloride of mercury daily, the accompanying engraving being an illustration of the apparatus in use in this city known as the "Equifex Spray Disinfecter."

The disinfecting solution consists of one part of perchloride of mercury to 5,000 parts of water. This method of disinfection was adopted by the general manager after consultation with the medical officer of health. It has met with the approval of the American

consul, and also with a number of railway companies as is indicated by the following communication from Mr. James Boyle, the United States Consul at Liverpool:

"I beg to thank you for your communication giving assurances of energetic steps taken by you to prevent the dissemination of contagious and infectious diseases by the Liverpool trams. I suggested to Mr. Davies, of the North Eastern railroad that he communicate with you.

"I am glad to be able to inform you that the railroads interested in the American passenger and emigration traffic have assured me that they will follow your example, and I am glad also to be able to say that the Liverpool Dock Board and the police authorities are doing what they can in the absence of specific local law to stamp out the nuisance of promiscuous spitting round the places of embarkation for American ports."

The practice of spitting on the trams has been rigorously dealt with under the by-law obtained in March of last year which reads as follows, viz.:

"No person shall swear or use obscene or offensive language or conduct himself offensively whilst in or upon any car or *spit* or commit any nuisance in or upon or against any car or tramway station, or premises used in connection with the tramway system, or in any way wilfully interfere with the comfort of any passenger."

Since the introduction of this by-law it has been found necessary in 33 instances to prosecute, and in every case substantial fines have been inflicted by the stipendiary magistrate, and the effect has been to put down the offensive habit. Great interest is being taken throughout the country in connection with the action of the corporation in this matter and the American consul is watching its operation with considerable interest. The secretary of the National Society for the Prevention of Tuberculosis, Dublin branch, has also looked into the subject and has sent a congratulatory letter.

Cleaning and Renovating Car Seats.

BY E. T. MILLAR, CAR DEPARTMENT BOSTON & MAINE R. R.

In the following description of methods of cleaning cars and seats it will be taken for granted that the upholstery is either plush or carpet, although some of the methods and devices for cleaning with compressed air are equally suitable for the treatment of cane or rattan.

The method employed by the Boston & Maine R. R. for cleaning, renovating and coloring car seats is practically as follows:

The cushions and backs are removed from the cars and placed on horses, where all loose dirt and dust is blown out of them with compressed air. The device used is shown in Fig. 1. This nozzle is made of brass, formed at one end so as to give an opening which can be connected to a pipe having a valve in it. This pipe in turn is attached to a rubber hose, which is connected to the reservoir containing the air supply. The opposite end of the nozzle is so constructed as to give an opening about 3 in. long and 3-100 in. wide; however, the length of the opening can be any dimension desired, according to the volume of air at hand, as the air pressure should not be lower than 60 lb. to 80 lb. per sq. in. The latter pressure will do much better work. With a pressure of 80 lb. and a nozzle 3 in. wide, a man can clean a cushion in two minutes. This does not include the time required for moving the cushion. By opening the doors and windows in a car, quite a good job of cleaning backs and cushions can be done without moving either of them. The results from a sweeper's standpoint are very good, as the compressed air will carry ahead of it all the dust and dirt which is in the lattice work on the floor, or in the heaters, or around the seats where they are fastened to the floor, much better than a broom, also much faster.

The average period that a car will run before it becomes necessary to thoroughly wash the seats or cushions, other than sponging off the spots, is about two years, always providing the interior has been blown out by air occasionally in the manner described. The third year it has been found necessary to wash the seats and backs, in which case a solution of water, wood alcohol and ammonia has given very good results. The solution is proportioned as follows:

1 ounce ammonia, $\frac{1}{2}$ pint wood alcohol, 5 quarts of water. This mixture is applied with a sponge, care being taken that the sponge is thoroughly washed out in warm water each time before dipping it in the solution again. By so doing the solution is kept clean until all is used up.

When the cushions and backs of a car become so badly faded,

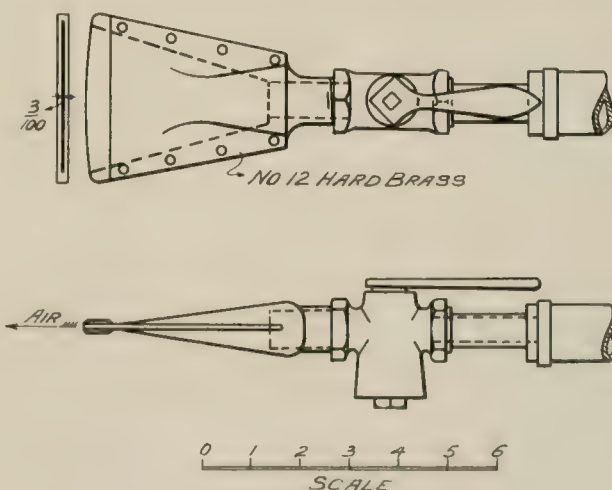


FIG. 1. NOZZLE FOR CLEANING.

spotted and dirty as to need a thorough renovating, the method employed by this company is as follows: The backs and cushions are thoroughly cleansed with air of all loose particles of dust and dirt in the manner previously described. Then they are laid on a rack in the sink (the details of which are shown in Figs. 2 and 3), saturated with hot water, and thoroughly brushed with "Olive Oil" soap suds. The brush used is 3 in. wide x 6 in. long and in order to stand

any length of time, must be made of best quality bristles, from $\frac{3}{4}$ in. to 1 in. in length. Then the backs and cushions are thoroughly washed so as to remove all the dirt which has been liberated by the soap suds, the suds to be also thoroughly removed by some process. Various means have been used to hasten the drying of the seats, such

seats are set on racks over a sink containing the dye, which must be kept hot by pipes passing through it, but the steam must not blow direct into the dye.

The dye can be applied to the backs and cushions either by dipping them into the dye in the sink, into which the forms have been

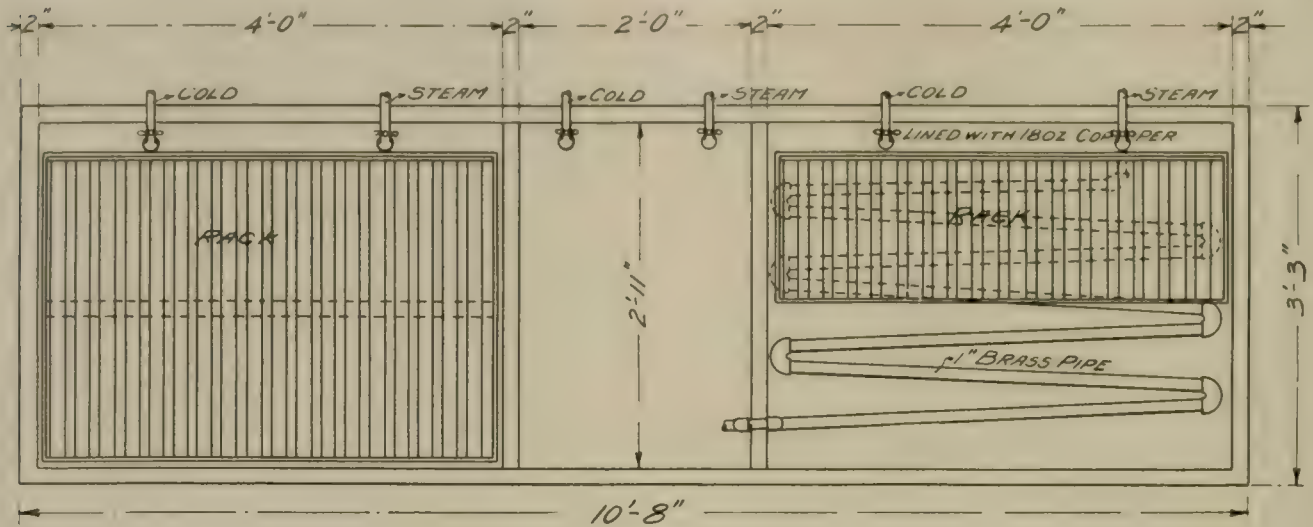


FIG. 2. PLAN OF SINK.

as scraping, but this wears the nap considerably. A better way is to blow the water out with air, using a nozzle with a shield on it, as shown in Fig. 4, the shield being designed to prevent the water from flying in all directions. This nozzle is so constructed as to be attached to the compressed air pipe. As soon as the greater portion of the water is removed from the cushions or backs by either

put in sufficient quantities and the sink plugged up; or the dye may be poured on them and the surplus permitted to run down into the sink again; after which they must stand for a short time, according to the condition they are in. If they are but little faded they can be washed off in five minutes, but if they are badly faded, they must stand longer, according to their condition, before they are

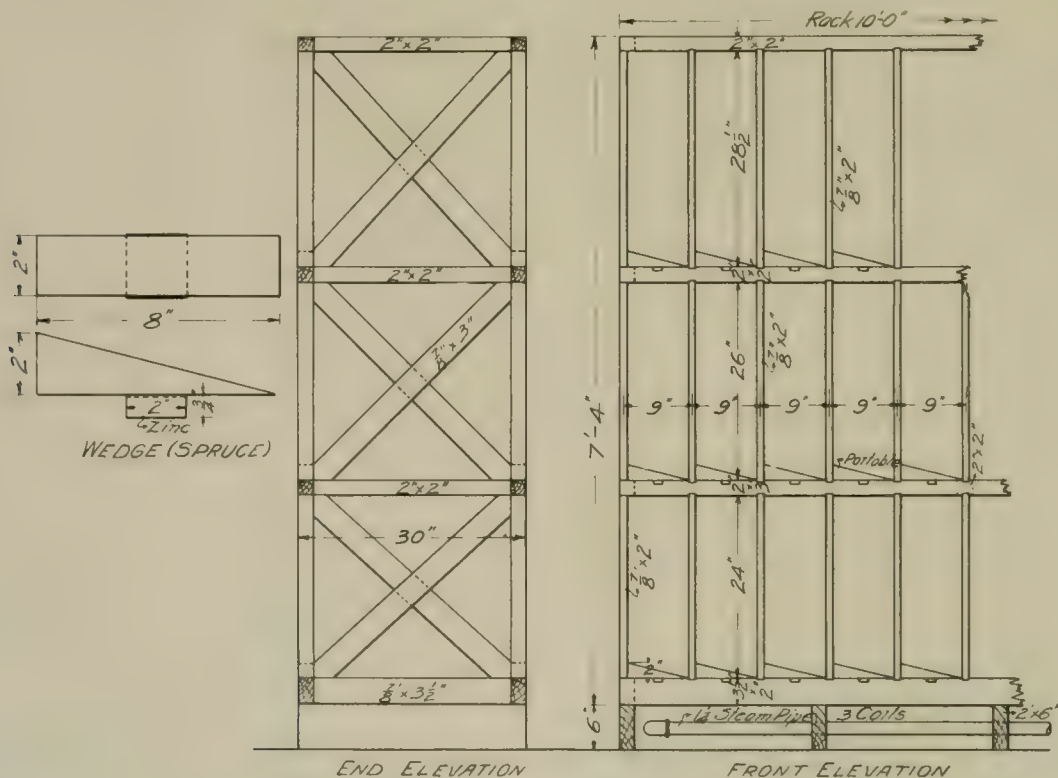


FIG. 5. DRYING RACK.

of the devices mentioned, or by standing them on end and letting the water drain out, they are ready for coloring, and should not be allowed to thoroughly dry, as the color should be applied as soon as the surplus water has been thoroughly drained or scraped off. In all cases the fabric should be damp before color is applied.

The color is prepared and applied as follows; The cushions and

rinsed off with hot water until the water comes off clear. Then use the scraper or air to remove all the water possible from the nap before putting them on the draining rack, where they must stand until the water has ceased to drip out of them, when they may be put in a dry room with racks in it as shown in Fig. 5. The material of this rack is spruce.

The dyes used are aniline. For old gold backs and cushions of the shade used by this company, the following colors are used: Orange, canary yellow and Nile blue, in proportion to get the required shade. For crimson all that is used is fast crimson. To fix

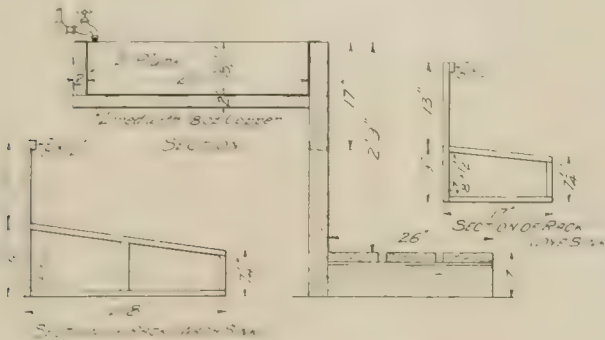


FIG. 3 SECTION OF SINK.

the colors, wool mordant or XX Resocine is used with the dyes.

After the backs and cushions are thoroughly dry, it improves their appearance to give them a good brushing with a stiff brush.

Disinfecting.

Relative to the matter of properly disinfecting car, I do not feel

like saying much on the subject, from the fact that in the past few years there have been so many elaborate lectures delivered and extensive articles written on the best and most economical way to properly and thoroughly disinfect not only cars, but all public

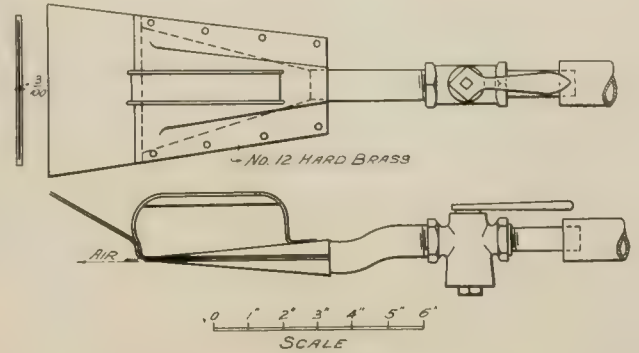


FIG. 4 NOZZLE FOR DRYING.

places. But in my judgment, if a car is thoroughly washed out at stated frequent intervals, with a solution of sulphur naphtholeum or sulphur naphthol, the sanitary conditions of cars will not be very bad. As well as being good disinfectants, the odor from either of these preparations is not at all offensive, neither are they so expensive as to make them impracticable for extensive use.

Track Construction.

BY W. B. ROCKWELL, GENERAL MANAGER, SYRACUSE, LAKESIDE & BALDWINVILLE RY., SYRACUSE, N. Y.

The subject of good track construction has been dealt with so often and by such eminent engineers that it is hard to say much of anything new on the subject. However there are two or three things that are worthy of emphasis.

When I first started out in railroad work, I went to the head track man of the Delaware, Lackawanna & Western R. R. to get some pointers. I asked him what he considered the first essential to a good roadbed.

He replied, "Plenty of ties."

When I inquired what was the next, his answer was, "More ties." It was right to the point, and I never forgot it.

The mistake is too often made of trying to economize in ties. They are the least expensive part of the roadbed, and yet the most important, so why try to economize here? I would rather use a light rail with plenty of ties than a heavy rail with few ties. Of course, this can be overdone; ties may be so close together that they cannot be properly tamped.

As most of the trolley roads of the future will be long distance suburban roads, I wish to say a few words with particular reference to that style of construction. Interurban work should be T-rail construction through private right of way and not in the highway.

Engineers should lay out their work with a view of interchanging traffic with steam roads. There should be no impractical grades or curves, but as many and as long tangents as possible. In this I would be extravagant, running through a farm house rather than deflect from the tangent.

The grading should be completed and allowed to settle, then rolled with a 10-ton roller before placing ties. The roadbed should be made true to grade, so as to have a uniform depth of ballast; made crowning, so that the water leaching through the ballast, will drain off readily; it should be 15 ft. wide, so that there will be shoulders of 3 ft. at the ends of a 9-ft. tie. Chestnut or white oak ties should be used, 7 x 9 in. x 9 ft. placed 2 ft. between centers. (I have not yet had sufficient experience in steel or other materials to advocate metal ties. Glass has a good running chance with steel as a material from which to make ties.) The weight of rail should be 70 to 80 lb. to the yard. An 80 lb. rail is a happy medium, and there are several very good sections of it. Rails should be in 60-ft. lengths, the old iron joints should be on the under supporting style, like the "Weber" or the "Continuous" rail joint. Six-bolt fish plates should be put on and screwed up tight, tie and rail should be aligned as well as possible before picking. Where pos-

sible to avoid it, cars should not be allowed to run on track till ballast, tamping, aligning, etc., is done.

For ballast, broken stone about the size of chestnut coal and laid 2 ft. deep is good. It tamps better than stove or egg coal size. A good gravel makes a splendid ballast and is preferred by some.

In aligning track, the eye must not be trusted for tangents or curves; instead, the engineers should use their instruments. Sometimes good men can be trusted in easing a curve. I know of very few. Many will say they can line a tangent almost any distance, and they really believe it. I do not.

As to the question of bonding rails. In the bonds is the largest chance for "leaks" in the cost of operation, and it is possible that the amount of current lost in "leaky" bonding may equal the amount used in the car motors. There have been no radical steps forward in methods of bonding for several years.

In 1885 we used a solid copper wire riveted, and before the next year we realized that we must have the bond flexible and that riveting was no good. The year 1890 found us using the flexible cable and fastening with either plugs or bolts, and a little later, soldering or brazing. Several supply houses are claiming that the only bond is the one made all in one piece with no joints. Why? Simply because they realize that there is danger in every joint or connection. They do not go far enough. There are two more connections yet to be made. The two ends have yet to be fastened to the rails, the hardest connection to make on account of its being copper to iron.

To my mind, these two ends must be welded, and the copper and iron thoroughly united before there is a contact that can be depended upon. In 1886 I bonded four miles of track by welding. It is in perfect condition today. I had a very crude way of doing the work, but it accomplished results. We hooked a wire over the trolley wire, then passed it through a rheostat that would have done credit to one of the old feeder equalizers of the Edison three-wire system of lighting, fastening it to a 3/4-in. carbon. We touched the carbon to the rail to start the current, then holding it 1/4-in. away, an arc was formed while the end of the bond also placed in the arc was held on the base of the rail, and by using the proper flux, we soon had a puddle of the materials. Then, removing the carbon the combined metals congealed forming a perfect contact. I have been waiting in vain for someone to produce an improvement upon this method, and, when this shall have been done, it will be a stride forward toward "Ideal" track construction.

METHODS OF CAR PAINTING AT SHOPS OF UNITED TRACTION CO., ALBANY, N. Y.

BY J. J. BUTLER, MASTER CAR PAINTER, UNITED TRACTION CO.

All cars and parts are passed through the paint shop and every year are cleaned and varnished. The exteriors and interiors are cleaned and renovated with Brooks renovating oil, applied with sponge or brush and then wiped dry. Plush seats and carpet covered seats and backs are washed and brought back to their original color by a process invented by the writer. Cane seats and backs are bleached and restored with a patented solution. The seats and backs are first washed and scrubbed with soap and pumice stone, using a stiff brush. The bleach is then applied and allowed to dry. The surfaces are then washed with water and after drying are treated to a coat of white shellac.

We believe that box cars should not be varnished inside oftener than once in every two or three years, as if too much varnish is applied it will crack and give an unsatisfactory surface. Open cars require varnishing and retouching at shorter intervals.

6. Coat rough stuff.
7. Coat rough stuff (grey coat).
8. Coat rough stuff (rubbed out).
9. Two coats of body color.
10. Ornament and letter.
11. Coat of body varnish.
12. Finishing coat of body varnish.

We generally allow 20 hours between coats providing we have the time.

INDIANAPOLIS NOTES.

The Indiana Union Traction Co. contemplates extending its system east from Muncie through Portland to Celina, O., where connection may be had with Lima and Toledo.

The Indiana United Traction Coal Co., capital \$100,000, has been incorporated to hold coal lands and operate mines in Indiana. The organization of this company is said to be due to the shortage of coal last year. George F. McCulloch and Arthur J. Brady, of the Indiana Union Traction Co., and Hugh J. McGowan, of the



PAINT SHOP, UNITED TRACTION CO., ALBANY, N. Y.

Window sash are cleaned by means of a special solvent. A long box is prepared to hold the solvent and the sash are dipped down into the box and permitted to remain about ten minutes. This preparation loosens the old varnish, which is then removed with a stiff scrub-brush. The sash are then washed clean with gasoline or turpentine and are bleached out and brought to their original color by a special solution which makes the wood look as good as new. The solution consists of oxalic acid and water in the proportions of 1 lb. of acid to 3 gallons of water. This is applied with a brush. When dry the surface is washed with water. After drying the surface is ready to be sandpapered and finished with three coats of body varnish. We find that sash need more varnish than interiors because they are dropped down near the floor where the air is more or less damp.

Doors and backs of all open cars are put through the same process. All brass trimmings are cleaned and lacquered.

When necessary to repaint closed cars from the wood we first burn the old paint off with a gasoline blast. The various steps are then as follows:

1. Thoroughly sandpaper and clean with benzine.
2. Coat of primer.
3. Coat of lead.
4. Putty.
5. Coat rough stuff.

Indianapolis Traction & Terminal Co., are the organizers. They have acquired coal lands in Sullivan County and may build a traction line into the coal fields.

The Jewett Car Co. will soon deliver to the Indianapolis & Northwestern Traction Co. 20 passenger cars and 4 express cars which will be forwarded on their own trucks from Newark, O., to Lebanon, Ind., about 250 miles, by way of Columbus, Springfield, Dayton, Richmond and Indianapolis. The new cars are 60 ft. long and the motors will be geared for 60 miles an hour. The Indianapolis & Northwestern's system will be completed to Frankfort by September 15th and to La Fayette and Crawfordsville by January 1st.

J. Morgan, president of the Dayton Traction Co., and L. J. Weadock, secretary of the People's Rapid Transit Railway Co., of Toledo, conferred with Ohio and Indiana capitalists at Indianapolis July 30th regarding a proposed electric road between Indianapolis and Toledo. It is planned to build from Toledo through Defiance, Napoleon and Van Wert, O., to Decatur, Ind., paralleling the Wabash railroad part of the way. From Decatur to Indianapolis no definite plan has been arranged, but the route favored is by way of Hartford City, Alexandria and Noblesville, part of which territory is occupied by the Indiana Union Traction Co. It is thought that an agreement will be entered into whereby the new road will use the Union Traction Co's. track, while the latter company will secure a desired connection with Toledo.

Hudson River Water Power Co.

Water Power Developments on the Hudson River at Spier Falls, Mechanicsville and Elsewhere on the Upper Hudson.

It is not generally known that within ten miles north of Saratoga there is now nearing completion a dam across the Hudson River which in importance and magnitude, ranks with the three or four largest dams ever constructed in any part of the world.

Five miles south of the old town of Assuan on the Nile, the English government has built an immense dam of red granite, laid in portland cement, as wonderful in its way as the pyramids, and far more sensible in its purpose than the Sphinx. This dam fills

the water supply of Boston and surrounding cities and towns. It is to be 850 ft. long; its maximum height 205 ft; its width at bottom 185 ft., at the top 20.5 ft. Its approximate cost will be \$2,000,000. Work on it began in the autumn of 1900.

At Spier Falls, N. Y., a point about 10 miles from the village of Glens Falls, N. Y., a citizen of that place, Mr. Eugene L. Ashley, with no fortune but his own indomitable energy and resourceful mind, in spite of obstacles that would have unnerved any but the



COFFERDAM AND PART OF CABLEWAY PLANT SPIER FALLS.

space of about a mile and a quarter between limestone cliffs on the west side of the river and a granite slope on the east. It is 147 ft. at maximum height above the rock foundation of the river, 82 ft. broad at the base and 23 ft. broad at the top. Its purpose is to conserve water for the irrigation of the plains of lower Egypt and maintain their fertility in the dry season after the annual overflow and subsidence of the river. Its cost will be nearly \$10,000,000.

The City of New York is building a new dam for the enlargement of the Croton reservoir. This dam will be 296 ft. high (extreme height), 216 ft. broad at the base, 22 ft. broad at the top and 2,180 ft. in length. It will cost from \$5,000,000 to \$6,000,000. This is supposed to be the second great dam in the world, inferior in size only to the Nile dam at Assuan.

At Clinton, Mass., a dam is being built to create a reservoir for

most resolute of men, has built a dam across the Hudson of white granite, 157 ft. deep where the river bed dips to its lowest point, 115 ft. broad at the base, 22 ft. thick at a point 8 ft. below its rounded top and 1,570 ft. in length from shore to shore. It is an enterprise to be compared with the three just mentioned, undertaken by governments of unlimited resources.

The history of this development of the water powers of the Upper Hudson contains much of more than passing interest, not unmingled with sentiment, and records of heroic human endeavors, but space will permit only a brief review of the more striking engineering features.

For several years prior to 1897 the various properties along the Hudson River between Glens Falls and Palmer Falls were in the hands of speculators. These men knew the value of water-rights,

but they had not the ability to assemble the property and finance such an undertaking. In 1887 Mr. A. E. Eddy began buying these water

rights, and later the power house at Spout Falls, and active operations began in June, 1900. In November of the same year the contracting company withdrew, and since that time all of the work has been done by the Water-Power company.

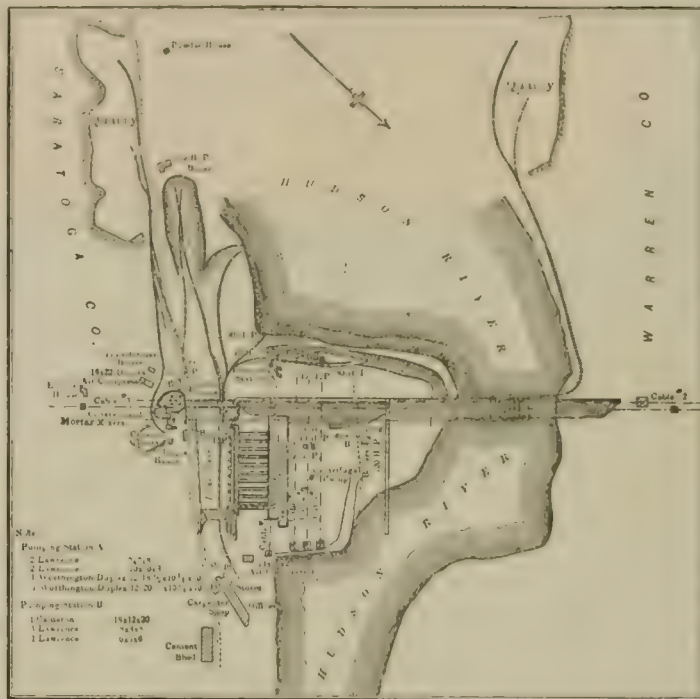
The location of the dam was naturally fixed by the conformation of the mountains where they approach each other most nearly. At this point the flow of the river is from southeast to northwest.

The land purchased and the company formed, competent engineers for designing and executing the work were employed. Mr. W. Barclay Parsons, chief engineer of the Rapid Transit Commission of New York, and Mr. G. E. Evans, of Boston, were retained as consulting engineers. Mr. C. E. Parsons of Glens Falls was installed as chief engineer in charge of the work.



MAP OF TERRITORY SERVED BY HUDSON RIVER WATER POWER CO.

rights, and, after two years of litigation, title was secured to all of the properties along both sides of the river, and the Hudson River



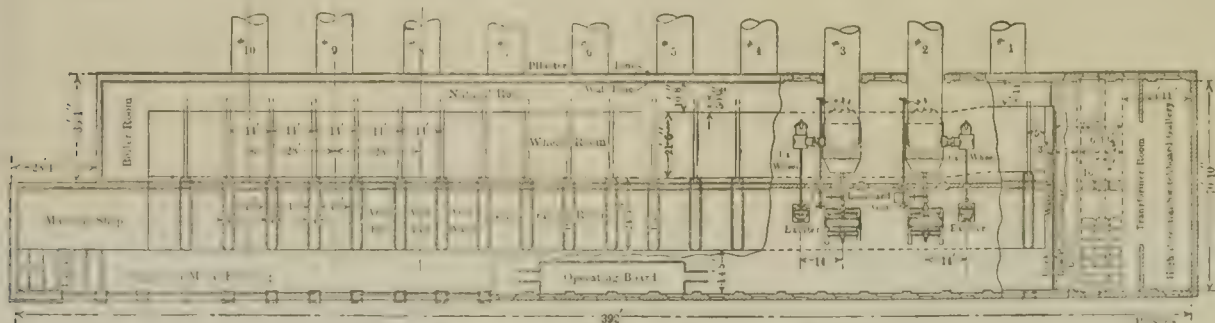
GENERAL PLAN OF HUDSON RIVER WATER POWER CO.'S WORKS.

The officers of the company as at present organized are: President, Eugene L. Ashley; vice-president, Walter H. Trumbull; secretary, Elmer J. West; treasurer, E. H. Gay; auditor, C. H. Peddrick, jr.

Thus organized ground was broken June 20, 1900. As the work advanced, more and more labor was required, until as many as 1,700 men were employed with a pay roll of \$60,000 per month.

PLANS.

The general plan shows the main dam, the cofferdam, and the location of the plant used during construction.



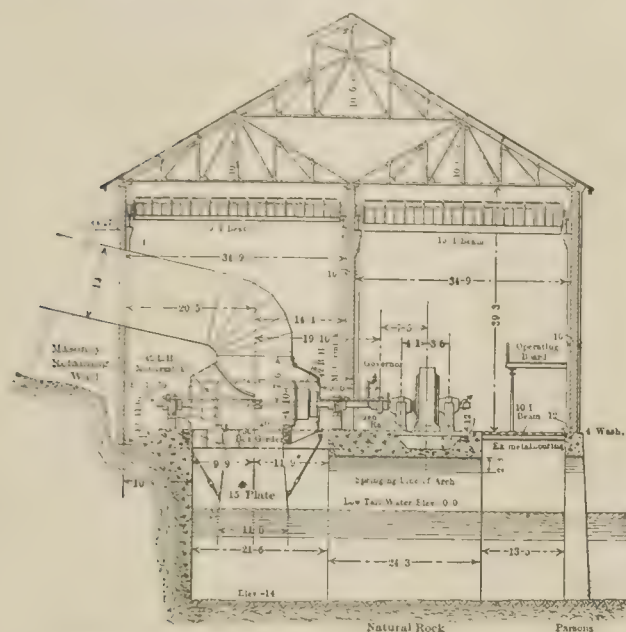
PLAN OF POWER HOUSE FOUNDATIONS.

Water-Power Co. was organized to construct a dam and transmit power to the surrounding cities and villages. A contract was let

The overfall or spillway, 820 ft. long, is on the northerly side of the river, and is separated from the river section by a wing-wall

at right angles to the dam. This wing-wall is 10 ft. high, 400 ft. long, and is built as a protection for the tail race.

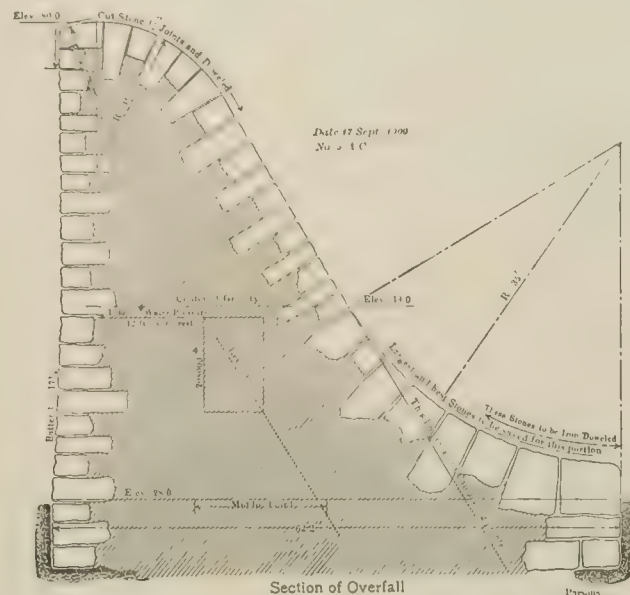
The high dam, or river section, 560 ft. long, extends from the



CROSS SECTION OF POWER HOUSE—SPIER FALLS.

overfall to the entrance of the intake canal on the southerly side of the river. The canal is 400 ft. long, and is formed by the intake wall on one side and the natural rock on the other. Ten feeder-pipes, each 12 ft. in diameter, pass through the intake wall and connect with the casings of the water-wheels. These tubes are 160 ft. long.

was abandoned in 1901. Since that time all of the stone has come from the quarry on the southeast side. An exceptionally good sand is found within 600 ft. of the work. The concrete- and mortar-mixers, and the stone-crusher and crusher-quarry are in line with the dam and directly under the three long cableways.



SECTION OF SPIER FALLS DAM.

Seven Lidgerwood cableways are in use, three parallel, and four at right angles to the dam. Two of these are the longest cableways in the world; one being 2,140 ft. between supports and the other 1,660 ft. The main wire on the longest cableway is $2\frac{1}{2}$ in. in diameter, and the others are $2\frac{1}{4}$ and 2 in. in diameter. The third parallel cableway is 1,000 ft. long, and the four shorter ones are,



PENSTOCKS AND ARCH TAILWAYS, JAN. 12, 1903—SPIER FALLS POWER STATION.

The power house is in the old river bed and against the southeast bank, the foundations being set in a rock excavation. About 8,000 cu yd. of rock were taken out at this point and used in the masonry.

The quarry on the northwest side of the river was used during the construction of the overfall and part of the river section, but

each 700 ft. long. The head towers of the short cables stand on the upper cofferdam 57 ft. above the old river bed.

This cofferdam has been the most difficult part of the entire construction work. It is 800 ft. long and 90 ft. high at a point near the southerly shore. It was built of round timbers spiked together,

and has pockets about 10 ft. square. These pockets were filled with stone and an embankment of broken stone was made on the upper side; above, and outside of this, a heavy gravel fill made the dam complete. The main part of the cofferdam has been tried by two spring treshets. Ice floes and logs have gone over parts of it which were then completed and it showed no signs of failure. The only trouble has been where the crib-work had not been entirely filled with stone.

The overfall is 63 ft. thick at the base and 17 ft. 10 in. thick 8 ft. below the crest. The downstream face is built of first-class, random range ashlar, laid with one-half inch joints. Fine pointed masonry is used over the crest and at the toe. The upper side is built of second-class ashlar laid with three-quarter inch joints. The filling is made of uncoursed rubble, laid in mortar consisting of $2\frac{1}{2}$ parts sand and 1 part cement.

the water in the tail-race and are connected with the tail-race by means of air tight draft tubes.

The generator room is directly west of the wheel room and will be divided from it by a brick partition. In the generating room will be located eight 2,500-kw. and two 2,000-kw., three-phase, 2,000-volt, 40-cycle General Electric generators, each directly connected to a pair of water wheels. There will also be located in the same room, between the generators, two 150-kw. and one 300-kw., 125-volt exciters, each directly connected to its own water wheel.

At the south end of the building will be located the transformer room which will be 40 x 70 ft. In this room will be located thirty 833-kw. and six 670-kw. air blast step-up transformers of General Electric type, necessary motors and blowers for cooling the transformers, and the high and low potential switchboards.

On the west side of the generator room, about in the center of



EXCAVATION IN RIVER BED 65 FT. DEEP, SHOWING DOWN-STREAM SIDE OF DAM AND DERRICK USED IN CONSTRUCTION SPIER FALLS—JUNE 12, 1903.

The high dam or river section is 154 ft. high, 113 ft. thick at the base and 17 ft. thick at the top. Both faces are laid with hammer-dressed rubble, and the interior is filled with rubble concrete. This concrete is made of 1 part cement, 3 parts sand and 5 parts crushed stone. It is used the same as mortar, and the large blocks of rubble are set in the wet concrete. The spaces between the stones are filled with spalls and concrete, and the whole mass settled into position with spades. The best portland cement has been used for the entire work.

The power house will be divided into three sections, the wheel room, the generator room and the transformer room. The wheel room will be located on the southeast side and will extend almost the entire length of the building. In this room will be located ten pairs of McCormick water wheels, each pair capable of generating 5,000 h. p. under an 80 ft. head. These wheels are controlled by various types of governors so that they will run at practically constant speed for all changes of load. The wheels are set 12 ft. above

the building, will be the instrument and operating switchboards. On the operating switchboard will be placed small controlling switches, by means of which the attendant stationed here will operate the main high potential oil switches, so that the whole plant is practically under the control of one man, who will be able to throw any machine or feeder in or out of circuit by manipulating the proper controlling switch.

Directly beneath the transformer room will be located an underground room for the low potential switchboard, and directly back of this will be located the air tight room from which the compressed air will pass up through the transformers.

Directly back of this room and on the floor above will be the high potential switch chambers. These chambers will contain the high potential transformer, selector and bus sectionalizing lever switches, high potential electrically operated oil switches, lightning arresters, etc.

Current will be generated at 2,000 volts, 40-cycle, alternating.

This current is then carried through cables, laid in ducts in the floor of the power house, to the low tension side of the transformers. In the transformers the voltage is raised to 30,000 volts and is then transmitted through the feeders to sub-stations in the various centers of distribution, located within a radius of 45 miles from Spier Falls, including Troy, Albany, Schenectady and intervening town and cities. Contracts have at this writing been closed for furnishing 10,000 h. p. to the General Electric Co., at Schenectady; 6,000 h. p. to the United Traction Co., at Albany; and various amounts of power to the Schenectady Railway Co. and other power users in the vicinity of Albany and Troy.

The company also owns water power development rights at Ashley Falls and at Gay's Falls, on the Upper Hudson, and when the three water powers are fully developed the company will be able to deliver a maximum of 150,000 h. p.

Pending the completion of the plant at Spier Falls, it became desirable, in order to fill certain contracts for power, to secure an operating plant and accordingly in 1902 the Hudson River Water Power Co., through a subsidiary company, purchased the water power plant at Mechanicsville, N. Y. Concerning the engineering features of this plant much has been published in the "Street Rail-

and 30 ft. thick through base and apron. The eastern abutment is 20 ft. long, 15 ft. high above the river bottom, 16 ft. thick at the top, and 34 ft. wide at the base; the western abutment is 100 ft. long, 26 ft. high above the river bottom, 16 ft. thick at the top, and 34 ft. wide at the base. The length of the spillway between abutments is 707 ft., and to this has been added an additional spillway 143 ft. long, which was formed by removing the rock and earth from the river bank back for 150 ft. from the eastern abutment to an elevation 1 ft. lower than that of the crest of the main dam. The crest on the additional spillway, however, is 1 ft. higher than that of the main dam.

In the western abutment are 12 arched waste gates, each 4 ft. wide and 6 ft. high, opened and closed by heavy iron hoists operated by rack and pinion to which is connected a 3-h. p. General Electric motor. The eastern dam is practically a solid rock wall, considered capable of resisting floods.

The power house lies between the west bank and the short concrete dam and is practically a continuation of the dam. It is of concrete, with the exception of the upper walls which are of brick. The foundations are carried down to bedrock, and the house is carried on heavy box web girders resting upon steel I-beam columns.



FINISHED COPPERDAM ABOVE MASONRY WORK. OCT. 23, 1902

way Review" and other technical papers. The following is a brief resume of the chief features:

MECHANICSVILLE STATION.

Mechanicsville is a village of about 5,000 inhabitants, situated on the Hudson River, 13 miles north of Troy. Two miles below this village in the town of Half-Moon, and 11 miles from Troy, on the Hudson River, is located the power plant of the Hudson River Power Transmission Co.

The point chosen for its development is divided by an island into two channels with a combined width of about 1,200 ft. The western channel is used for the head-and tail-race. The power house starts from and extends into the river 215 ft. and is connected with the island by a concrete dam 26 ft. above the bed of the river, 10 ft. wide on top and 18 ft. wide at the base. The up-stream face is vertical, the down-stream face sloping. The dam is provided with four arched waste gates 4 ft. wide, 6 ft. 6 in. thick. The main dam is built entirely of concrete. The up-stream face is vertical, the down-stream face curved, with a horizontal apron 14 ft. wide, which carries the running water off laterally, preventing wash on a corner of the dam. The dam is 15 ft. high above the river bed, 8 ft. thick just below the crest, 16 ft. thick through the base,

The latter are embedded in concrete walls carrying arches which form the floor of the generator room and the floor on which the wheel flumes rest. The walls form a separate and distinct tail-race, 22 ft. wide, for each set of turbines from which the water may be shut out at will.

The power house is divided into two parts by a head wall 6 ft. thick. The up-stream part contains wheel chambers for seven 1,000-h. p. water wheels, five of which were installed in December, 1898, the two additional wheels having been installed in December, 1899.

The down-stream portion of the power house contains the wheel governors, and the electrical apparatus. The length of the power house proper is 257 ft. 6 in.; the total width 66 ft. 6 in. At the western end a brick extension runs up-stream 87 ft. 5 in. long, and 44 ft. 10 in. wide. The western stream running between the bank and the island forms the forebay 300 ft. long. The main tail-race is 205 ft. wide and joins the main stream 750 ft. below the power house.

Arched chambers are provided for seven main wheels and two exciter wheels. In the head wall of each main chamber is set a heavy cast iron cover, through which the turbine shaft passes in a water-tight packing box carrying the ring oil bearing for the shaft.

A 30-ton crane runs the entire length of the dynamo room.

In front of the wheel chambers is a trash rack of steel bars supported on a framework of I beams. This rack effectually prevents the access to the wheels of any rubbish or floating material that may escape the boom.

The water wheel plant consists of 14 pairs of 51-in. McCormick turbines, built by the S. Morgan Smith Co. Each turbine unit consists of two pairs of wheels each of which at the normal speed of 114 revolutions is rated at 250 h. p. Each set of turbines is, therefore, rated at 1,000 h. p. Two draft tubes lead from each main turbine, the forward tube descending straight into the tail-race beneath the power house, the rear or up-stream tube curving and flaring downward and outward. The head under which the wheels are operated is 17 ft.

The turbines for the exciters consist of three 18-in. Victor cylinder gate wheels, giving, at 259 revolutions per minute, a total of 300 h. p. Two draft tubes are allotted to each set of exciter wheels, the rear tube 4 ft. in diameter and the forward tube 3 ft.

The governors installed are the type "B" as manufactured by the Lombard Governor Co., of Boston, Mass., and have given very satisfactory service.

The dynamo room is 34 ft. wide and 255 ft. long. The ultimate generator capacity of the station is 7,000 h. p. in seven generators each of 700-kw. capacity. They are of the General Electric type, unitooth, three-phase, 40-pole, 750-kw. 114-revolutions alternating-current machines having revolving fields and stationary armatures wound to deliver to the transmission lines 36 amperes of current at a periodicity of 38 cycles and a pressure of 12,000 volts. By using the revolving field type of generator, thus securing this pressure directly from the machine, the use of step-up transformers to raise the voltage for transmission is dispensed with.

The exciters are placed one on each side of the stairway leading to the switchboard gallery. They are 6-pole, 100-kw., 125-volt standard direct connected machines.

The switchboard is located on a gallery on the north wall of the dynamo room, and was originally equipped with air break switches, which were not satisfactory for high tension work. These were

board the high tension wiring was so arranged that the operator might be injured in switching, whereas on the new board all the high tension apparatus is beneath the switchboard gallery, and the switches are in separate compartments, worked by a lever from the upper gallery.

The building is heated throughout with electricity, the current being furnished by the direct current exciters.

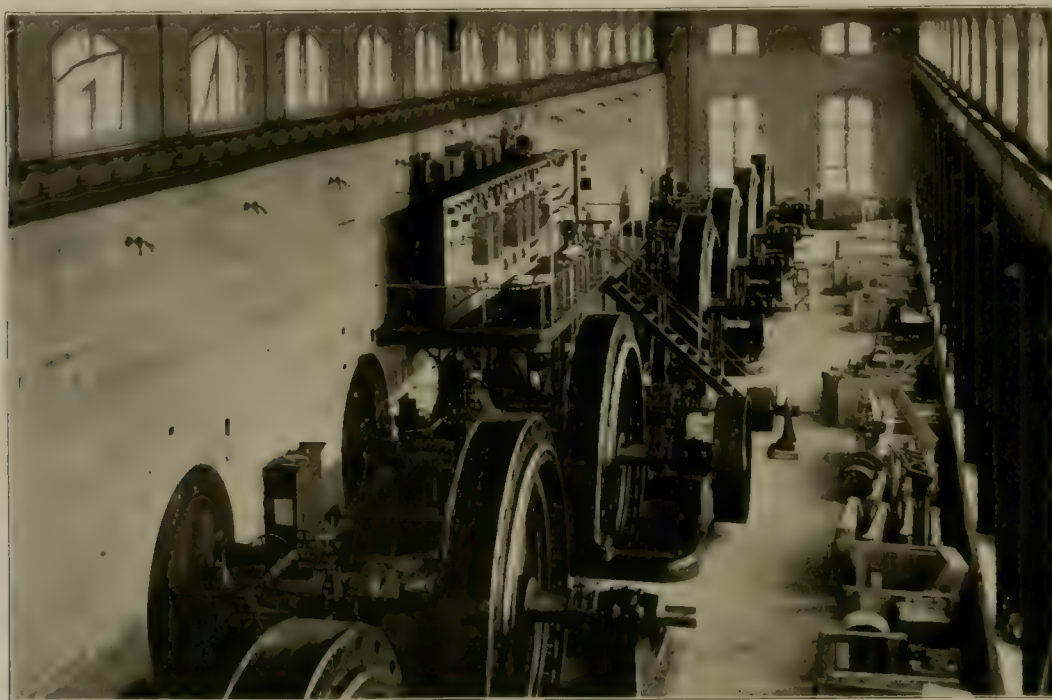


DAM AT MECHANICSVILLE

The station is equipped with pumps of a suitable design so that in case of flood or high water the operation of the plant is never interfered with. These pumps are also used for fire purposes and for pumping water for general use throughout the building.

A modern air compressor is installed in the power station, which is used for cleaning the apparatus and is by far the most satisfactory way of taking care of this work.

The power house and racks are protected from damage due to ice



INTERIOR OF MECHANICSVILLE POWER STATION

replaced by later oil break switches, which were also not entirely satisfactory. These have lately been replaced by a modern "Form H" General Electric oil switch with motor control that will open any circuit up to 30,000 h. p. without trouble. With the latest changes that have been made in the switchboard it is now feasible to run different circuits on separate bus-bars thereby insuring perfect voltage regulation to the different customers. On the original

in the Spring or Fall by means of a number of piers, so placed in the river immediately above the station that all ice, etc., is forced over the main dam.

An auxiliary steam plant of 1,000 h. p. capacity was installed during the summer of 1901 to aid in fulfilling contracts in case of low water. This plant consists of two 505-h. p. Heine safety water tube boilers, one Hamilton-Corliss tandem compound engine, 24-in.

and 48 in. x 48 in. of 1,000-h. p. capacity to which by means of a rope drive can be connected one of the 750 kw. generators. A rope drive was used in this installation owing to the short distance available between center of engine and generator, which was 18 ft. 10 in. There are 25 of these ropes, each one being $2\frac{1}{4}$ in. in diameter. The steam plant is also provided with a Smith-Vaile feed water pump, one 1,000-h. p. Deane condenser, and one American feed water heater.

The generator to which this engine can be coupled is so arranged that it can be run either by water or steam power, and can be changed over either way in about one hour's time.

The transmission lines from this plant are as follows:

One 18-mile, three-phase circuit of No. 000 bare copper wire from power station to Schenectady via Alplaus.

One 17-mile, three-phase circuit of No. 000 bare copper wire from power station to Albany via Waterford, Cohoes and Watervliet.

One 11-mile, three-phase circuit of No. 000 bare copper wire from power station to Watervliet via Waterford and Cohoes.

The first circuit runs cross-country, following the highway about one-third of the total distance.

The other two circuits follow the Champlain Canal from the power station to their destination.

Electrical energy is furnished over these high tension lines to the United Traction Co., of Albany, N. Y., for use in operating its entire electric railway system in Albany, Troy, Cohoes, Watervliet and Waterford. Current is also furnished for lighting and power purposes in Watervliet and vicinity and to the General Electric Co., of Schenectady for use in its factory at that place, and the Schenectady Railway Co. in connection with the operation of its local trolley system as well as the new road operating between Schenectady and Albany.

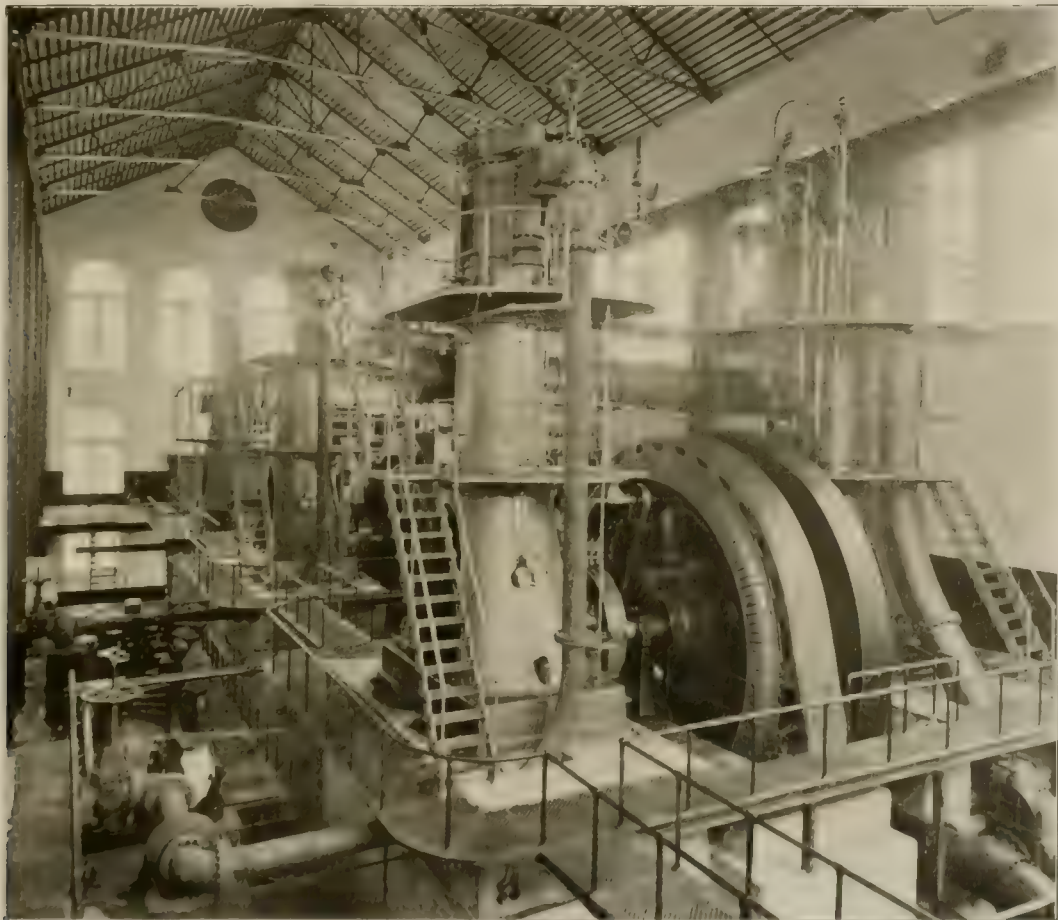
In conclusion acknowledgment is made for assistance derived in the preparation of this article to "The Story of a Great Enterprise" prepared by Mr. George B. Gow, of Glens Falls; to a paper read by Mr. Charles E. Parsons, chief engineer, before the February, 1903, meeting of the American Institute of Mining Engineers, and to an account of the Mechanicsville plant prepared by Mr. B. E. Morrow, manager operating department, Hudson River Water Power Co.; from all of these authorities extracts have been freely made by kind permission of the respective authors.

The Electric Division of the Fonda, Johnstown & Gloversville Railroad.

BY H. O. ROCKWELL, ASSISTANT GENERAL SUPERINTENDENT AND RESIDENT ENGINEER.

A description of the electric division of the Fonda, Johnstown and Gloversville Railroad is appropriate in this issue for several reasons. The line gives continuous electric railway connection

with Albany. With the long interurban lines running north and south from Albany, as described elsewhere in this issue, the Fonda, Johnstown and Gloversville forms a connecting link from this

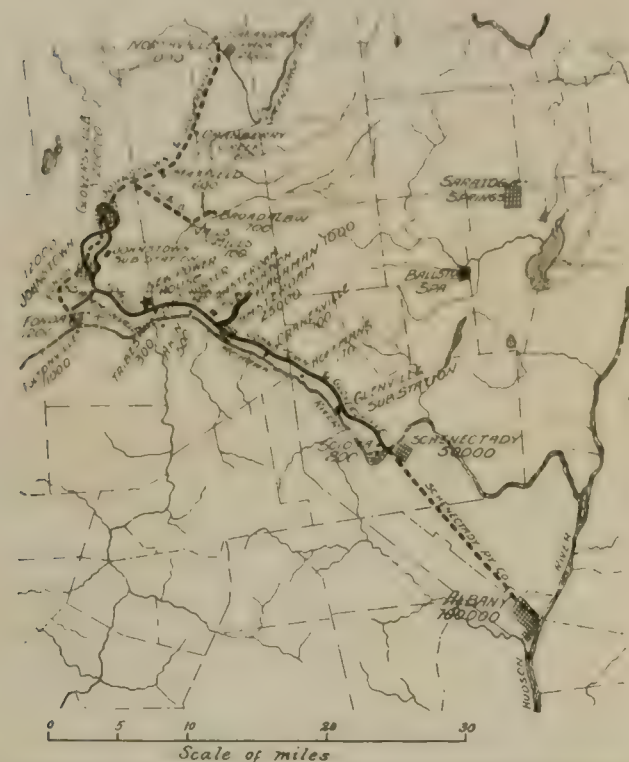


GENERAL VIEW OF ENGINE ROOM, MAIN POWER STATION, FONDA, JOHNSTOWN & GLOVERSVILLE RAILROAD.

between Gloversville, N. Y., and Johnstown, and in conjunction with the line up our river. Below, please, the portion of the Mohawk Valley in direct connection by electric railway

important section of the Mohawk Valley to the Lake George region on the north and Hudson, N. Y., on the south. The distance is about 50 miles from Gloversville to Albany, and with the 40 miles

the Fonda, Johnstown and Groversville Railroad, these connections form the longest continuous electric railway routes in the state. For operating the electric line between Groversville and Schenectady a power house has been built, which, excluding the traction



MAP OF THE FONDA, JOHNSTOWN & GROVERSVILLE RAILROAD.

power houses in Greater New York, constitutes the latest and largest steam driven electric generating power station in the state.

Incidentally the enterprise is interesting as illustrating the movement started by several of the important steam railroad interests of the country towards the purchasing and building of electric railways as feeders and adjuncts to steam railroad properties.

The Fonda, Johnstown and Groversville Railroad Co. is a steam railroad corporation, operating a steam railroad from Fonda, N. Y., through Groversville to Northville. Although less than 40 miles in length, this steam railroad property from its strategic location is a very important factor in the transportation arrangements of the state. The line forms the only outlet from the important manufacturing city of Groversville and the Adirondack region to the north, and all the freight from this section passes over the road to Fonda, where connection is made with the main line of the New York Central. During the last few years the possibilities of electric traction have appealed strongly to the management of the Fonda, Johnstown and Groversville Railroad, and these interests have purchased and built electric lines until now they own the double track interurban line between Groversville and Schenectady; a single track electric line between Groversville and Johnstown; a single track electric line between Johnstown and Fonda, both of which lines parallel the steam road; and the local lines in the cities of Amsterdam, Johnstown and Groversville. The entire system constitutes 88 miles of well-built and well-managed railway lines.

It is believed the new central power house for this system embodies the latest developments now generally accepted as feasible in engineering practice. The following is a full description of the important features in design and equipment.

POWER HOUSE.

The power house is located about four miles west of Amsterdam at a historical place known as Tribes Hill, on the main line of the

road between Amsterdam and Groversville and near the Mohawk River. Leaving Amsterdam going west the road is slightly up grade until the power house is reached. It is at the foot of the hill near where the viaduct is built, and is directly between the New York Central main track and the electric railway tracks. The elevation of the track at this point is about 80 feet above the basement floor of the building. A spur leading from the main track runs into the upper part of the boiler room and is directly over the coal bunkers. The coal is received in bottom dump cars, and all that is necessary in unloading the coal is the service of the train crew, who open the dumps in the bottom of the car and the coal drops by gravity into the coal bunkers. The same crew also handle the ashes and do other switching. The cheapness with which the coal and ashes are handled is certainly ideal. Water, which in a plant of this kind is necessarily an important item, is taken direct from the Mohawk River without cost and is of a very good quality. The operation from the time the coal is dumped into the coal bunkers until the ash is taken out in the basement is simply one gravity system, requiring no attention or conveying apparatus.

BUILDING.

The engine room is 52 ft. x 160 ft. and 75 ft. high. The boiler room is 85 ft. x 187 ft. A portion of the boiler room 23 ft. 6 in. x 85 ft. is but one story high and is used as a pump room, men's room and oil room and a passageway leading into the boiler room. The oil room is 23 ft. 6 in. x 19 ft.; toilet room 16 ft. x 23 ft. 6 in.; passageway 12 ft. x 26 ft., and pump room 36 ft. x 23 ft. 6 in. In the men's room are Merritt expanded metal lockers, so arranged that each man has his own separate locker. There is also bath-room with shower baths and toilet facilities. This room has a granitoid floor and is heated with steam and hot and cold water is supplied.

The building is entirely fireproof. It is built on heavy concrete foundation with a limestone base. Pressed brick is used on the east, south and west sides of both the engine and boiler rooms.

South of the engine room on the ground floor is a storage room for supplies of all kinds. On the engine room floor is the engineer's office and toilet room, which is supplied with bath, hot and cold water, etc. On this floor is the storeroom for small supplies; also a large machine shop, which is supplied with the necessary tools, etc., for doing light repairs.

The main floors of the engine room and boiler room are laid with Berger patented Multiplex steel plate which is of No. 16 gage, 4 in. high in manifold form; on this 4 in. of concrete is



LOOKING WEST FROM F. J. & G. RY., SHOWING MOHAWK RIVER, ERIE CANAL AND WEST SHORE AND NEW YORK CENTRAL TRACKS

laid. This floor will carry a load of over 2,000 lb. per sq. in. As appears in the accompanying illustrations the plates in this case are placed between I-beams on the lower flange of which the plates rest.

Around each of the engines is a gallery connecting the engine with the switchboard. Each engine is also supplied with top connecting gallery, so that the attendant can go from one engine to the other without coming to the floor. At the west end of the engine room is a large opening covered with a Kinnear door of sufficient size to permit freight cars to enter.

The interiors of the boiler, oil, supply room and machine shop

are painted with a light colored cold water paint. The interiors of engine, pump and men's rooms are painted with three coats of white enamel paint; the lower portion up to a distance of 6 ft. from the basement and engine room floors is painted a dark bottle green.

A traveling crane of 50,000 lb. capacity, made by the Northern Engineering Works of Detroit, Mich., is installed; this is supported on large steel columns and girders on each side of the engine room and is operated by three 500-volt motors, supplied with power from the trolley line.

ENGINES.

There are three vertical cross-compound condensing engines of the Allis-Chalmers Co's. latest type, with high pressure cylinder 28 in. in diameter, low pressure cylinder 60 in. in diameter, and a common stroke of 48 in. These engines run at 94 r. p. m. with 160 lb. steam pressure and are each directly connected to a 1,000-kw. General Electric alternating current generator. Water relief valves are placed in each cylinder and the steam exhaust valves of both cylinders are operated by separate eccentrics providing for automatic cut-off of from zero to $\frac{3}{4}$ stroke. Between the cylinders is placed a reheating receiver with traps to drain the receiver. The main bearings are 22 in. in diameter and 38 in. long, made in two parts, having one top and one bottom piece with attachments for taking up any wear on the bearings. All bearings are water jack



VIEW OF POWER HOUSE FROM LONG STEEL BRIDGE.

eted, and the crosshead slides are also provided with water jackets and suitable oil guards are bolted to bed plates covering the eccentrics to prevent oil from coming in contact with generator. Crosshead pins are $7\frac{1}{2}$ in. in diameter and $7\frac{1}{2}$ in. long. The crank shaft is 24 in. in diameter and is made of solid hammered steel. The balance-wheel of the engine is 20 ft. in diameter, $20\frac{1}{2}$ in. face and weighs 100,000 lb. The cranks are all counter-balanced type, pressed on the shaft and keyed in place. The crank pins are $10\frac{1}{2}$ in. in diameter and 20 in. long.

Each engine is provided with an electrically operated synchronizing device controlled from the switchboard. Each engine is guaranteed to stand a 50 per cent. overload with changes in steam pressure from 160 to 125 lb., not varying 2 per cent. from normal speed. The electric speed controller has a range greater than this for placing the engines in parallel when one is already in operation. Each engine is guaranteed, when running at 94 r. p. m. with 160 lb. steam pressure at the throttle and a 25 in. vacuum, to develop 1,700 i. h. p. on not to exceed 13 $\frac{1}{2}$ lb. of dry steam per i. h. p. per hour, at 187 $\frac{1}{2}$ i. h. p. not more than 14 lb., and at 2,250 i. h. p. not more than 18 lb. of dry steam per i. h. p. per hour. Each engine, complete, approximately 380,000 lb.

GENERATORS.

The generators in the main power station are three 1,000 kw. 13,200-volt General Electric type A. T. B. machines of the rotating



VIEW OF POWER HOUSE AND 584-FT. STEEL BRIDGE FROM NEW YORK CENTRAL TRACKS.

field type with 32 poles, are direct connected, running at 94 r. p. m.

There is one engine-driven exciter set running at 310 r. p. m. The engine is of the General Electric vertical tandem compound type, $10\frac{1}{2} \times 18$ in., with an 8-in. stroke, direct connected to a 75-kw. 125-volt multipolar General Electric generator.

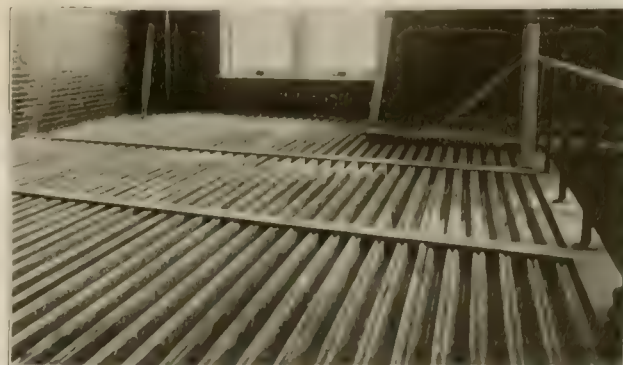
There are also two motor-driven exciter sets, each consisting of a 75-kw. 125-volt direct current generator, mounted on a common base and driven with a 100-h. p. 350-volt three-phase form K induction motor running at 500 r. p. m.

The main engine foundations are built of solid concrete and each is 22 x 30 ft. and 28 ft. high, 10 ft. being below the basement floor level. There are two exciter foundations, one for the steam-driven exciters and the other for the motor-driven sets. These are 17 x 9 ft. for the engine-driven exciters and 29 x 9 ft. for the motor-driven exciters. On the exciter gallery is the switchboard which controls the lights of the station.

The station is arranged to be lighted from any one of the exciter sets. The engine room is lighted by twelve 110-volt d. c. arc lamps, and the boiler room by ten 110-volt d. c. arcs.

There are also in different parts of the building about one hundred 16-c. p. incandescent lamps. The outside of the building is lighted with five railway

series arc lamps, which are suspended on the west end of the building from poles, and on the east end by attachments to the building.



BERGER PATENT FLOOR BEFORE CONCRETE IS LAID

It is found necessary to install these arc lamps on the outside of the building in order to keep the bugs, which are quite numerous

to the part of the country from entering the building during the summer months, as they were exceedingly annoying, and the light from the outside attained the desired results.

OIL AND WASTE

Each engine is piped to all bearings with a gravity oiling system, the oil tanks being at the roof of the engine room. The drips



UNDER SIDE OF BERGER PATENT MULTIPLEX STEEL PLATE FLOOR

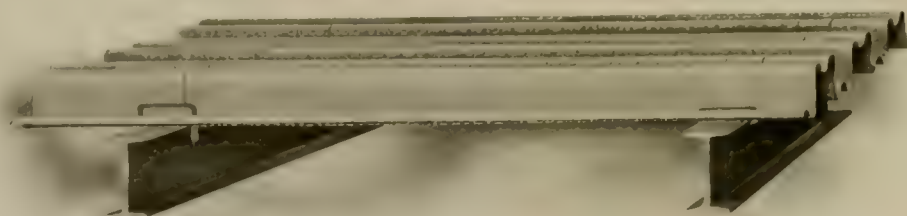
are carried to a Turner oil filter and all the oil, after passing through the filter, is drained to a set of receiving tanks underneath

also installed and so piped up that oil delivered in barrels to the oil room, which is located about 100 ft. away, can be drawn from



BERGER PATENT STEEL PLATE FLOOR, SHOWING STEEL FOUNDATION AND CONCRETE FILLING.

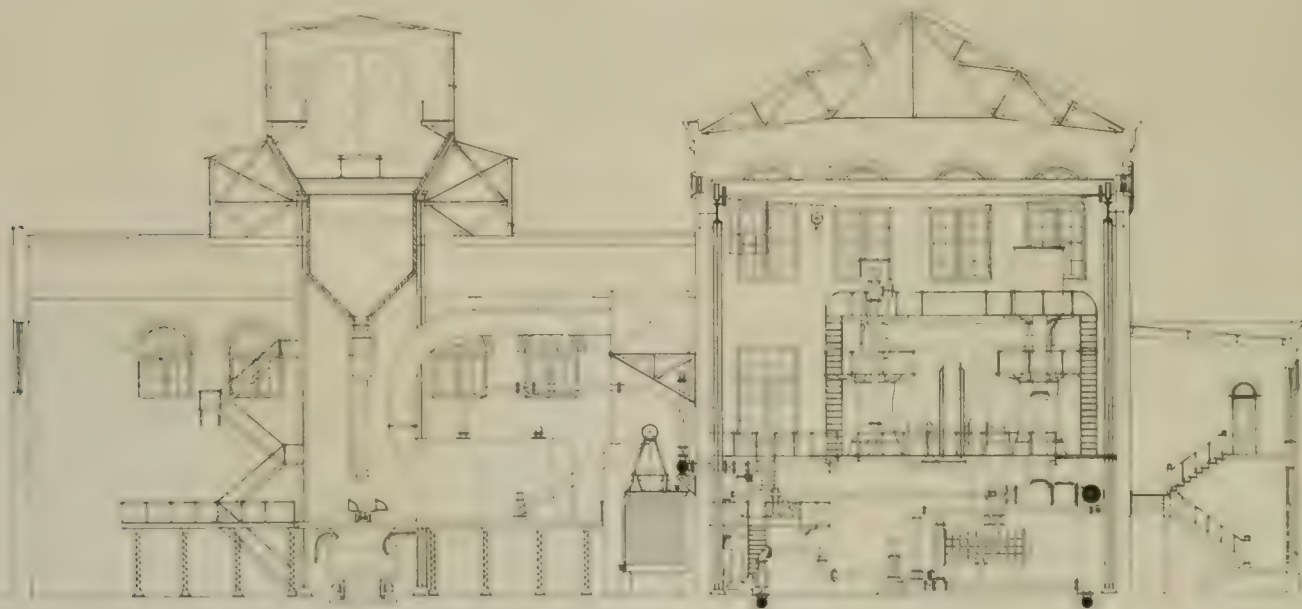
the barrel and forced into the oil receiving tank without having to move the barrel, thus preventing uncleanness from oil being



MULTIPLEX PLATE IN ITS SIMPLEST FORM RESTING ON TOP OF I-BEAMS AND TIED.

it, and from there pumped back to the oil supply tanks. The oil pumps are $4\frac{1}{2} \times 2\frac{3}{4} \times 4$ in., there being a duplicate set of oil pumps

spilled on the basement or the engine room floor. The same compressor is also piped up and used for blowing dust out of the a. c.



SECTION THROUGH ENGINE AND BOILER ROOM OF MAIN POWER STATION, PONDA, JOHNSTOWN & GLOVERSVILLE RAILROAD CO.

and filters installed, these are so arranged that either engine or cylinder oil can be handled with them.

A motor-driven air compressor of the General Electric make is

apparatus around the switchboard and also for cleaning the generators.

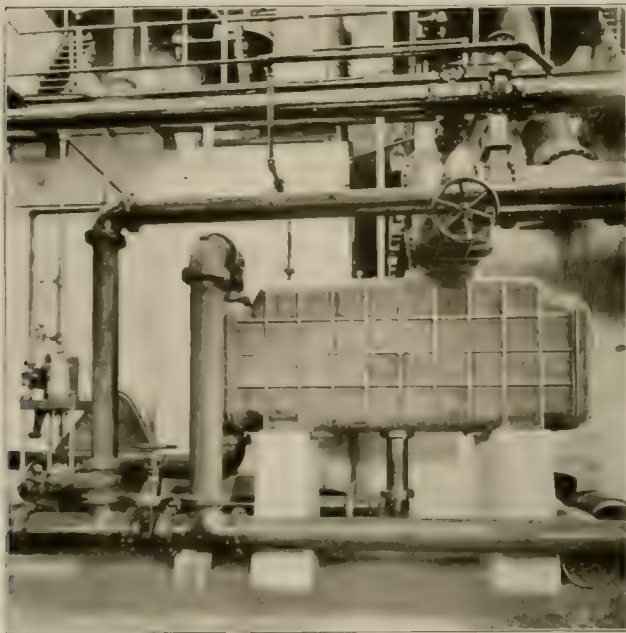
The oil room is on the ground floor and is made fireproof in

every particular. In this room is also stored waste and other material which is received in large quantities.

An "extractor" built by the Troy Laundry & Machine Co. is used in removing the oil from the waste. The oil that comes from it is piped to the oil filters, and after the waste has been freed from oil it is put into a washer and cleaned and the waste used again. These machines clean the waste and wipers that are used in the three sub-stations, the waste being sent to the main power station in galvanized iron cans. The oil extractor, which is shown in one of the accompanying illustrations, is designated by the maker as its solid curb machine, and is driven through a countershaft attached to the frame. The basket is from 20 to 30 in. in diameter, the builder making five sizes.

SWITCHBOARD.

The switchboard, which is at the west end of the engine room, is of polished black marble. It consists of three 1,000-kw. 13,200-volt three-phase generator panels; two 100-h. p. 13,200-volt three-phase induction motor panels; one 125-volt exciter feeder panel; four 1,500-kw. 13,200-volt outgoing line panels; one ground detector panel; one 75-kw. 125-volt exciter generator panel for engine-driven exciter; two 75-kw. 125-volt exciter generator panels for motor-driven exciters. The board is provided with one frequency indicator; one Lincoln synchronizer mounted on swinging bracket; seven potential transformers; twenty-seven 15,000-volt transfer switches; twelve 13,200-volt lightning arresters; twelve lightning-



WHEELER CONDENSERS

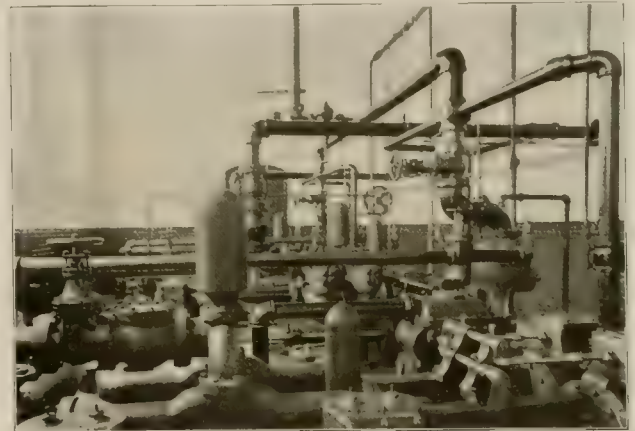
arrester switches; two 25-cycle 100-kw. 13,200-volt primary 370-volt secondary three-phase oil-cooled step down transformers. The high tension feeder lines are controlled by four General Electric type "H" motor-driven electrically operated oil switches.

All high tension wires are carried in conduits underneath the basement floor and are incased in lead armored cable and all alternating current meters in power house and sub-stations are horizontal edgewise type.

BOILERS

There are 10 boilers, 500 h. p. each, of the internally fired Scotch marine type, manufactured by the Springfield Boiler & Manufacturing Co., of Springfield, Ill. These boilers have a working pressure of 180 lb. of steam and are tested to stand a cold water pressure up to 225 lb. per sq. in. They are 10 ft. 6 in. in diameter, 19 ft. long over all. This includes the rear smoke box or combustion chamber, making the boiler proper 16 ft. long. Each boiler is fitted with a Morrison suspension corrugated furnace, 45 in. in diameter and 16 ft. long, $\frac{3}{4}$ in. thick, and the Morrison protected fire door. Each boiler has 147 tubes. The combustion chambers in the rear are formed of circular steel plates $\frac{1}{4}$ in. in thickness and 4 ft. wide.

The back of the combustion chamber is lined with fire brick 12 in. in thickness, and the sides $4\frac{1}{2}$ in. thick, and the top is covered with fire brick tile 5 in. in thickness. The back head of the combustion chamber is also provided with steel plate $\frac{1}{4}$ in. in thickness.



PUMP ROOM, MAIN POWER STATION.

On the front of each boiler is arranged a 36-in. steel flue, which conveys the gases from the boiler to the main smoke chamber. The steam outlet is 8 in. in diameter, the steam pipe being without sharp bends. In each of the 8-in. pipes leading from the boilers to the main steam header is an 8-in. Pearson check valve. This valve is of peculiar construction and design, and is so arranged that in starting up a boiler no particular attention is required on the part of the operator in getting the boiler cut in with any other one that might be in service, as the valve can be set at any desired pressure, and when the steam rises to this point the valve opens automatically and allows the steam to pass through into the steam header, thus equalizing the pressure on all boilers. It is also arranged so that when necessary to do repair work on any boiler this valve can be closed as any ordinary gate valve. These valves have been found to work very satisfactorily indeed, as the rattle that is sometimes found in other valves of this type is in these entirely eliminated.

In addition there is an 8-in. Lunkenheimer gate valve placed in each of the 8-in. steam leads.

The steam header is directly over the economizer and is 18 in. in diameter and 124 ft. long. In the center of this header is an 18-in. Crane gate valve. There are two Wainwright expansion joints in the header, each 30 in. in length. The steam header is anchored at three points by large angle brackets through the 30-in. wall which divides the engine and boiler room. The header is carried on brackets of special design having roller bearings and springs underneath.

There is also a 7-in. auxiliary steam header that connects with the 18-in. header on one side of the 18-in. gate valve. The 18-in.



EXTRACTOR FOR REMOVING OIL FROM WASTE

gate valve is in the center of the boiler distribution, so that five boilers can be worked independently from the others in case any repairs are necessary. The 7-in. auxiliary header is arranged to provide a means whereby steam for the pumps and other auxiliary apparatus in the building could be taken from either end of the

one boiler should one end of it be shut down for repairs of any kind. The boilers are on the second floor of the building, thus providing a very simple way of arranging for the feed water supply and the blow-offs.

The boiler blow-offs are carried underneath the floor. All of them are connected in series, the size of the pipe being reduced from 6 to 3 in., this being provided in case that two or more boilers should be washed out at any one time. The blow-offs to each boiler use a 3-in. Homestead blow-off cock and 3-in. extra heavy Crane



AMSTERDAM SUB-STATION

gate valve. The connection to the main blow off line pipe is made by Y branches.

WATER SUPPLY.

The water supply is taken from the Mohawk River, which is about 300 ft. south of the main building. On the bank of the river is a well 20 ft. in depth and 18 ft. in diameter. Water is conveyed into this well from the river by a 36-in. extra heavy cast iron pipe, which is run out into the river a distance of about 40 ft. from the well to deep water. This pipe lies on the bed of the river and is held in position by a concrete wall. The mouth of the pipe is provided with a concrete opening about 5 ft. sq. The sides are arranged with concrete slopes to prevent any possibility of the pipe or intake in the winter time from being damaged should the ice for any reason become lodged against the pipe. Over this 5-ft. opening are placed iron bars $3 \times \frac{5}{8}$ in., with openings between each bar of about $\frac{3}{4}$ in. The bars were formed together in sections like a grate and are set on edge. These are supported across the mouth of the opening by three 60-lb rails. The end of the pipe entering the well is provided with a 36-in. Ludlow sluice gate valve, so that if it should be found necessary at any time to clean the well this valve could be closed and the water pumped out. Entering the well is a 20-in. cast iron pipe with two 20-in. openings formed in the shape of a T, protected by brass screens. Back of the 36-in. sluice gate is a removable screen.

The top of the well is covered with 3-in. oak planks, and there is a trap door with ladder built in the well so it can be examined readily at any time.

Adjacent to this well is also a 20-in. check valve and in case any of the valves leading to the stand pipe should get out of order and allow the water supply to run back towards the river, the check will hold it. A 20-in. cast iron overflow pipe is also brought back from the building to the river and is so arranged that the end of the pipe entering the river is at all times covered and below the water level in the river. This is done to form a siphon effect so far as possible.

FEED WATER PIPE.

The boiler feed after leaving the pump passes through a recording water meter and from there it is conveyed to the economizer. The water meter is by-passed. There are two 6-in. mains which supply the water to the boilers, and these are so cross connected that should one line get out of order for any reason the other line

can be readily cut in. Leading from the 6-in. main to the boilers are two $2\frac{1}{2}$ -in. pipes with $2\frac{1}{2}$ -in. Crane extra heavy gate valves; these pipes unite and enter a Pratt & Cady $2\frac{1}{2}$ -in. check valve. With this arrangement the water for the boilers can be taken from either line, at the will of the attendant.

Connected with the cold water supply line from the stand pipe, which is located on the hill back of the power house, is a 6-in. pipe line, which runs the entire length of the boiler room, and is connected with five 4-in. risers that carry the water into the coal bunkers. This water is used in wetting down the coal and for fire protection. From this line is also taken a 1-in. tap that is piped directly into the ash hoppers, underneath the boiler room floor, to be used in wetting down the ashes that drop into these hoppers, there being a 1-in. perforated pipe running the entire length of each ash box. The water to each ash box is controlled by a valve with an extension handle, so that it can be operated from the boiler room floor.

CONDENSERS, PUMPS, ETC.

There are installed three Wheeler surface condensers, which have 2,625 sq. ft. of cooling surface; dome-shaped tops serve as a reservoir for the steam. Any of the condensers can be worked in connection with any engine.

There are also installed three Blake vertical valveless double acting air pumps having steam cylinders 9 in. in diameter and air cylinders 18 in. in diameter and a 12-in. stroke. There are also installed two centrifugal circulating pumps direct connected to a 12 x 12-in. Wheeler vertical engine running at 320 r. p. m., which are capable of delivering 4,000 gallons of water per minute, against a total suction and discharge head of 34 ft., including 22 ft. suction lift. These pumps were made by the Wheeler Condensing & Engineering Co. and are of its latest pattern and design. There are two compound condensing outside packed plunger pumps of the Chandler pattern, having two 8-in. high pressure cylinders and two 16-in. low pressure cylinders, and two 8-in. double acting water plungers, all having an 18-in. stroke. These pumps are used in pumping water to the stand pipe or tower, and are called "tower" pumps. There are also two duplex Potform horizontal boiler feed pumps having two steam cylinders 12 in. in diameter and four single acting water plungers 6 in. in diameter, and all of 12-in. stroke. These are outside packed plunger type. There are also two Independent air pumps and condenser having a 7-in. steam cylinder and a 10-in. water cylinder and 12-in. stroke. These pumps are all made by Fred M. Prescott Co., of Milwaukee, Wis., and are of its very latest design. Each pump is mounted on a sole plate for

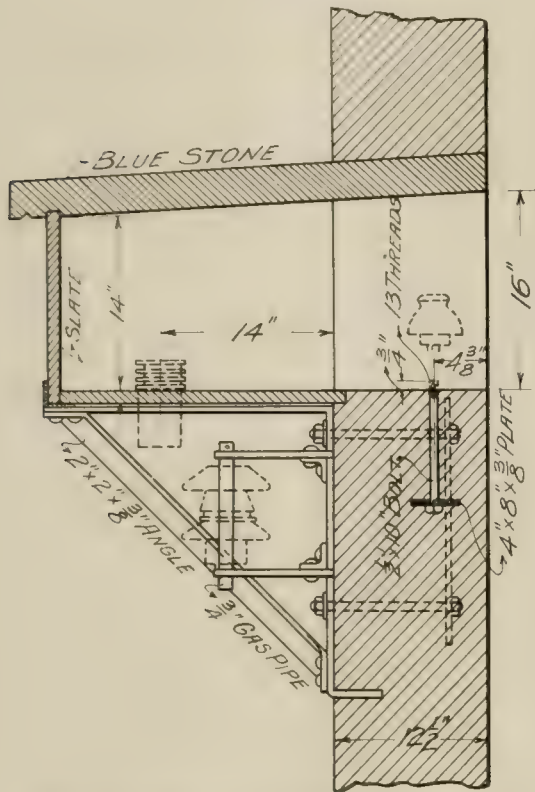


INTERIOR OF AMSTERDAM SUB-STATION.

collecting the water or drip that comes from it, and these plates are in turn connected with the waste pipe or sewer, so that the pump room is at all times kept free from water.

On the basement floor at the west end of the engine room is the hot well or tank, which is 6 x 6 x 20 ft. This hot well receives all the drips from the engine, and is so connected with the boiler feed pumps that this water can be pumped directly into the economizer if so desired.

On the south side of the boiler room, adjacent to the engine room, is one of the Broomell, Schmidt & Steacy latest improved economizers, of a capacity sufficient to raise the temperature of 48,000 lb.



LINE ANCHORAGE FOR HIGH TENSION LINES

of water per hour, 300° F. The water enters the economizer at a temperature between 60 and 100° F. The gases from all the boilers enter a flue 8 ft. x 10 ft. in the upper part of the boiler room, and are drawn through the economizer by either forced or natural draft. For forced draft a 12-ft. blower fan driven by a 12 x 12 in. vertical engine, is used. Should the engine or fan get out of order the dampers in the smoke flue are so arranged that the natural draft from the stack will produce sufficient circulation to draw the gases from the boilers through the economizer and thence into the stack making practically a duplicate unit.

All the boilers, smoke tubes, main smoke flue, and steam pipes in the boiler and engine rooms are covered with magnesia covering furnished by the H. W. Johns-Manville Co.

The coal for the main power house is delivered to the company's siding or yard at Akin, a station on the N. Y. C. & H. R. R. R. about 1¼ miles east of the power house, and from here a 35-ton electric locomotive takes the coal to the power house.

The coal bunkers at the power station are five in number and are supported by 12 heavy steel columns mounted on solid concrete bases, and extend to the top of the boiler room to carry the girders on which the coal track is laid. These bunkers are capable of storing 1,200 tons of coal. They are made funnel shape and lined the full height with concrete 6 in. in thickness. In the end of each funnel shaped opening is a weighing hopper and scales, weighing one ton of coal at each filling. From the weighing hoppers the coal descends to the boiler room floor, where it is dumped into charging cars that run on a track in front of the boilers. The cars are arranged with drop sides so that the coal can be shoveled from them at the side. At the end of the building is a turn-table and storage track. There is also a side track on the center of the boiler room used for oil and water pipes.

In front of each boiler is a trap door which opens into the ash hopper and is so arranged that by raising the door when the fires are being cleaned, the ashes drop into it, and should the ash cars be in use distributing ashes along the line, the ashes are held in place until the car returns. The ash boxes are each provided with an automatic tripping device, so that the ashes are taken in at the top

and let out at the bottom, at the will of the operator. In front of each boiler is also fastened a scoop to prevent any of the ashes dropping down on the floor when the fires are cleaned.

The ground floor of the boiler room is concrete and is provided with the necessary traps and drains for taking off water. In the center of the boiler room on the ground floor is the ash track with overhead trolley connections whereby ash cars are run in under the boilers and receive the ashes from the ash hoppers or bins.

At the east end of the building is a large opening provided with a Kinnear door, which permits the ash cars to enter the building. The ashes are then taken out on a special track, which connects with the main track about ½ mile east of the building. The ashes are used for ballast and grading purposes. They are handled by the 35-ton electric locomotive.

The stack is 175 ft. high and 25 ft. square at the base, which extends up a distance of 25 ft., where the circular portion begins. This is 13 ft. inside diameter and extends up a distance of 150 ft., being 10 ft. inside diameter at the top. The top is covered with a steel capping. The stack is also provided with a lightning rod of No. 00 copper wire running from the top of the stack to the earth and is grounded by a large copper plate buried about 8 ft. in the ground and covered with charcoal.

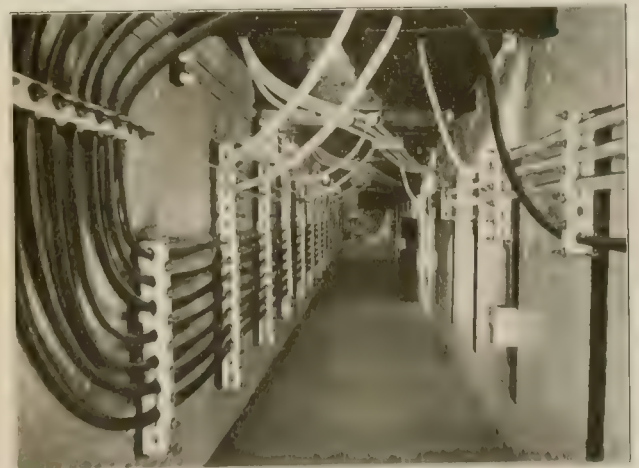
A stand pipe made of steel plate is built on the hill directly in the rear of the power house. This stand pipe is 18 ft. in diameter and 40 ft. high and holds 74,000 gallons of water. It is supplied by a 10-in. water main and arranged with shut off gate valves. A water float or gage is arranged inside the pipe; this is electrically connected with a signal bell in the pump room and may be set to operate for any desired height, announcing both high and low points.

SUB-STATIONS.

There are three sub-stations located respectively at Amsterdam, at Johnstown, and at Glenville.

AMSTERDAM SUB-STATION.

The Amsterdam sub-station is in the western part of the city of Amsterdam, and is a new, red-pressed brick fire-proof building 45 x 105 ft. with a steel truss roof, this building having been erected especially to receive the sub-station apparatus. The roof was specially designed and the purlins which are bolted to the roof trusses are drilled so that the slate roofing could be fastened directly to them by copper wire, no roof boards being used. In order to prevent moisture gathering underneath the slate the purlins were covered with ½ in. asbestos. The ground floor on which the apparatus is



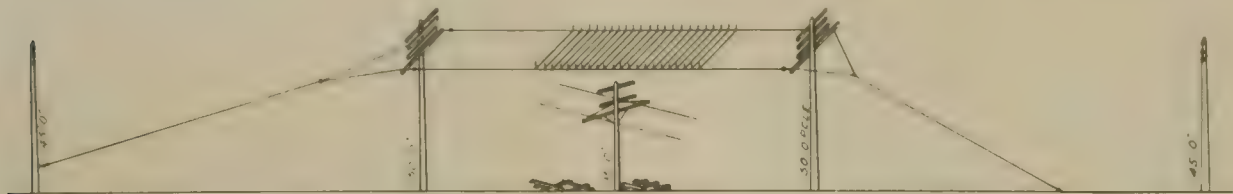
CABLE VAULT UNDER JOHNSTOWN SUB-STATION

placed is of concrete, laid on expanded metal, which was furnished by the Expanded Metal Co. through James McKimsey & Son, of Albany, N. Y. This concern also furnished the iron stairs and wire partitions in this as well as the other sub-stations and main power house.

It is very essential that the basement should be kept perfectly dry. The foundation walls are 24 in. in thickness. The 12-in. brick wall forming the outside courses was first laid and smoothed off to a sidewalk finish. After this was laid it was covered with pitch, both sides and bottom (during the construction it resembled

cradle bar) and against the walls were put six layers of specially prepared tar paper, which extended up the sides a distance of 9 ft. from the bottom. On this was laid 1 in. of cement and sand which covered the tar paper in the bottom to prevent the paper from becoming punctured during the progress of construction. This being completed the additional 12-in. brick wall was laid on the inside. On top of the 1-in. neat cement in the bottom was laid 6 in. of concrete, this making a foundation for the partition walls which carry the electrical apparatus on the ground floor. Before the tar paper was laid on the bottom, the cellar was excavated a sufficient depth to permit of 4 in. of concrete being laid on the solid rock foundation, in order to make a smooth surface on which to lay the paper.

The building is finished in pressed brick on all four sides, and



PERSPECTIVE VIEW OF CRADLE GUARD.

faces on Division St. running adjacent to Henrietta St. The switchboard was placed on the west side of the building in order to get the best light, as it was feared that at some future time the light of the building might be shut off by other buildings erected near it. In this station is also installed a 10-ton hand crane, which runs the entire length of the building on girders supported by columns. This crane was furnished by the Whiting Foundry & Machinery Co., of Harvey, Ill. This station is designed to receive the installation of both railway and lighting apparatus, inasmuch as the Fonda, Johnstown & Gloversville Railroad Co. also owns and operates the Edison Electric Light & Power Co., of Amsterdam, in addition to the electric railway lines.

The company does commercial lighting and also furnishes arc lamps, 225 in number, for the city. The arc lamps are of the series alternating inclosed type, and are of the General Electric Co.'s latest improved type. It also does a considerable business in furnishing power to local manufacturers in the city of Amsterdam. All stationary motors are of the induction type, and motors larger than 1 h. p. are operated on a 220-volt three-phase motor circuit.

The railway apparatus in the Amsterdam sub-station consists of three 300-kw. 600-volt 25-cycle three-phase rotary converters; three 25-cycle 330-kw. 13,200-volt primary, 370-volt secondary three-phase air blast step-down transformers; three 45-kw. air blast reactive coils; two alternating blower sets each connected to a 350-volt induction motor, direct connected to a Buffalo fan.

The switchboard for the railway apparatus consists of two 1,500-kw. 13,200-volt incoming line panels; two 600-kw. 13,200-volt outgoing line panels; three 300-kw. 13,200 volt a. c. rotary converter panels; three a. c. rotary converter starting panels; three 300-kw. 600-volt d. c. rotary converter panels; one 600-volt d. c. total output panel; five 1,200-ampere, 600-volt Form A feeder panels; two 350-volt a. c. blower motor panels; two blank panels; four potential transformers; twenty-four 15,000 transfer switches; twelve 13,200-volt lightning arresters; twelve lightning arrester switches; and one 750-volt Weston illuminated dial station voltmeter on swinging bracket.

The lighting apparatus consists of two 540-kw., 2,300-volt, 60-cycle three-phase generators running at 300 r. p. m., mounted on a common base and direct connected to a 570-kw., 13,200-volt, 25-cycle three-phase synchronous motor. Each set is also direct connected to a 125-volt 100-h. p. direct current exciter. There is also one 300-kw., 2,300-volt, 60-cycle three-phase generator mounted on a common base, direct connected to a 325-kw. 350-volt 25-cycle three-phase synchronous motor, this set being provided with a direct connected 125-volt direct current exciter; also one 25-cycle 250-kw. 13,200 primary 370-volt secondary three-phase air blast step-down transformer; six 50-light 2,300-volt 60-cycle Type R oil cooled constant current transformers; eight 6-kw. 60-cycle 2,300-volt 50-ampere single phase regulators.

The switchboard for lighting consists of two 540-kw. 2,300-volt three-phase generator panels; two 570-kw. 13,200-volt three-phase synchronous motor panels; one 300-kw. 2,300-volt three-phase generator

panel; one 225-kw. 13,200-volt primary 350-volt secondary three-phase synchronous motor generator; one starting panel for 225-kw. synchronous motor; one 200-kw. 2,300-volt alternating current total output panel; six 250-kw. 2,300-volt single-phase two circuit feeder panels for incoming feeders; two 460-kw. 2,300-volt single-phase two-circuit feeder panels for main feeders; six arc panels, each for controlling one 50-light constant current transformer; three blank panels; fifteen 2,500-volt transfer switches; thirty-six 2,000-volt lightning arresters; and twelve arc circuit lightning arresters.

On the three-phase arc panels are six 11-ampere inclined coiled arc ammeters; sixteen open circuiting plug switches; eight transfer plug switches; four plug switches for connecting adjacent panels; four short circuiting plug tube switches; eight 2,500-volt primary current tube switches; four 2,500-volt tube explosion fuses on back

of panel; and two current transformers. The Stanley recording wattmeters are used on all lighting and power circuits.

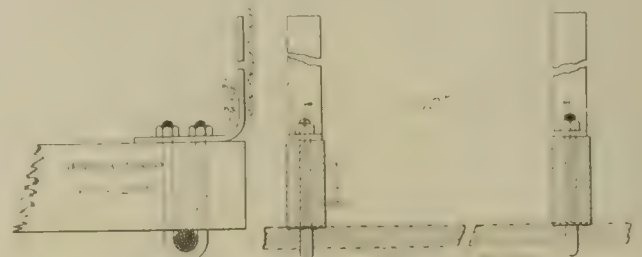
JOHNSTOWN SUB-STATION.

The sub-station at Johnstown is in a part of the brick power house that formerly operated the electric division of the road before the new station was completed. The part occupied by the a. c. apparatus is 30 x 54 ft. Under this part is a large basement. Both the ground and basement floors are of concrete. The basement has three compartments, one for an air blast chamber, and two for the a. c. and d. c. wires, which are on racks against the walls.

Installed in this station are three 300-kw. 600-volt, 25-cycle three-phase rotary converters; three 25-cycle 330-kw. 13,200 volts primary, 370 volts secondary, three-phase air blast step-down transformers; three 45-kw. air blast reactive coils; and two alternating current blower sets, consisting of a 350-volt induction motor and a Buffalo fan.

The switchboard comprises two 1,500-kw. 13,200-volt incoming line panels; three 300-kw. 13,200-volt a. c. rotary converter starting panels; three 500-kw. 600-volt d. c. rotary converter panels, one 600-volt d. c. total output panel; four 1,200-ampere 600-volt Form C feeder panels; two 350-volt a. c. blower motor panels; two blank panels; six lightning arrester switches; six 13,200-volt lightning arresters; four potential transformers, and fifteen 15,000-volt transfer switches. The oil switches in this station are operated by hand.

The potential transformers are connected to line and used for overload relays, to wattmeters. On the total output panel are one



DETAIL OF CRADLE BAR.

2,200-ampere Bristol recording ammeter; one 750-volt Bristol recording voltmeter; one 600-volt 1,200-ampere Thomson recording wattmeter. There is also one 750-volt Weston illuminated dial voltmeter on a swinging bracket.

GLENNVILLE SUB-STATION.

The Glennville sub-station is on the main line of the road between Amsterdam and Schenectady and is near the center of electrical distribution. It is also adjacent to the New York Central tracks at what is known as the Washout Bridge. It is 33 x 44 ft., one story and basement. The ground and basement floors are of

concrete and the building is fire proof throughout. The outside is finished in pressed brick with a projecting cornice. The interior is painted with white enamel paint, has a toilet room, and is heated with small low pressure heater. The basement has four compartments, two for the wires and cables, one for the cold air duct, and the other is used as a passage way and for the storage of coal. On the ground floor is a store room for small supplies.

In this station there are installed two 300-kw. 600-volt, 25-cycle three-phase rotary converters; two 25-cycle 330-kw. 13,200-volt primary, 370-volt secondary three-phase air blast step down transformers; two 45-kw. air blast reactive coils; two alternating current blower sets consisting of 350-volt induction motor direct connected to a Buffalo fan.

The switchboard has two 600-kw. 13,200 incoming line panels; two 300-kw. 13,200-volt a. c. rotary converter panels; two a. c. rotary converter starting panels; two 300-kw. 600-volt d. c. rotary converter panels, one 600-volt d. c. total output panel; two 1,200-ampere 600-volt Form A feeder panels; two 350-volt a. c. motor blower panels; two blank panels; one 750-volt station voltmeter; six 13,200-volt lightning arresters; six lightning arrester switches; and four potential transformers.

HIGH TENSION FEEDERS.

From the main power house to the Amsterdam sub-station four high tension feeders are used. An extra wire was used instead of using a duplicate set of feeders. This additional wire is so arranged at the switchboards at each end that should there be trouble of any kind on any one feeder, the extra wire can be cut in to take the place of the one that is not working. The high tension wires on the cross arm of every fifth pole are numbered so that when the repair man is sent out to investigate trouble on any one line, he can readily trace the wire without having to climb the pole. No transposition is used on the line and the wires are not pyramided. On account of the lighting load in the Amsterdam sub-station a No. 0 wire is used. At the Amsterdam sub-station there is a set of incoming high tension feeders and a set of outgoing high tension feeders. This is done for safety, as the high tension wires to the Glenville sub-station lead out from the Amsterdam sub-station. The wire of the Glenville station is No. 2.

From the main power house to the Johnstown sub-station three No. 2 high tension wires are run. As no lighting was to be done

and dead ended, and a right angle connection is then made to the other set of cross arms, a special terminal to fit the different sized wire being used, and all connections soldered.

Where d. c. feeders are turned at corners, double blocked arms are used. The wires are carried across and dead ended to guy poles by Brooklyn "Strains", and the wires in the opposite direction



ROADBED AND LINE CONSTRUCTION ON TANGENTS.

are held in place the same way and taps are made at right angles connecting the two, thus holding the corner pole in place.

Locke No. 100 chocolate colored insulators are used on all high tension work. All high tension pins are Locke No. 13 with paraffined wood top and $\frac{5}{8}$ -in. galvanized steel bolt. For straight line to carry 500,000 and 300,000-c. m. d. c. feeders 6-in. double petticoat glass insulators are used. On long curves No. 2 Hemingray extra heavy cable glass insulators and on sharp curves the "Electrose" cable insulators with $1\frac{1}{2}$ -in. steel pin were used. For dead ending high tension wire a G. E. imported Italian porcelain cable rack insulator was employed.

OVERHEAD LINE.

Nearly all of the interurban lines are double track and the overhead work is mostly center pole construction. Poles on straight line are set 90 ft. apart and 75 ft. to 80 ft. in curves. Cedar poles are used almost entirely and were furnished by the E. E. Naugle Tie Co. of Chicago. From the main station to each of the sub-stations 35-ft. center poles were used along the company's right of way, these poles also carrying the high tension lines. In the cities the construction is span wire and side bracket. The high tension cross-arms are $3\frac{3}{4} \times 4\frac{3}{4}$ in. \times 10 ft. and are bored to take four $\frac{5}{8}$ -in. steel pins spaced 3 ft. on center. The low-tension arms are also $3\frac{3}{4} \times 4\frac{3}{4}$ in. \times 10 ft. and are bored to take a $1\frac{1}{2}$ -in. standard pin. All braces are U-shaped made in one piece $1\frac{1}{2} \times 5$ -16 in., and double galvanized. All arms are fastened to poles by $\frac{5}{8}$ -in. galvanized bolts that are bolted through the poles. All braces are bolted through the arm with a $\frac{1}{2}$ -in. galvanized bolt. A one piece galvanized iron back brace is also used in holding arms in place. The braces are put on every fifth pole. All poles are stepped with a $\frac{5}{8} \times 10$ -in. galvanized pole step. Steps start 8 ft. above the rail. All poles on curves are double armed and blocked, for both high and low tension work.

All of the galvanized U-braces and back braces were furnished by the Mayer & Englund Co., as well as nearly all of the bolts, pole steps, etc.

The bracket arms for supporting the trolley wires were furnished by the Mayer & Englund Co. and are a modification of the "Key-stone" type No. 181, a number of changes having been made to strengthen the bracket and in the method of attaching to the pole.

All curves on center pole construction have a guy pole set opposite the center pole and a bridle is extended from one pole to the other to which the pull-off wires are attached. All connections from center poles are made with 5-16-in. semi-steel galvanized cable attached to the center and pull-off pole by a galvanized eye bolt. Nearly all guy poles are back guyed to an 8-in. Stombaugh guy anchor and they are also connected to a $\frac{1}{2} \times 15$ -in. galvanized turn buckle and 5-16-in. galvanized semi-steel cable and eye bolt to the



CRADLES FOR PROTECTING TELEPHONE WIRES FROM HIGH TENSION LINES

from the station it was not thought necessary to carry the extra wire to the station.

Where high tension wires are turned at corners a special crib work is constructed the poles being set at the corner of a square, back guyed from all corners, and having special double cross arms facing the square. Two sets of arms are used one above the other. The wires are brought across the square on one set of cross arms

line pole. On curves and in wet places where the earth was not very loose, poles were either battered or set in concrete.

The poles were constructed of a 3.6-in. 7-strand galvanized steel cable covered with a 2-in. half strain insulator with an eye on each end. The cable is fastened to a galvanized eye bolt that is bolted to the pole and the eye made up into the span.

All poles and feeders are dead ended to Anderson bronze Brooklyn strain insulators.

The trucks were of No. 6000 groove. The overhead material is of the Mayer & Englund "Keystone" type and Mayer & Englund insulators were used throughout. The cars are equipped with bell's were furnished by the Mayer & Englund Co. and by General Union Brass Co. of St. Louis. The round type hanger with malleable iron shell and 1/2-in. bolt was used, those being of the Mayer & Englund and the Anderson manufacture.

Mechanical cars are used throughout. On the straight line and pole at a 60-in. 4-screw bronze ear is used tapped for a 3/4-in. stud. All strain cars are 10 1/2-in. bronze with six screws tapped for 3/4-in. stud. All phasing cars are bronze tapped for 3/4-in. stud with soldered ends turned up. The McCallen extra heavy sectional line insulators furnished by the Mayer & Englund Co. are used.

Every 2,500 ft. a General Electric M. D. lightning arrester is placed, connected above the feeder span with a kick coil and grounded to the four rails and also to a copper plate 24 x 24 x 3/8 in. buried in the ground a depth of 4 ft. and covered with a bed of charcoal.

Every 500 ft. is a feeder span which connects the two feeders and the two trolley wires, the connections to the trolley wires being made with a bronze feed-in bell; also a 10 1/2-in. feed-in ear with a 3/4-in. galvanized bolt and a galvanized lock washer fastens the feed-in bell to the ear. The feed-in bell is crimped onto the feeder span and a tap is also taken off from the feeder span connecting into a feed-in ear and fastened with two set screws. No. 00 copper wire is used for all feeder spans.

PROTECTED CRADLES.

For preventing telephone and telegraph wires from coming in contact with high tension wires, a special cradle or grill is suspended at every crossing where there is any possibility of danger from this source. The cradle consists of maple strips 1 x 2 in. x 12 ft. long, which are suspended side by side a few inches apart in the manner shown by one of the engravings. At the ends of the strips are attached upright iron strips, the whole arrangement forming a perfect cradle, which will effectively catch and hold the ends of wires in the case of breakage.

FEEDERS.

The three sub-stations are connected with one 500,000-c. m. and one 300,000-c. m. feeder and the two No. 0000 trolleys are arranged to be fed either jointly or independently from either sub-station. The lines are opened at the extreme end of electrical distribution and held in place by McCallen extra heavy sectional line insulators. The lines entering each sub-station are divided and connected with independent feeder panels, so that each section is controlled by the switchboard operator. Pole line circuit breakers and switches are also used to further cut the lines into sections so that a large number of combinations of lines and cut outs can be obtained and the best results secured from all copper in use.

In connection with the large cables that tie the sub-stations together there are a number of smaller feeders for local sections. The feeders from Johnstown sub-station aggregate 4,000,000 c. m.; from Amsterdam sub-station, 3,000,000 c. m.; and from Glenville sub-station 1,500,000 c. m.

The ground return feeders at the Johnstown sub-station aggregate 2,500,000 c. m. in area, 500,000 of this being an overhead return for a distance of about four miles connecting to the track at different points. Amsterdam sub-station has 2,000,000 c. m., and Glenville sub-station 1,000,000 c. m. in ground returns. All joints are bonded with a No. 0000 "Crown" rail bond furnished by the American Steel & Wire Co.

CAR EQUIPMENT.

The rolling stock is as follows:

Amsterdam Division.

Nine single truck closed cars mounted on Taylor trucks and

equipped with two G. E. 67 motors. Bodies furnished by J. M. Jones' Sons, and the Jackson & Sharp companies.

Nine single truck 10-bench open cars mounted on Taylor single trucks and each equipped with two G. E. 67 motors. Bodies furnished by J. M. Jones' Sons.

Four of the closed and four of the open cars are equipped with the Westinghouse magnetic traction brake, as these cars operate on the Hagan Division where a grade of 14 per cent is encountered.

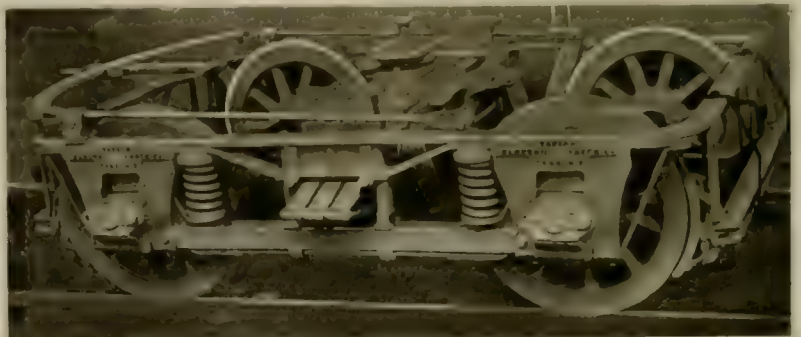
One 35-ton electric locomotive built in the company's shop. This is equipped with Taylor extra heavy M. C. B. locomotive type double trucks, four G. E. 73 motors, Westinghouse, air brake, air whistle and bell.

Fonda or Cayadutta Division.

Four double truck closed cars. Bodies made by the Gilbert Car Co. and mounted on Taylor swing bolster double trucks, equipped with two Westinghouse 56 motors, Westinghouse air brakes and whistles. Car bodies are 34 ft. 6 in. over all and fitted with baggage and smoking compartment.

Local Line—Johnstown and Gloversville.

Eleven closed cars 29 ft. over all, built by the J. G. Brill Co., equipped with McGuire single trucks, and two G. E. 1,200 motors per car. Sixteen open cars, five of these being 15-bench, built by Jones' Sons of Troy, N. Y., and equipped with Taylor swing motion double truck, and four G. E. 67 motors and Christensen air brakes; 11 are 10-bench cars built by the Ellis Car Co. and equipped with Taylor single trucks and two Westinghouse 40 motors.



TAYLOR TRUCK FOR INTERURBAN LINE

Interurban Line.

Eight double truck closed cars built by the St. Louis Car Co. These have steel floor-framing, and double floors and are mounted on Taylor extra heavy swing motion M. C. B. double trucks. They are equipped with four G. E. 73 motors, Westinghouse air brakes and whistles and have smoking and toilet rooms, water cooler, etc. Hale & Kilburn high back seats with head rests are used and bundle racks run the entire length of car. The cars are fitted with multiple unit control. They are heated by the Peter Smith hot water system. Electric lights are placed over each seat. A telephone system connects each end of the car, and is also arranged to be used in calling up the office, so the motorman and conductor can talk with each other from either platform and also with the office. Motors are geared to run 45 miles per hour. The trucks will be fitted with steel tired wheels furnished by the Standard Wheel Works, of Philadelphia, and equipped with Mausell retaining rings.

Four double truck trail cars fitted up similar to the eight motor cars, the only difference being they are not equipped with motors at present. These trail cars are mounted on St. Louis Car Co. extra heavy double trucks.

Eight double truck closed cars built by the St. Louis Car Co. These have St. Louis Car Co. reversible seats and each car is equipped with St. Louis double truck and four G. E. 57 motors and Christensen air brake. The car bodies are 47 ft. 6 in. over all.

All cars on interurban lines carry a full set of steam railroad signals.

Snow Plows and Sweepers.

Two McGuire single truck sweepers, equipped with two G. E. 67 motors on the trucks and one G. E. 67 motor to operate the brooms; two Wason Manufacturing Co. double truck plows, equipped with Wason truck and four G. E. 57 motors, and Christensen air

brakes, one Pollard & Co. plow equipped with two G. E. 1,200 motors and Pollard truck; one Stephenson plow equipped with two G. E. 57 motors, McGuire truck.

REPAIR SHOPS

The repair shops of the company are at Gloversville. The plant is equipped to do all ordinary repair work that might be necessary for a road of this size, being fitted with lathes, drill presses, shapers, boring mill, etc. The machine shop is 165 x 50 ft.; the carpenter and paint shop, 114 x 52 ft.; the store house 90 x 20 ft.; a foundry, 75 x 40 ft.; car sheds 235 x 34 ft.; blacksmith shop 40 x 30 ft.; car barn for the storage of electric cars 150 x 68 ft.; storage barn 108 x 35 ft. Here all the repair work, armature winding, etc., is done.

At Amsterdam is a brick car barn 50 x 200 ft. with four tracks. This barn is fitted up to do light repairs, has two pits 80 ft. long; the whole is covered with a granitoid floor. Here is also the office of the Amsterdam Division of the F., J. & G. R. R. and the office and store rooms of the Edison Electric Light & Power Co.

The main offices of the company are at Gloversville where are the headquarters of the president, general superintendent and the auditing department.

Offices for the sale of tickets for electric division only, are located at Gloversville, Johnstown, Amsterdam and Schenectady in the business portion of each city.

RATE OF FARE.

Commutation tickets are sold between Gloversville and Amsterdam; Amsterdam and Schenectady; Amsterdam and Tribes Hill.

A special workingman's ticket is sold between Gloversville and Johnstown good between certain hours of the morning and evening, for 5 cents.

Gloversville to Johnstown, 10 cents; to Amsterdam, 45 cents; to Schenectady, 70 cents; to Albany, 95 cents.

Johnstown to Amsterdam, 35 cents; to Schenectady, 60 cents; to Albany, 85 cents.

Amsterdam to Schenectady, 25 cents; to Albany, 50 cents.

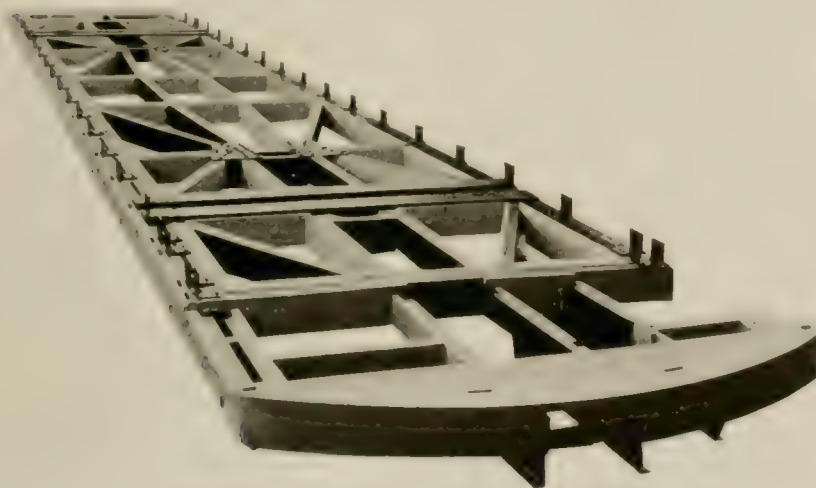
ROUND TRIP FARES.

Gloversville to Amsterdam, 75 cents; to Schenectady, \$1.20; to Albany, \$1.60.

Johnstown to Amsterdam, 60 cents; to Schenectady, \$1.05; to Albany, \$1.45.

Amsterdam to Schenectady, 45 cents; to Albany, 85 cents.

Commutation tickets are sold good for 54 rides and they must be



FRAME, AFTER TIMBER FILLING IS ADDED

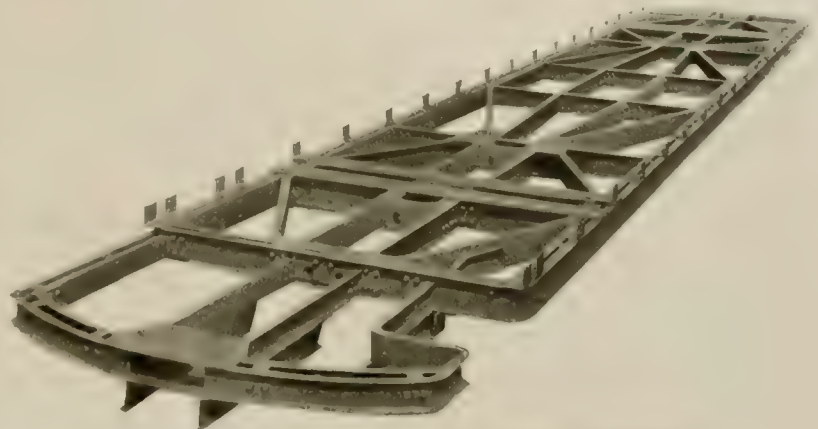
used within one month from date of issue and are not transferable.

| | |
|---------------------------|---------|
| Gloversville to Amsterdam | \$12.00 |
| Johnstown to Amsterdam | 10.00 |
| Amsterdam to Schenectady | 0.00 |
| Amsterdam to Tribes Hill | 1.00 |

The rate is about one cent per mile.

PARKS.

The company has a number of pleasure parks and picnic grounds along its different lines. The most notable of these is Sacandaga Park, which is without doubt one of the most beautiful spots to be found in this part of the country. It is owned and operated by the railroad company. There are three large hotels at the park and a summer theater that is run every night during the season except



STEEL FRAME ST. LOUIS CAR FOR FONDA, JOHNSTOWN & GLOVERSVILLE RY.

Sunday, the theatrical attractions being furnished by Gorman.

Prouty's Concert Band, of Boston, is engaged for the season, and three concerts daily are given. There are a miniature railroad, base ball grounds, merry-go-round, water toboggan, picture gallery, shoot the chutes, bathing, boating, burros for the children to ride on, large dancing pavilion, and restaurants. The company owns and rents the sites for over 150 cottages and many people from New York City spend the summer here. The company owns the hotels and all the furnishings. The summer population of the resort is about 2,000.

ROUTE.

The road from Sulphur Spring Junction to corner Market and Main St., Amsterdam, is 10.5 miles, all double track, excepting 1.23 miles through Akin. Between Akin and Sulphur Spring Junction, a distance of 7.05 miles, the approximate excavation was 150,000 cu. yd. and the approximate embankment was 160,000 cu. yd. The longest curve is 1060 ft., this being a 6 degree curve. The longest tangent is 1.01 miles. The total curvature between Akin and Sulphur Spring Junction, a distance of 7.5 miles, is 593 degrees 26 minutes. On this section there are 12 overhead bridges and 8 highway crossings.

STEEL VIADUCT.

On the main line near the central power house is a steel bridge or viaduct, having a total length of 584 ft. The steel work is of the plate-girder construction, all tower girders being 30 in. deep and all intermediate girders being 72 in. deep. The supports rest on concrete pedestals, having lime stone caps 4 x 4 ft. x 18 in. The abutments and bridge seats are concrete. The greatest height of the bridge is 72 ft. above the bed of the creek. There is a 4 ft. plank walk along each outside edge of the viaduct, protected by gas-pipe guard railing.

SCHENECTADY EXTENSION.

The Schenectady extension of the F., J. & G. R. R. is the new division of the system between Amsterdam and Schenectady, which are about 16 miles apart.

Amsterdam is in a portion of the Mohawk Valley which is ranked among the world's beautiful spots. The city is on the north side of the river and extends back onto the hills, which rise gradually from the water's edge. Amsterdam is the seat of large knitting mill interests. The Chucteneunda Creek furnishes water power for the mills, which for the most part are situated on its bank. Beside the milling interests, broom factories, boiler and machine shops, etc

give the town a permanent population of 25,000, and its growth is assured. The valley narrows to the eastward and at Hoffmans where the high limestone bluff has defied the west of the river for ages, the rocks rise 250 ft. above the valley, forming a bold point in the landscape which is in plain view of Amsterdam and Schenectady. Eastward from Hoffmans the hills fall back from the river and the



BOSTON ELECTRIC LOCOMOTIVE AND TRAIN

narrow valley spreads out into a flat country, probably the ancient delta of the Mohawk.

In the center of this delta is the city of Schenectady. Here are the General Electric Works and Schenectady Locomotive Works.

It is fortunately situated for a commercial center on the lines of the New York Central and D. & H. railroads with West Shore R. R. connections across the river. The Erie Canal passes through the main part of the city, and recently electric lines have been built to Troy, Albany, and a fast line is under construction to Saratoga.

The management of the Fonda, Johnstown & Gloversville R. R. was cognizant of the public demand for fast and safe transportation, and the location of the line was placed in the hands of Chambers & Hone, consulting engineers, of New York, with instructions to locate a double track line with steam road grades and light curvature. The surveys were begun in the spring of 1901 and completed in November of the same year. The time consumed in location was well spent. The difficult features were given proper weight, and time was allowed for a proper study of the natural obstacles to be overcome or avoided.

The surveys were conducted under the immediate direction of M. Thompson, of New York, who resigned in September, 1901, and Mr. W. C. Hebard, C. E., carried on the work, and under his supervision the grading was almost completed. When the contract with Chambers & Hone expired, in January, 1903, Mr. Hebard severed his connection with the work, and Mr. C. A. D. Bayley, C. E., took charge as engineer for the railroad company and completed the grading and track laying.

The contract was awarded to Pitts, Hankins & Trundle, of Virginia, who commenced work in November, 1901. Their section extended from Amsterdam east ten miles through the most difficult portion of the grading. Cragg & Co., of Buffalo, secured the next section east, which terminated at the Boston & Maine R. R. 13.6 miles from Amsterdam.

The nature of the work under each of the three contracts was different. Pitts, Hankins & Trundle's section included the steep side hill work through ground which had been subject to action of water and ice in geological periods, and they encountered material varying from sand to solid rock. Blue clay and boulders, quicksand and blue mud were frequently met with.

The next section to the last was in a flat country well drained by the great depth of gravel composing it, and the road was built without difficulty. The gravel taken out of the ditches formed the shallow embankments.

On each section there was considerable work to do before a track could be laid, and this was done by the railroad company under the direction of its own engineers and forces and completed in June, 1903.

The features of technical interest in matters of construction are naturally the general methods of location and results secured.

The track is mostly all upon previous right-of-way. Highways are crossed at grade and wherever practicable overhead railroad crossings have been built. Side hill location was adopted in order to secure grades and line with the result of a total curvature of 749° for the 15.75 miles with tangents as great as 6,800 ft. in length. The tangents east from Hoffmans are respectively 4,553 ft., 3,050 ft., 1,250 ft., 1,402 ft., 2,079 ft., 1,585 ft., 4,832 ft., 2,279 ft., 6,868 ft., 3,868 ft., 3,860 ft. and 3,663 ft., showing over 46 per cent of the line is composed of tangents from 1,000 to 6,000 ft. in length. The general profile is a rising grade from Amsterdam to Hoffmans, six miles, and thence east about four miles a descending grade to the flats. The five miles across the flats is almost level.

The maximum grade is 1.5 for 500 ft. at an under grade crossing which is worked as a momentum grade, there being no possibility of a regular stop ever being ordered at any point on the grade. The next heaviest grade is 1.25 for 1,500 ft. at an under grade crossing with the New York Central. Grades on the remainder of the line vary from 0.13 to 0.89.

The water is well taken care of by concrete arches, bridges and pipe culverts. All masonry is concrete of 1-3-5 mixture of portland cement, sand and stone respectively. Pipes are protected by concrete headwalls and all joints are calked and cemented except in cast iron pipes where lead was used for joints; 6,200 cu. yd. of concrete were laid in abutments, headwalls and arches.

The roadbed is 30 to 40 ft. wide in cuts and 26 to 28 ft. on embankments. Slopes in cuts, according to material, are 1 to 1 to 2 to 1. The complete roadbed required a movement of 300,000 cu. yd. of material, the heaviest work being at Hoffmans at the under grade crossing of the New York Central and at the sand cut near Schenectady. The completion of the 1.1 miles at Hoffmans required a movement of 54,500 cu. yd. of material and 12,500 cu. yd. was hard limestone. The 0.49 mile at the New York Central sub-grade crossing necessitated a movement of 26,600 yards and over 100,000 yards were taken out of the sand cut west of Schenectady. The greatest difficulties were met with at a 20,000-yd. cut just west of Hoffmans, where blue clay and boulders were encountered. This hard core was covered with a 12 or 13 ft. layer of rotten rock and washing which became semi-liquid when saturated with water. The cut was taken out successfully, but the winter and spring saturated the layer of soft material on the core of blue clay and the spring thaws caused a continual sliding of the semi-liquid mass which filled the cut to a depth of 12 to 14 ft. Owing to the difficulty in handling this soft material, it was decided to go around the cut and allow the slide to dry out, and then take it out, which accounts for the temporary line around this cut when the road was opened July 1, 1903.

The track will be gravel ballasted and further protected from water by ditches 5 to 7 ft. from the outer rail and of sufficient depth to thoroughly drain the sub-grades. The track is of a solid construction consisting of cedar ties laid 17 to a 33-ft. 80-lb. T-rail connected by 4-hole Weber joints. Tie plates are used on all curves and hard wood ties are substituted for cedar at points where curvature is over 8 degrees. All switches and crossovers are trailing and of standard dimensions.

It has been the object of the engineers in charge to secure first-class work in every particular and the liberal and broad-minded policy on the part of the management in furnishing means to carry out the recommendations of the engineers, has secured a road which is remarkably free from any features that will put a limit to the speed and service which will naturally have to be given to meet the demands as progress is made in interurban transportation.



H. O. ROCKWELL.
Photo by Wheaton.

If future success and conditions demand it by the elimination of the sharp curves at the New York Central sub-grade crossing, the sharpest curve will be 8 degrees. With light grades and easy curves, double track on private right of way the speed and service will be increased until the demands of the public are satisfied.

OFFICIALS.

The acting officials of the company are: J. Ledlie Hees, president and general manager; Geo. M. Place, secretary and treasurer; L. K. Brown, auditor; J. N. Shannahan, general superintendent; H. O. Rockwell, assistant general superintendent and engineer; Julian Du Bois, superintendent of the Amsterdam Division; Carleton Banker, superintendent of the Cayadutta Division; W. H. Collins, master mechanic; F. A. Bagg, engineer of maintenance of way; T. S. Williams, superintendent of overhead line construction; T. H. Ceperley, chief engineer, power house, assisted by W. H. McDonald. The plans for the main power house and general line construction, including cars, were laid out by Mr. C. H. Ledlie, consulting engineer, No. 920 Rialto Building, St. Louis, Mo.; C. W. Guest, of St.

Louis, chief draughtsman; H. O. Rockwell being the resident engineer in charge of the electrical and mechanical installation, representing Mr. Ledlie.

George Caywood, erecting engineer for the Allis-Chalmers Co., Milwaukee, had charge of the erection of the engines and pumps. Robert Turner, erecting engineer for the Springfield Boiler & Manufacturing Co., looked after the installation of the boilers. C. W. Chappelle, electrical engineer for the General Electric Co., assisted by N. C. Stewart and C. D. Lewis, had charge of the installation of the electrical apparatus for the General Electric Co. The American Bridge Co. was the contractor for the power house building, and furnished all the iron and steel work connected with it, J. J. Turner of Amsterdam, being a sub-contractor under the American Bridge Co. for the brick and wood work. Mr. Turner was also contractor for the Amsterdam sub-station. Dennis Madden, of Amsterdam, was contractor for the Glenville sub-station. William Van Wie was the engineer in charge of maintenance of way, track and grading between Amsterdam and Johnstown, and Charles Bailey had charge of the work between Amsterdam and Schenectady.

System of the Schenectady Railway Co.

In addition to owning the entire street railway system in the city of Schenectady and its suburbs, the Schenectady Railway Co. owns and operates a double track line about 12 miles in length from Schenectady to Albany, and a double track line about 15 miles in length from Schenectady to Troy, making the total track of the company now operated about 80 miles. The company has a trackage

Electric Co. The Schenectady Railway Co. was chartered Feb. 11, 1895.

The railway serves a population of about 250,000, including directly Schenectady, now estimated with recently annexed district at over 50,000; Albany 94,150; Troy 73,250; as well as a considerable intermediate population. Adjoining Troy is the city of Cohoes with



LOOKING DOWN STATE ST., SCHENECTADY

agreement with the United Traction Co. for running its cars to the business centers of the cities of Albany and Troy. The company is now building a double track line to Ballston of about 18 miles together with other local extensions. The company also owns the entire capital stock of the Schenectady Illuminating Co. and of the Mohawk Gas Co., thus owning and operating in addition to the important interurban lines, the entire street railway, gas and electric light business of Schenectady and its suburbs. The management and control of the company is in close alliance with the General

23,900 population. The new line will serve Ballston with 4,000 people and indirectly Saratoga Springs with its large summer population. Schenectady in the Mohawk Valley owes its rapid growth to the extensive and prosperous manufactories located there, foremost among which are the General Electric Co. employing about 11,000 and the American Locomotive Works, employing about 5,000 persons. Schenectady is on the main line of the New York Central & Hudson River R. R. and the Erie Canal.

The Schenectady Railway Co. receives power for the operation

of the system from the Mechanicville water power station of the Hudson River Water Power Co., and partly from the steam plant at the works of the General Electric Co. Upon the completion of the Spier Falls water power station of the Hudson River Water Power Co., it will receive a portion of its power from that point. A description of the system whereby the current is received and distributed over the Schenectady Ry. will be found in an article by Mr. F. G. Sykes, electrical engineer, elsewhere in this issue.

The company owns 22.66 miles of city lines laid with 7 and 9 in.



TRACK ON PRIVATE RIGHT OF WAY.

girder rails. The Albany line includes 12.41 miles of double track or 25.04 miles, measured as a single track. The line to Troy has 13.68 miles of double track or 27.40 miles measured as single track. With the completion of the extension to Ballston, the company will have practically 100 miles of track. On the interurban lines rails of various weights, ranging from 70-lb. to 80-lb. T sections, are used. During the past year the company has had a large force of men resurfacing and aligning the tracks wherever necessary and the system is now in excellent condition.

There are eight bridges on the entire system, these varying from a 48-ft. highway bridge to a 773-ft. 8-span pony-truss steel bridge over the Mohawk River.

The trolley wire on all lines comprises: No. 0, .22 miles; No. 00, 4.30 miles; No. 000, 64 miles; No. 0000, 13.92 miles. The feeders include: No. 1 wire, .17 mile; No. 00, 1.91; No. 000, 2.08 miles; No. 0000, 4.5 miles; 300,000-c. m. 22.72; 500,000-c. m. 2.11. There are about five miles of return feeder cables.

There are two car houses both within the city of Schenectady, one known as the Fuller St. car house and one as the McClellan St. car house. The company is now preparing plans for new repair shops to accommodate all the cars of the system. At the present time, car repairs are made partly at the Fuller St. house and partly at the McClellan St. house.

At the Fuller St. station the tool equipment includes: 100-ton Niles wheel press; 36-in. x 10-ft. Fitchburg wheel lathe; 36-in. Niles boring mill; 18-in. x 8-ft. Reed lathe; 21-ft. Barnes drill press; Yankee drill grinder; 4 x 4-ft. Buffalo forge; No. 4 Challenge tool grinder; 5-ton Mairs hand travelling crane; two Patton motor lifts.

At the McClellan St. station are: 21-ft. Barnes drill press; No. 3 Challenge tool grinder; 4 x 4-ft. Buffalo Forge Co. forge; four 4-ton Harrington hoists.

ROLLING STOCK.

The rolling stock owned by the Schenectady Railway Co. comprises 37 single truck closed cars; 18 single truck open cars; 4 double truck "Duplex" cars; 12 double truck open cars; 28 double truck closed cars for interurban service; total 99. There are 6 express cars and 6 motor flats. Cars were furnished by St. Louis Car Co., Stephenson Car Co., Laconia Car Co., Jones Car Co., and Brill Car Co. The motor equipment includes General Electric motors of the types known as 52, 57, 58, 60, 67, 73 and 1000. The total

number of motors owned is 278, most of which are G. E. 57's and G. E. 67's. The new long cars recently ordered have four 75-h. p. motors, the G. E. 73, to each car and the cars are provided with the General Electric system of multiple unit control.

Each interurban car is equipped with a tool box in which is a wrench, screw driver, pliers, axes, fuses, carbon for headlights, 10 ft. of insulated wire, extra lamps; bell plugs, torpedoes and rubber gloves. The box is carried on the front platform and is in the care of the motorman. There is a stationary stool for the use of the motormen when running on suburban and interurban lines. The rules for operation on the interurban lines require that when the car comes to a stop other than the ordinary passenger stop, the conductor shall immediately proceed back 15 pole lengths and place two torpedoes on the track. The cars carry electric head lights and oil tail lights. All interurban cars are equipped with Magam storage air brakes. For replenishing the air storage tanks on the cars there are four compressing and charging stations on the system, one at each of the sub-stations on the Troy and Albany lines and one at each of the car houses in Schenectady. A fifth charging station is being installed at the main office and waiting room on State St., Schenectady. The interurban cars are also fitted with the Flood emergency brake.

RECORDS.

For the general information of the general manager and all heads of departments, the company has adopted a system for reducing all operating statistics to the basis of an 18-hour car per day. This is practically the car hour basis, concerning which there has been considerable discussion at the past three meetings of the Street Railway Accountants' Association, but it is believed that the 18-hour car per day has certain advantages as a unit for checking and comparisons that are not evident with the use of the single car hour as the basis of computation. The 18-hour car gives a larger decimal for most of the items of receipts and expenses, thus reducing clerical work necessary in making reports. It is the practice on the Schenectady Ry. to have frequent meetings of the general manager with all heads of departments and the monthly statement reduced to an 18-hour car per day basis is posted in the general manager's office in a specially arranged cabinet, which keeps the sheets clean and renders them easy of access. At these meetings, the items of receipts and expenses for the system and for each line are examined and discussed by those present and suggestions are requested and discussed



FULLER ST. CAR HOUSE AND EXPRESS DEPOT MEN'S ROOMS ON SECOND FLOOR.

to the end that the entire service may be improved and bettered. A sample statement for the month of May, 1903, for the railway system, reduced to an 18-hour car per day basis, is reproduced herewith.

SCHENECTADY RAILWAY COMPANY.

| May | Operations per 18 Hour Car per Day. | 1903. |
|----------------------------------|-------------------------------------|----------|
| Total 18-hour cars operated..... | | 1191.6 |
| Receipts per 18-hour car..... | | \$ 51.62 |
| Expenses | | 30.26 |
| Profit | | \$ 21.36 |

| | |
|--|---------|
| Operating— | |
| Maint. track and roadway, Labor | \$.910 |
| Maint. track and roadway, Material | .238 |
| Maint. electric line, Labor | .475 |
| Maint. electric line, Material | .220 |
| Maint. buildings and fixtures | .107 |

| | |
|---|-------|
| Wages of car house employees | 1.021 |
| Car service supplies | .402 |
| Superintendence of transportation | 4.401 |
| Wages of conductors | 1.170 |
| Wages of conductors | 4.184 |



VIEW AT BRANDYWINE PARK.

| | |
|--|-------|
| Cleaning and sanding track | .393 |
| Removal of snow and ice (bill rendered late) | .009 |
| | 2.352 |
| Maint. of air plant, Labor | .002 |
| Maint. of air plant, Material | .0003 |
| Maint. electric plant, Labor | .030 |
| Maint. electric plant, Material | .029 |
| | .0613 |
| Power plant wages | .464 |
| Fuel for power | |
| Water for power | |
| Lubricants and waste for power plant | .009 |
| Misc. supplies and expenses of power plant | .037 |
| Hired power | 3.935 |
| | 4.445 |
| Maint. of cars, Labor | .962 |
| Maint. of cars, Material | .805 |

| | |
|---|--------|
| Wages of motormen | 4.154 |
| Wages of other car service employees | .386 |
| Misc. car service employees | .722 |
| | 10.616 |
| Salaries of general officers | .331 |
| Wages of clerks | .969 |
| Printing and stationery | .106 |
| Misc. office expenses | .152 |
| Storeroom expenses | .185 |
| Stable expenses | .331 |
| Advertising and attractions | .397 |
| Misc. general expenses | .238 |
| Damages | 1.328 |
| Legal expenses (account of damages) | |
| Other legal expenses | .382 |
| Rent of lands and buildings | .076 |
| Rent of tracks and terminals (Trackage rights with other companies) | 4.020 |
| Insurance | .270 |



STEPHENSON CAR IN SCHENECTADY

| | |
|---|------|
| Maint. of elec. eqpt. of cars, Labor | .514 |
| Maint. of elec. eqpt. of cars, Material | .481 |
| Maint. of Misc. Equipmt., Labor | .001 |
| Maint. of Misc. Equipmt., Material | .001 |
| Misc. expenses | .157 |

| | |
|--|-------|
| | 8.797 |
| Taxes | 1.019 |
| Interest on funded debt | 6.201 |
| Interest on floating debt | 2.104 |
| | 9.747 |
| Ratio operating expenses to gross earnings | .909 |

EXPRESS SERVICE.

The Schenectady Ry. is doing an express and freight carrying business from and to Schenectady and outlying towns, including Albany and Troy. The service is divided into three classes known respectively as "Class A", "Class B" and "Class C". "Class A" is designated as an express service, including wagon collection and delivery at both ends. "Class B" is a freight service with no wagon service whatever. "Class C" is a freight service, including the wagon service at one end only.

The rates for the various classes between Schenectady and Albany are given as follows: "Class A": 20 lb. and under 15 cents; 21 lb. to 50 lb., 25 cents; 51 lb. to 100 lb., 30 cents. Over 100 lb. at the rate of 30 cents per hundred pounds.

"Class B", 10 cent. per 100 lb. with a minimum charge of 25 cent.

"Class C", 15 cents per 100 lb. with a minimum of 40 cents.

In the daily work, "Class A" or express matter receives first attention in all cases, and although the freight service is just as fast, preference in loading and delivery is given to the express business. This division of the express and freight carrying business into classes has been found extremely satisfactory to the company and to the shippers of the vicinity. The express and freight business is growing very rapidly and four express cars are needed in the



DOUBLE TRUCK CAR—ST. LOUIS CAR CO.

daily service. With the opening of the lines to Troy and Ballston the service will cover a wide range of territory, and it is expected that additional cars and depot facilities will be required. At present the electric express depot at Schenectady is located at one of the car houses at Albany and the company is using the express depot jointly with the United Traction Co. The company has made arrangements with the People's Line, operating on the Hudson River, whereby freight and express is delivered from the boats to the Schenectady Ry. cars at Albany, the goods being delivered in Schenectady at a considerable saving to shippers. The company hopes to move freight from New York by the People's Line and electric express to Schenectady at the following rates, based upon Interstate official classification as follows: First class, 30 cents; second class, 25 cents; third class, 22 cents; fourth class, 20 cents, with a minimum charge of 40 cents.

The blank forms used in the conducting of the express and freight business are very similar to those previously described in the "Review" as in use by the United Traction Co. of Albany. The express and freight department is in charge of Mr. E. J. Ryon.

The officers of the Schenectady Railway Co. are as follows: President, Hinsdill Parsons; secretary and treasurer, James O. Carr; general manager, E. F. Peck; chief engineer, C. C. Lewis; electrical engineer, F. G. Sykes; superintendent, Frederick Smith; master mechanic, V. B. Turnbull.

POWER SUPPLY AND DISTRIBUTION FOR THE SCHENECTADY RY.

BY F. G. SYKES, ELECTRICAL ENGINEER, SCHENECTADY RAILWAY CO.

The power used for operating the lines of the Schenectady Railway Co. is furnished mainly by the Hudson River Water Power Co., from the large water power plant at Mechanicsville, augmented at times by the steam plant at the works of the General Electric Co. The Power is transmitted from Mechanicsville at a voltage of 10,000 and a frequency of 40 cycles over two entirely different routes. One of these transmission lines crosses the country about in a straight line from Mechanicsville to the works of the General Electric Co. at Schenectady, touching Alplaus, and crossing the Mohawk River at the Scotia Bridge.

This is the main line and consists of three No. 000 B. & S. bare copper wires mounted on double petticoat porcelain insulators. The power transmitted over this line is used to supply the wants of both the General Electric Co. and the Schenectady Railway Co. The power used by the Railway company in its Dock Street sub-station is conducted by two No. 1 B. & S. 3-conductor cables, one

being used exclusively for the railway load and the other for lighting the city, being transformed to 2,300 volts for this purpose.

The second transmission line starting from Mechanicsville passes along the canal through Watervliet, where it turns and following the line of the Schenectady Railway Company's Troy Division tracks, enters the Troy sub-station of the railway company at Lathams Corners. From here three No. 2 B. & S. wires follow across country to the Albany sub-station of the railway company, at Colonie, on the line of that company's Albany Division. Duplicate lines then follow the tracks located on the Albany-Schenectady Turnpike, into Schenectady, to the works of the General Electric Co., thus making almost a circle from Mechanicsville around through the sub-stations and the works of the General Electric Co. back to Mechanicsville. When the new sub-station at Dock St. is completed, late in the fall, these transmission lines will be changed somewhat. The lines from the Albany sub-station will be rebuilt to consist of duplicate aerial lines of No. 1 B. & S. bare copper from Albany sub-station to the city limits. The current will then pass underground through duplicate paper insulated cables, each consisting of three No. 1 B. & S. stranded wires made into a cable, to the new Dock St. sub-station, instead of going direct to the General Electric works. The connection between the new Dock St. sub-station and the General Electric power plant will be by three 3-conductor No. 000 B. & S. cables placed in ducts in the street.

The lines from the General Electric works to Mechanicsville will remain unchanged.

The Hudson River Water Power Co. will furnish power from another source, i. e., Spier Falls, situated approximately 40 miles from Schenectady; over a transmission line direct to the power house of the General Electric Co. The voltage of this line will eventually be 30,000.

Another steam source for supplying power to the Schenectady Railway Co. besides the present power house of the General Electric Co. will be the large steam turbine station now being built by the General Electric Co. This station will contain at first three 1,500-kw. Curtis steam turbine sets, and will use Stirling boilers and electric auxiliaries. The station is designed, however, for a much larger ultimate output.

Current from the various sources is received by the Schenectady Railway Co. in four sub-stations; one known as the Albany sub-station located on the Albany Division between Schenectady and Albany; one known as the Troy sub-station, located on the Troy Division between Schenectady and Troy; one known as the Ballston sub-station on the new line between Schenectady and Ballston Spa; and in a sub-station located in the city of Schenectady and known as the Dock St. sub-station, which station will soon be supplanted by a new station now under construction and to be known as the New Dock St. sub-station.

Present Dock St. Power House.

The old power house of the railway company on Dock St. is a one-story building, having a frontage on Dock St. of 74 ft. and extending 119 ft. towards the tracks of the New York Central R. R. The station is divided longitudinally by a party wall into a boiler room on the south side and an engine and dynamo room on the north side. The use of steam has been discontinued, although the machinery has not been dismantled. The boiler room contains one Stirling and three Babcock & Wilcox boilers, aggregating about 1,030 h. p., while the engine equipment consists of one Erie, simple and two vertical Westinghouse compound engines.

The railway machinery at present operating in the station consists of three compound wound rotary converters, made by the General Electric Co., each of 300-kw. capacity and running 800 r. p. m. There is also one 200-kw. 800-r. p. m. compound wound General Electric rotary converter. The 10,000-volt, 40-cycle three-phase current from Mechanicsville is fed into the three 300-kw. rotary converters through nine static transformers of the air blast type, each of 110-kw. capacity, and which transform the potential from 10,000 to 372 volts.

The 200-kw. rotary converter is fed through a 225-kw. three-phase air blast transformer. All of these transformers are provided with additional leads connected to the middle points of the secondary

windings in order that the rotary converters may be started from the a. c. side at half voltage, thus cutting down the starting current.

The railway switchboards are of the standard G. E. type for such installations, and are of black enamelled slate, provided with the usual circuit breakers, ammeters, knife blade switches, etc. One of the panels has a total recording Thomson wattmeter. The 10,000-volt operating switchboard is placed in a gallery above the low tension boards, and is equipped with oil switches, ammeters, etc.

Troy Sub-Station.

The Troy sub-station is at the intersection of the Loudonville Road and the Troy-Schenectady Turnpike. The lot covers an area of 3.22 acres. The building is one story and cellar, 26 ft. x 70 ft. The station is built of brick, and thoroughly fire proof in construction. The floor is of concrete with a granolithic top.

The apparatus consists of three 300-kw. rotary converters, operating at 800 r. p. m. The transformers are of the three-phase, air blast type and are two in number, each of 330-kw. capacity. Each converter is also provided with a reactive coil in the a. c. side for the purpose of regulating the voltage. Part of the cellar is made into an air blast chamber for the transformers, while in the rest of the cellar the cable work and wiring is carried on insulators fastened to the walls and converter foundations.

The switchboard is of black enamelled slate, and is made up of

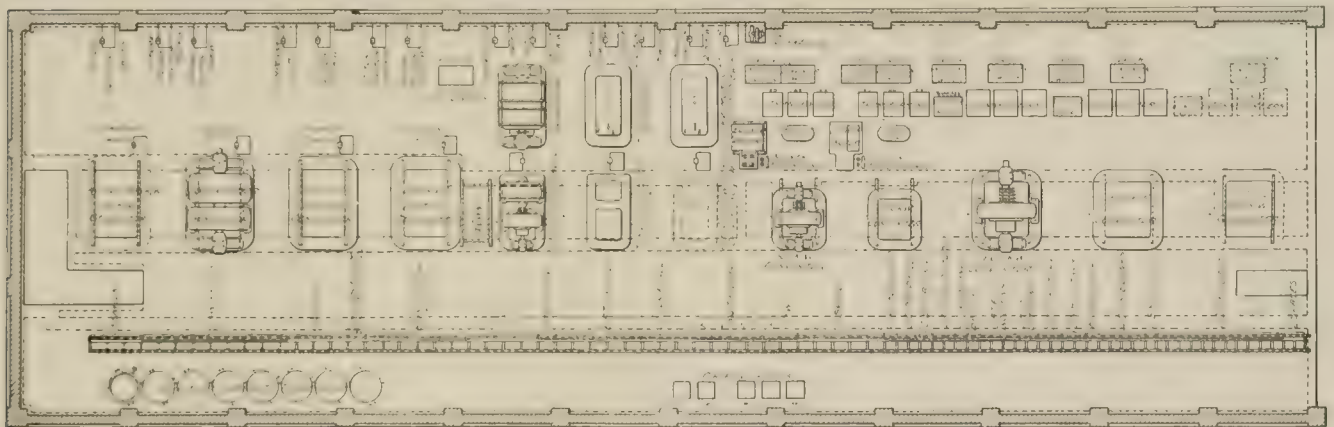
Three 300-kw. 40-cycle, compound wound rotary converters running at 800 r. p. m.; three air blast 220-kw. transformers, provided with double secondary windings, one blower set consisting of a 2-h. p., three-phase induction motor, direct coupled to a 35-in. Buffalo Forge fan; two 45-kilo-volt-ampere air blast reactive coils; one 20-h. p. three-phase induction motor with two pulleys for operating a Magann compressor and the necessary switchboard panels for the apparatus mentioned.

New Dock Street Sub-Station.

The property on which the new Dock St. sub-station is built has a frontage on Dock St. of 180 ft., while the distance on the rear, next to the New York Central tracks is 368 ft. The depth of the lot is 165 ft. The new sub-station is 165 ft. 8 in. front by 45 ft. 2 in. deep and is of brick and steel construction, thoroughly fireproof throughout. The station is without a cellar owing to the fact that at times of freshets water from the Mohawk River and Erie Canal overflows and would in all likelihood flood the cellar. The outside walls of the basement are faced with brown stone and the basement itself is divided off by means of brick partition walls into air blast chambers, bus-bar compartments and oil switch cells.

Upon the first floor is all of the transforming apparatus and this floor is of steel and concrete construction and is finished as a "terrazza" floor.

The railway apparatus placed in this sub-station consists of two



PLAN OF NEW DOCK ST. SUB-STATION.

three d. c. feeder panels, two d. c. rotary panels, two a. c. rotary panels and three 10,000-volt panels.

The low tension panels are all of standard G. E. pattern, provided with circuit breakers, ammeters, etc.

The 10,000-volt panels are provided with single pole oil-break switches mounted in separate brick cells, about 10 ft. back of the panels themselves. The switches are provided with overload relays, and on the panels themselves are mounted horizontal edgewise black oxidized finish, ammeters, voltmeters, power factor indicators and one round pattern induction recording wattmeter. The bus-bars back of the panels are heavily insulated, and carried on an insulated iron frame-work. All of the 10,000-volt feeders enter the station overhead, and are connected with a suitable number of lightning arresters of the Wirt type. At this station there is also an air compressor for use in connection with the Magann storage air brake system, used on the cars of this company. This air compressor is operated by a 20-h. p. induction motor, belted to it.

Albany Sub-Station.

The Albany sub-station is a one-story frame structure with cellar; is 45 ft. square. The lot on which it is built is 75 ft. x 100 ft. The apparatus installed in this sub-station is exactly similar to that in the Troy sub-station and the foregoing description will suffice as well for the Albany sub-station.

Ballston Sub-Station.

The Ballston sub-station is in process of construction and is intended to furnish current for the operation of the Ballston division of the Schenectady Railway Co. The following apparatus is in process of manufacture for this station by the General Electric Co.:

600-kw., 600-volt, six-phase, 40-cycle rotary converters together with two 90-kilo-volt-ampere air blast 40-cycle reactive coils and six 220-kw., 10,000-volt air blast static transformers. Two 300-kw., 600-volt, three-phase, 40-cycle rotary converters and two 45-kilo-volt-ampere air blast reactive coils and six 110-kw., 10,000-volt primary 40-cycle air blast transformers.

As indicated on the plans, space has been left for a future 600-kw. rotary converter.

All of the 10,000-volt bus-bars, etc., are placed in the basement between brick and concrete barriers and each phase is thoroughly insulated. The transmission lines and the primary lines leading to the various transformers are operated by means of the well known General Electric Type H oil-switches, electrically operated, these switches being placed in brick cells. The switchboard panels are placed on the opposite side of the station from the Form H switches and the operating voltage is reduced by means of potential and current transformers so that at the switchboard panels it will not be greater than 150 volts. The current for operating the Form H switches is furnished by a storage battery, built by the Electric Storage Battery Co., of Philadelphia, and consisting of 55 type E 9 cells.

The 10,000-volt bus-bars are arranged so that they can be sectionalized by means of knife disconnecting switches.

All of the switchboard panels are of black enamelled slate and the instruments have the marine finish. Each of the three-phase incoming line panels has a capacity of 4,000 kw. at 10,000 volts and each panel contains the following:

One horizontal edgewise ammeter; one horizontal edgewise voltmeter; one double pull overload relay with lamps for indicating the open and closed position of the oil switches; one controlling switch

the H. I. switch, together with the necessary current and potential transformers, and static dischargers.

Each of the three-phase rotary converter panels is equipped with a three-phase three-pole outgoing line panels with a capacity of 2000 h. p. to 3000 v. and each panel contains one horizontal edge-wise ammeter, one polyphase induction recording wattmeter (railway pattern), together with relays, controlling switches, indicating lamps and current transformers and static dischargers.

Each of the three-phase rotary converter panels is equipped with a power factor indicator and horizontal edgewise ammeter and a three-phase induction recording wattmeter together with overload relay, controlling switches for Type H oil switch, indicating lamps and current transformers.

The lighting of the Dock St. power house has been worked out

with a view of providing against any possible failure of current.

The ordinary lighting will consist of 24 arc lamps, placed on brackets fastened to the sides of the wall and lighted by means of current from the ordinary lighting circuits of the company. As an emergency lighting, a number of incandescent lamps will be mounted on the roof girders and will be fed from the railway circuit. Should both the railway and lighting current fail, arrangements have been made for placing a number of lights on the storage battery.

The station will be provided with a traveling crane, having a capacity of 15 tons and will be arranged in such a manner that the track for this crane extends outside of the building under an archway so that teams driving under this archway may be unloaded directly by the crane.

System of the United Traction Co., of Albany, N. Y.

The United Traction Co., of Albany, controls by ownership or by lease about 80 miles of track (measured as single line), comprising all the electric railway trackage in and between the cities of Albany, Troy, Cohoes, Lansingburgh, Watervliet, Rensselaer and other smaller towns in the immediate vicinity of Albany and Troy. It has been the policy of this company to maintain its system within its own territory, and it has left the matter of building suburban and interurban extensions outside of its territory to outside companies, to which it has been liberal in the matter of granting trackage rights for terminal purposes over its city lines in Albany and Troy. In accordance with this policy, it has accepted traffic agreements with the Albany & Hudson Railroad Co., the Schenectady Railway Co., and the Hudson Valley Railway Co., by which the passenger and express cars of these three corporations are permitted to reach the business center of the city of Albany. The United Traction Co. also has made an agreement with the Troy & New England Railroad Co. by which the cars of the latter company run into the city of Troy.

The United Traction Co. was chartered Dec. 30, 1899, as a consolidation of The Albany Railway (chartered 1863), the Watervliet Turnpike & Railroad Co. (chartered 1862), and the Troy City Railway Co. (chartered 1866). Since that date it has purchased the property of the Troy & Lansingburgh Railroad Co., and has leased the properties of the Lansingburgh & Cohoes Railroad Co., the Troy & Cohoes Railroad Co. and the Waterford & Cohoes Railroad Co. The United Traction also has traffic arrangements with the Cohoes City Railway Co., a corporation owning six miles of track in Cohoes and suburb, whereby the properties of the two companies are operated in close harmony.

POWER FEATURES.

The United Traction Co. purchases its power from the Mechanicsville water power station of the Hudson River Water Power Co., the power company delivering current at 11,000 volts at two sub-stations of the Traction company, one located at 25th St., Watervliet, and one at North Albany, a suburb of the city of Albany. The Traction company is under contract with the Power company for 6,000 h. p. to be delivered at the sub-station switchboards as desired. Pending the completion of the new water power station at Spier Falls, the Power company is not able to deliver the full quota of power required by the Traction company and the additional power needed at times of heavy load is generated in three steam-driven power stations, one at Albany, one at Troy and one at Lansingburgh, but as soon as the Spier Falls plant is finished the steam-driven apparatus will be discarded. A full description of the Mechanicsville and Spier Falls plants will be found elsewhere in this issue.

As stated, the Power company delivers current to the United Traction Co. at 11,000 volts at two sub-stations.

The sub-station at 25th St., Watervliet, is the larger of the two and contains the following apparatus:

Five 375-kw. 550-volt Westinghouse rotary converters and one 500-kw. Stanley rotary converter. There are three 150-kw. oil-cooled Westinghouse transformers for each rotary, these being of the usual 40-cycle three-phase type for railway work. For general convenience, part of the converter sets are arranged to be started by a three-phase induction motor and part are arranged to be started from the d. c. side.

In connection with the sub-station apparatus, there is now being

installed a 1,365-ampere-hour 264-cell storage battery, furnished by the Electric Storage Battery Co. of Philadelphia. This will be used in connection with a differential booster in order to meet a local condition brought about by the terms of the contract with the Power company. The Traction company buys 4,000 h. p. of the

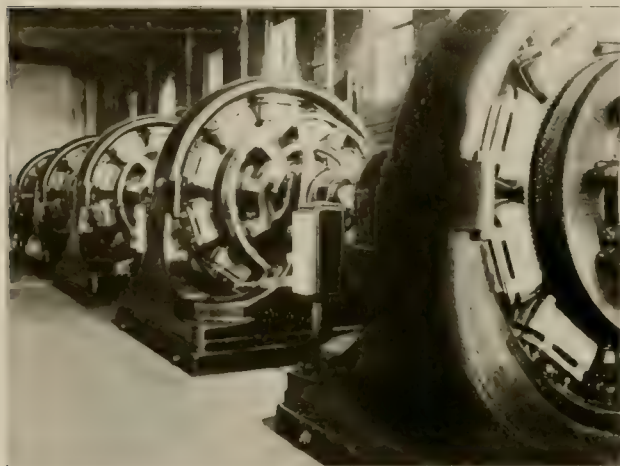


SYSTEM OF UNITED TRACTION CO., ALBANY

total 6,000 h. p. on a flat rate, the other 2,000 h. p. being purchased on a meter basis, and the battery together with the differential booster will be used to bring the load curve as near the 4,000 limit as possible. That is, the battery will be charged during periods of light load, and at times of heavy load current will be drawn from

the storage battery in so far as possible, and additional power will be taken from the Power company only after the capacity of the storage battery is reached. The storage battery will be housed in a special building, constructed of concrete, according to the patented method of the Steel Concrete Construction Co.

The apparatus at the North Albany sub-station is identical in all respects with the Watervliet sub-station, except that there are four 375 kw. Westinghouse rotaries and one 500 kw. Stanley rotary.



INTERIOR WATERVLIET SUB-STATION.

The transformer equipment is the same and there is being installed a storage battery in connection with a differential booster in the same way and for the same purpose as the battery at the Watervliet station.

At these two sub-stations, the 11,000-volt alternating current is changed to 375-volt a. c. and transformed to 550-volt d. c. for transmission to the trolley wire, the converting and transforming operations following the usual methods in work of this nature.

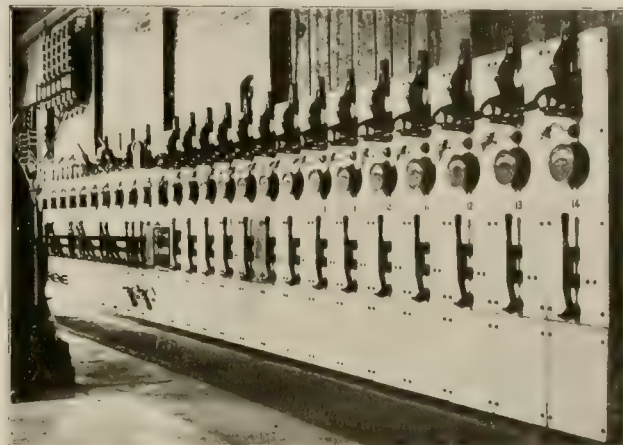
The equipment at the three steam-driven stations has been in use for some time and comprises direct current generating units of various standard makes, some of the units being direct connected and some belted. Inasmuch as all of this apparatus will be discarded within the near future, it is not necessary to describe it in this connection. It is interesting to note that pending the ability of the power company to furnish the full amount of power required, resort is occasionally had to the expedient of operating the rotary converters reversed to take direct current from the steam stations and send it at high voltage from one sub-station to the other. For its feeder system, the Traction company has adopted aluminum cables in all recent work and now has nine or ten miles of aluminum feeders, equivalent to 500,000 c. m. copper, and five miles equivalent to 350,000 c. m. The aluminum has given excellent satisfaction and probably will be used in all future work. As an instance of the facility with which aluminum can be made to meet special conditions, it is cited that the feeders are carried across the Hudson River into Troy in a single span of 300 ft., the aluminum cables being supported from a tower on the river bank on the Troy side of the river. The longest transmission of current from either of the sub-stations does not exceed four miles. The company has 1,000 amperes for the Albany division and 2,000 for the Troy division.

OTHER FEATURES

The character of roadbed and overhead work and rolling stock has been described in previous issues of the "Street Railway Review" and will not be repeated at length in this connection. For the most part the cars of the United Traction Co. are double ended, and the feeders are 6 in. x 8 in. double bond, and laid partly with steel and partly with concrete and joint. The overhead work

is span construction with No. 00 round trolley wire and overhead material of various makes.

The company owns 300 cars, divided as follows: 200 closed cars; 150 open cars; 6 express cars; 15 service cars; 12 snow ploughs and 7 sweepers. Eleven of the newer double truck cars are 40 ft. over all, built by the J. M. Jones' Sons and mounted on Taylor trucks. The company has recently purchased ten new double truck closed cars, having 28 ft. bodies, built by the J. G. Brill Co. and mounted on Brill trucks. A novel arrangement of seats and compartments



SWITCHBOARD, WATERVLIET SUB-STATION

for the new double truck cars has been adopted as shown in one of the accompanying engravings. The standard short car for city service has a 20-ft. body, mounted on Taylor trucks with from 7 to 8-ft. wheel base. The double truck cars are mounted on trucks having 4½-ft. to 6-ft. wheel base. All double truck cars are equipped with four Westinghouse No. 12 A motors and single truck cars are equipped with two Westinghouse No. 12 A motors. The longer cars are equipped with Christensen air brakes and all cars that operate on the heavy grades are fitted with the Flood emergency brake. Cars are heated by the Consolidated Car Heating Co's. electric heaters.



REMODELED CAR HOUSE, UNITED TRACTION CO.

CAR HOUSES AND SHOP NOTES

The company has five car houses, two at North Albany each having a storage capacity of 75 cars; one at Quail St., Albany, with a storage capacity of 80 cars; one at Lansingburgh with a storage capacity of 250 cars; and one at Troy with a storage capacity of 50 cars.

During the last year the company has expended considerable money in improving its car house facilities, the additions consisting of a new building at North Albany and extensive alterations to the Quail St. car house.

Most of the repair work on all cars of the system is done at the shop at North Albany, although each of the car houses has a blacksmith's shop and facilities for making light repairs.

The shops at North Albany are equipped with a full complement of wood working and metal working tools, and here the company winds and repairs armatures, casts babbitt bearings and carries on the various operations incident to the proper maintenance of its rolling stock.

car wheels 25,000 to 35,000 car-miles. The type of wheel in use is a good quality chilled wheel, 33 in. in diameter with 2-in. tread and $\frac{3}{4}$ -in. flange. The wheels have a 2-in. chill with a $\frac{1}{4}$ -in. soft spot at the edge of the tread, as this softening of the outside edge of the tread has been found to prevent chipping. It is the practice to make careful inspections each day of all parts of each car, and no car is permitted to go into service until it has been given a clear bill of good condition by the inspectors. These precautions are



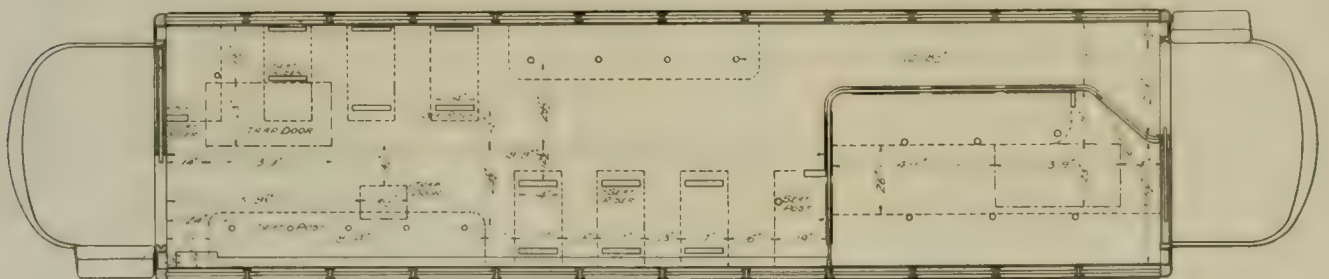
MACHINE SHOP UNITED TRACTION CO.

The paint room is particularly well lighted and airy. Various notes written by Mr. J. E. Butler, master car painter, on the methods of painting will be found elsewhere in this issue.

The mechanical department keeps complete records of all cars and car equipments. Every morning as the cars go out, the crew sending the car out makes note of what run the car goes on. This information is transmitted to the office on a slip giving the car number, the run number, the time out and the date, so that the location of every car on the system is known at any time of the

all in the line of discovering defective and worn-out parts before actual breakdowns occur.

In order to secure an arrangement of offices suited to its own particular requirements, the United Traction Co. has erected a very fine office building at the corner of Broadway and Columbia Sts., Albany, near the Union Depot. This building was fully described and illustrated in the "Review" for July 15, 1901, page 413. The building has a frontage of 74 ft. on Broadway and 45 ft. on Columbia St. It has a basement, two stories and a loft under the



FLOOR PLAN OF COMPARTMENT CAR BODY.

day. A journal is kept of the cars and in this is entered the total mileage made by each car each day, this information being taken from the conductor's day sheets. In a second book is kept a record of the equipment of each car, including the make and type of each of the various parts and the date on which they were placed in service. A separate record is kept with pinions, armatures, wheel bearings, etc., so that the life of each part can be determined. The average life of armature bearings, made from good quality babbitt metal, is found to be 6,000 car-miles; trolley wheels 4,000 miles;

roof, and is as near fireproof as modern methods can make it, the only wood employed being the doors, window trimmings and decorative wainscoting. The walls are gray brick and Indiana limestone with elaborate decorations in mosaics or marble.

The ground floor is used by the accounting department and has vaults for the storage of valuable papers and records. On the second floor are the general manager's office, the superintendent's office and various rooms and offices for other officials. On one side of the general manager's office is a large room for directors' meet-

ings, this being finished in mahogany with highly decorated ceiling and paneled walls.

The third story, which is lighted from sky-lights, is utilized as engineers' office and drafting room.

The United Traction Co. was one of the first electric railway companies in the country to inaugurate a service for the carrying of express packages and general merchandise. The service was established in 1894 and has been very successful and satisfactory both to the company and the public. For the year ending June 30, 1902, the company carried 17,322 tons of express and freight matter and the receipts from this department amounted to \$27,833.35. The expenses of the express department were given as \$24,995.69, leaving a very satisfactory profit. The freight and express car mileage was given as 37,926 car miles.

The city of Albany is peculiarly well located for an express carrying service, as the Albany merchants send out agents to Troy, Cohoes, Watervliet, Lansingburgh and other of the nearby towns, and the United Traction Co. distributes and delivers the greater part of the sales thus made. The service is distinctively an express business inasmuch as wagon collections are made in Albany and all the different towns. Considerable heavy freight matter is carried but always at express rates. For the collecting and delivering of goods, the company operates five wagons in Albany, four in Troy, three in Cohoes, and one in Watervliet. The company owns six express cars and three are in operation all the time. The cars used are 20 ft. long inside, were built by Jones Sons and are mounted

on Taylor trucks, equipped with two motors to each car. The express cars make five regular trips to Troy each day, four to Cohoes, three to Watervliet.

The company maintains express depots at Albany, Troy, Watervliet and Cohoes. The main express depot at Albany has recently been enlarged and comprises a four-story brick building. The upper stories are rented to a printing establishment and the ground floor and first story are occupied by the express department. The depot is provided with double platforms, the express cars running up to one side of each platform and the wagons back up to the other side, thus greatly facilitating loading and unloading of express matter. There is considerable business into Albany as well as out of Albany, and the class of goods carried includes fruit, beer, groceries and general merchandise of all kinds. A considerable business is carried for the collar and shirt houses at Troy. The main express depot at Albany is used jointly by the United Traction Co. and by the other interurban electric railways entering Albany, and the United Traction Co. prorates with the other companies on all shipments for places on their lines. A description of the methods of handling express matter together with the various blank forms used, will be found in the "Review" for Mar. 15, 1901, page 147. The express department is in charge of Mr. J. W. Gibney.

The officers of the United Traction Co. are: President, John W. McNamara; secretary, Charles G. Cleminshaw; treasurer, James McCredie; superintendent, Edgar S. Fassett; electrical and mechanical engineer, H. A. Benedict.

Third Rail System of the Albany & Hudson Railroad Co.

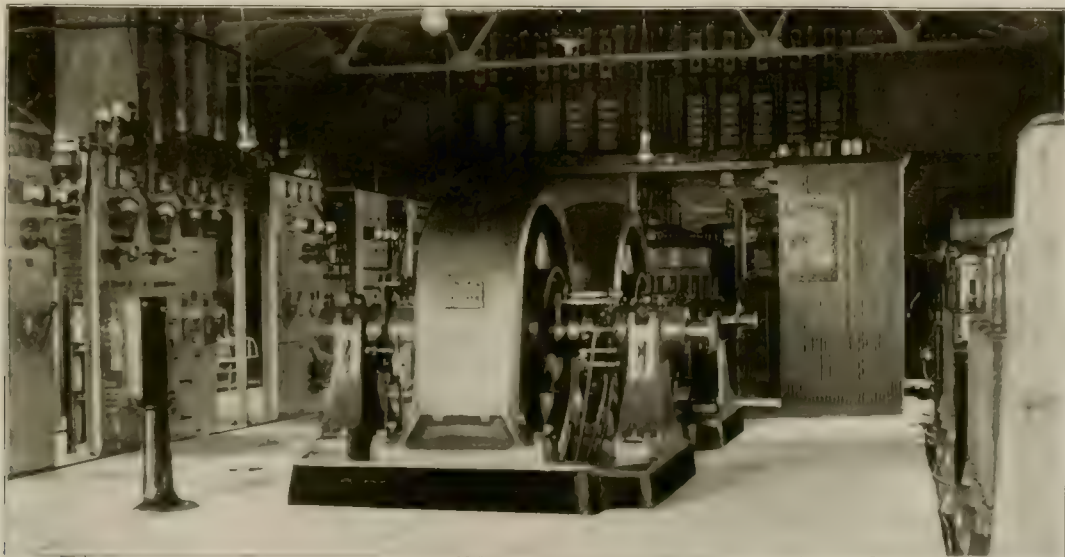
BY R. P. LEAVITT, ELECTRICAL SUPERINTENDENT, ALBANY & HUDSON R. R.

Among the earlier ventures in third-rail construction for cross country electric roads, the Albany & Hudson was perhaps the most prominent. Notwithstanding that earlier descriptions of the equipment of this road have appeared in the "Street Railway Review", an article at this time reviewing the prominent features of this road, with the changes which have taken place since the completion is deemed of interest.

This line which receives the greater part of the travel between

"Continuous" rail joint. Cross bonds are installed at intervals and at all sidings.

The conductor rail is also 80 lb. to the yard but is of a lower carbon steel than the traffic rail on account of its lower electrical resistance. The joints of this rail are bonded with two 425,000-c. m. bonds placed under the base of the rail, and are made mechanically strong by either two or four-hole splice bars, the two-hole pattern being used on straight line only.



INTERIOR OF HUDSON SUB-STATION.

terminal points, Albany and Hudson, affords the only railroad facilities, for both passengers and freight, for a number of thriving villages along its line, although previous to the organization of the Albany & Hudson Railroad Co., a part of the territory was served by a steam road from Hudson to Niverville, a distance of about 18 miles.

The entire line including the acquired track was laid with 80-lb. steel upon a sub-surface road-bed of graded ballast. The traffic rails are bonded with two No. 0000 bonds to each joint, placed under the

Every fifth tie is 9 ft. long with the extra length for supporting the third rail which is insulated from the tie by a specially prepared creosoted wooden block. The top of the insulator block is provided with an iron cap with lugs which hold the rail in position laterally.

This cap extends down the sides of the block and terminates in a petticoat of 1 in. Corresponding in position to the petticoat on the cap is an offset of 1/2 in. in the block which gives a petticoat of practically 1 1/2 in. and forms a very strong feature of this block. The insulation resistance after three years' exposure to weather shows

of 1,000 to 10,000 volts per mile of rail. This is possible, but is very well avoided, but with a third rail the system is practically dead-end.

At highway crossings where the third rail is in use, instead of an overhead or underground cable is used, though for single track where conductors will permit the overhead cable is now standard.

Current for the railroad and various lighting plants is supplied at 12,000 volts pressure from one power house located at Stayvossent Falls, which location was selected on account of the available water power. The power house is 11 miles from Hudson and 20 miles from Albany.

The power station is a substantial brick building 82 x 142 ft. as main building with an annexed boiler room 32 x 80 ft. It is on Kinderhook Creek, about 3,000 ft. in a straight line and 100 ft. vertically below the dam and falls from which the village derives its name.

The water is conveyed to the station by two 7½-ft. steel penstocks which connect to the various wheels. Each penstock is provided with a standpipe extending several feet above the water level at the dam, which acts as a relief valve for the protection of the wheel cases, due to the varying water pressure resulting from a fluctuating railway load.

The hydraulic equipment consists of 10 Stillwell-Bierce & Smith-Vaile turbines and Lombard governors placed in a row parallel to the penstocks near the south side of the station. Each turbine supply pipe is provided with a gate valve, which with the exception of the exciter wheels, is hydraulically operated. Direct connected

generators which feed direct into the third rail at the power house.

These machines are run in multiple with the sub-stations during the day, and at night after running-in time take care of any extra

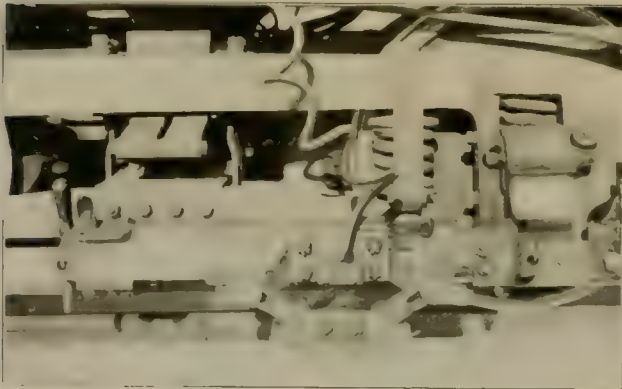


INTERIOR OF ALBANY & HUDSON POWER STATION

cars that may be on the line. Two independent turbines drive the exciters and the three remaining wheels are direct connected to single-phase, 60-cycle alternators for commercial lighting.

To insure against any shortage of power in the driest season, a steam equipment of a 1,200-h. p. Ball & Wood, and a 1,250-h. p. Buckeye engine were installed, each being belted to a separate jack shaft which may be connected to its 750-kw. generator by a clutch coupling. The duplicate steam equipment for the lighting consists of a 750-h. p. Buckeye engine which may be connected by clutches to the two 250-kw., 60-cycle machines and exciter.

The switchboard galleries, of two floors, are on the south side



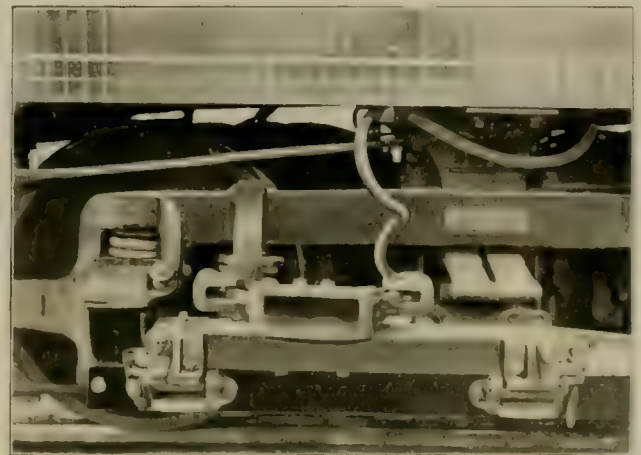
THIRD RAIL SHOE LOWERED

to each of the 1,000-h. p. turbines is a 750 kw. General Electric three-phase, 25-cycle, 12,000 volt generator for supplying railway



FEEDER CONNECTION AT SUBSTATION

current for three sub-stations. In addition to these for railway purposes are two 200-kw. 600-volt, direct current, direct connected



THIRD RAIL SHOE-RAISED

of the building above the leading in pipes for the turbines. On the lower gallery is located the chief engineer's office, bath room and machine and feeder panels, which latter present a noticeably neat appearance both on the front and rear, due to the fact that with the exception of the 600-volt panels no heavy current comes to this floor, as the switch levers of this floor connect with the oil switches on the floor above.

In this upper gallery as already mentioned are the 12,000-volt oil switches, each in its own compartment built of fire brick and soapstone. The bell cranks for operating the switches pass through the floor and are connected to the switch levers on the front of the board in the lower gallery by iron pipe with one section of wood as an extra precaution that no high voltage may reach the operator. All oil three-phase switches are double throw, and connection may be

made to duplicate bus bars so that different machines may be operated together or independently. The various transformers for the switchboard instruments are also located on the second gallery. All high tension lines are provided with expulsion fuse blocks which



STATION AT ELECTRIC PARK ALBANY & HUDSON R. R.

operate most satisfactorily on either a natural overload or a dead short circuit.

The transmission line branches near the station, one to the north feeding the railway sub-stations at North Chatham and East Greenbush, the other to the south supplying the Hudson station. The high tension wires are supported on two arms except at transpositions which occur every mile; the upper being four-pin and carrying two pair of single-phase lighting wires and the lower a six-pin carrying the Hudson two duplicate three-phase lines. The north line has but one set of three-phase wires.

The telephone and telegraph lines are carried on eight-pin arms 6-ft. below the power wires, with the telephone wires transposed every 400 ft. Notwithstanding the fact that telephone wires are carried the length of the line on the same poles with power and lighting lines, and also, that the line has 44 telephones, no more trouble is experienced in the working of the line than the writer has noticed with trolley systems where telephone wires were carried on the side of the track opposite from the high tension wires. At each station where agents are regularly employed the line is "looped in" and switches are so arranged that trouble may be more easily located. Local telephone lines in both Rensselaer and Hudson connect with the various employes' homes and are arranged for connection with the main line when desired.

The two sub-stations on the north transmission line are North Chatham, 10 miles, and East Greenbush, 22 miles, respectively from

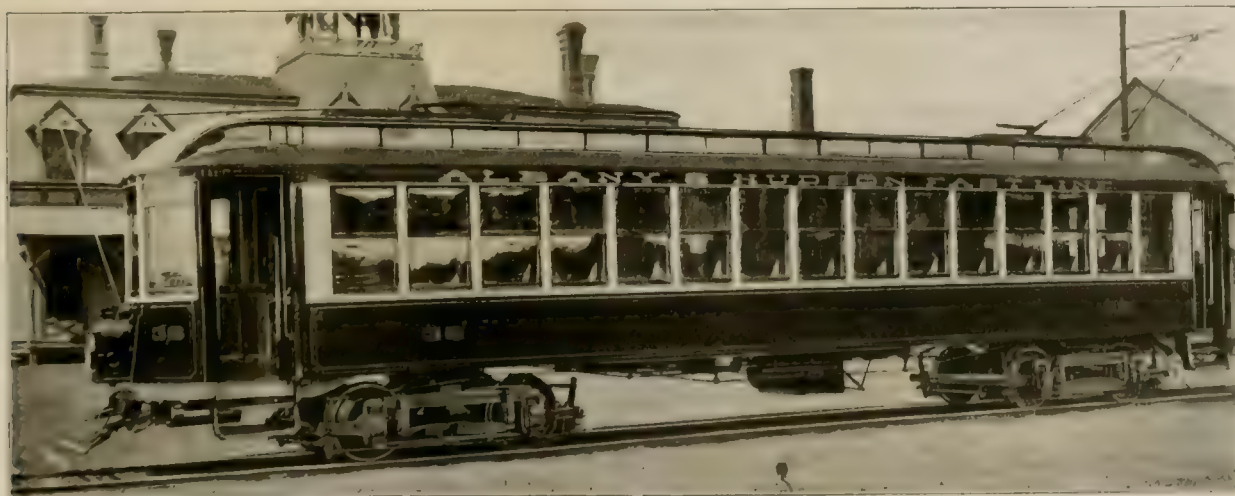
at each station, and at East Greenbush station provision is made for starting from the alternating current at full voltage by means of a double-throw switch connected in the secondaries of the step-down transformers. Full and one-third voltage secondary taps are taken to opposite ends of this switch which allow the rotary to start with a. c. current at 125 volts, and after approximate speed is reached the switch is changed to the full voltage connection. This method of starting is very satisfactory indeed, as the current required is of no considerable amount, and it also permits the synchronizing lamps to be entirely disregarded. The Hudson station is 10 miles south of the power house and differs but little in the railway equipment from the other stations, except in having two 200-kw. rotaries. The station building at this point, also of brick, is considerably larger than the other stations, to accommodate the lighting apparatus for Hudson. Under normal conditions all stations are run in multiple on both alternating and direct current sides. However, at each station, the third rail is interrupted and the rails connected to north and south feeder panels, so any par-



ALBANY & HUDSON TWO-CAR TRAIN

ticular section between stations may be readily cut dead, should the occasion demand it.

The main repair shop and car house is near the general offices in Rensselaer, just across the river from Albany. Another shop



SUMMER CAR FOR ALBANY & HUDSON—WASON MANUFACTURING CO.

the power house. These stations have practically the same electrical equipment consisting of one 400 kw. and one 200 kw. General Electric rotary converter with two independent sets of three air blast synchronous transformers and one reactance coil. Rheostats for starting the rotaries with the direct current from the rail are included

and car house used primarily for Hudson local car—adjoins the sub-station at Hudson.

The rolling stock for the main line equipped with motors consists of eighteen 53-ft. and two 43-ft. double truck cars made by Wason Manufacturing Co. and mounted on Brill No. 27 trucks. Eight of

these cars classed as winter equipments are heavier in construction, heavily finished in cherry with inland work and equipped with two T-4 controllers and four G. E. No. 51, 80-h. p. motors, geared for a speed of 30 miles per hour. Three of these cars have a baggage compartment while the other five have glazed partitions forming a compartment for smokers. The ten so-called summer cars are somewhat lighter in construction and are finished in light wood with windows arranged that both sashes, instead of one, may be let down in the car body pockets. The electrical equipment for these cars consists of two K-14 controllers and four G. E. No. 57, 50-h. p. motors. The two 43 ft. cars are without seats and are used as locomotives for handling freight, and have the same motor equipment as used on the winter cars, except that the gear ratio is much lower, and allows a maximum speed of 23 miles per hour running light. These locomotives are equipped with automatic air while all other cars use straight air brake apparatus. Owing to the heavy freight business these two cars are to be superseded by a 50-ton locomotive now being built, which is to be equipped with four G. E. No. 55, 160-h. p. motors with low gear ratio and Type M. control. The cars are fitted with Christensen air brakes. Besides the third rail shoes all cars are provided with a trolley pole at each end of the car, for use when on city tracks at terminal points. A special enclosed commutating switch is installed in each vestibule for connecting the controller to either the trolley or shoes and at the same time cutting the other dead. The third rail shoes which weigh from 22 to 24 lb., make contact only by their own weight, and are suspended at each end by slotted links from the casting on the wooden shoe beam, allowing a vertical movement of about $2\frac{1}{2}$ in. These links are so constructed that they will break and free the shoes in case any serious obstruction is met. The method of connecting the shoe beam to the journal boxes is clearly shown in the accompanying illustration.

The difficulties of operation with sleet on the rail which has been experienced by many third rail systems, has after a great deal of experimenting been overcome by a specially designed scraper operated by compressed air from the car reservoir.

The maintenance charge of renewing worn out shoes is very small indeed as compared to renewing trolley wheels on a purely trolley road of high speed.

The Albany & Hudson company does an extensive freight business, having traffic arrangements with the New York Central and Boston & Albany at Hudson, Niverville and Rensselaer. It handles only standard steam road cars. With one freight train a day each way with often twelve to fifteen cars to a train, this traffic makes a very profitable feature which is steadily increasing.

The system of operation embraces only standard steam road principles and is practically the same as used on the New York Central. At present all successful applicants for trainmen's positions must, among other qualifications, have had quite an extensive steam road experience.

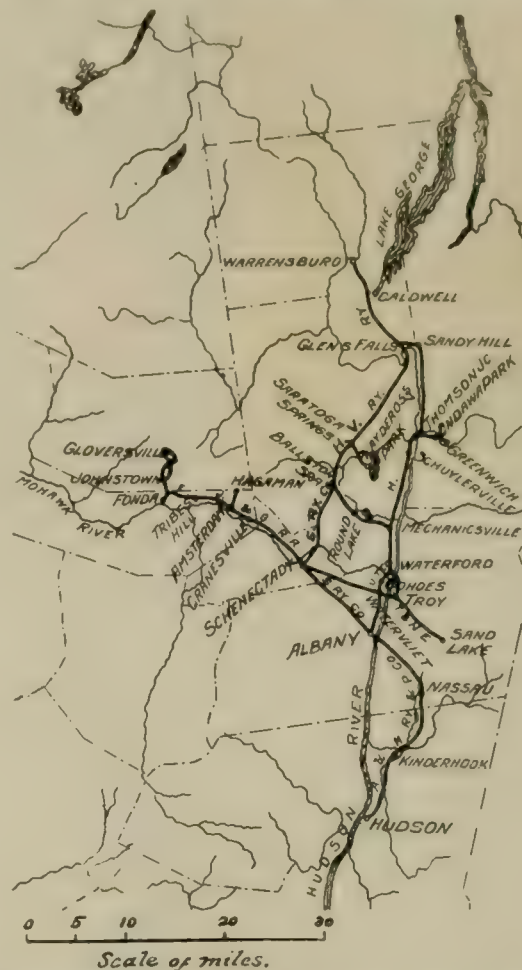
In despatching trains both telephone and telegraph are used. Telephone booths are located at all sidings between regular stations so the train crew may receive orders direct when necessary, though this is not at all frequent, as a large per cent of the orders are delivered through regular operators at stations. An hourly schedule is maintained between terminal points in addition to through limited trains and limited trains from Albany to Electric Park during the afternoon of the summer months. This park which is owned and operated by the railroad company is situated on Kinderhook Lake, 18 miles from both Albany and Hudson, and has since its opening, three years ago, steadily increased in popularity until today it is perhaps one of the best known railway parks of the state. The natural beauty of the original forests covering the elevations overlooking the beautiful Kinderhook Lake alone makes it a most desirable spot for a day's outing. In a large pavilion overlooking the lake an orchestra is stationed throughout the day, and near by, on week days at 3:00 and at 8:30 o'clock p. m., high class vaudeville performances are given in an open air rustic theater seating 1,500 people. In the evening the park and buildings are brilliantly lighted by hundreds of incandescent lamps. Boating is one of the principal attractions, in addition to which the usual park amusements and recreation features are provided.

The officers of the company are: G. G. Blakeslee, second vice president and general manager; J. S. Gillespie, superintendent; A. P. Deeds, auditor and general freight and passenger agent; R. P. Leavitt, electrical superintendent.

THE HUDSON VALLEY RAILWAY SYSTEM.

Inasmuch as a complete description of all the construction and operating features of the Hudson Valley Ry. was published in the Review for April 15, 1902 (page 493) it is not necessary to repeat at this time a detailed account of the property, and attention will be directed to the few changes which have been made since the publication of that article.

Perhaps the most important improvement has been the opening of a new line from Glens Falls to Saratoga Springs. This extension was built with the idea of giving a more direct service between Saratoga and the Lake George region, and, although it has been in operation but a few months, it has become very popular. The company's main line, by way of Fort Edward, Schuylerville and Mechanicsville, gives connection to Saratoga in conjunction with the Ballston branch, but this is a round-about way, and the new air-line



ELECTRIC RAILWAYS IN EASTERN NEW YORK.

Hudson Valley Ry.; United Traction Co., Albany; Albany & Hudson Railroad Co., Schenectady Ry.; Fonda, Johnstown & Gloversville R. R.; Troy & New England Ry.

reduces the schedule time between Glens Falls and Saratoga to an hour and a quarter. The new line is well built and is about 18 miles in length. The Hudson Valley Railway Co. now owns about 125 miles of track, including the main line from Warrensburg into Albany and the loop line from Glens Falls to Mechanicsville by way of Saratoga and Ballston. For the most part the track is laid with 60 or 70-lb. T-rail with gravel-ballasted roadbed.

In 1902 the company was confronted with the question whether to build a large dam on the Hudson River or to secure the necessary power from the Hudson River Water Power Co. The Hudson Valley company secured eight Westinghouse 300-kw. 40-cycle rotary converters for its sub-stations before deciding upon the question of procuring power and eventually, owing to labor troubles, decided to secure power from the Hudson River Water Power Co., but it afterward developed that this company was not able to furnish power required for the railway and this plan was therefore abandoned. The company therefore found itself with

eight complete sub-station outfits but with no available power and it was under these conditions that the flexibility of rotary converters as auxiliary outfits proved of greatest advantage.

The rotary converter at Warrensburg sub-station was belted to a 400-h. p. water wheel and was separately excited from a small 550-volt exciter, making an a. c. and d. c. generator of the machine. The direct current supplies the end of the line near this sub-station while the alternating current is stepped up to 22,000 volts and transmitted $7\frac{1}{2}$ miles to the Lake George sub-station where, by means of transformers and a rotary converter it is changed to 600-volt direct current which feeds that portion of the road. This arrangement has been found very satisfactory and it handles the load easily notwithstanding the traffic is heavy on this part of the road in summer and there are a number of heavy grades on the line.

At the Queensbury power house there was installed an 800-h. p. Allis-Corliss cross-compound engine direct connected to a 525-kw.

generator giving 550-volt direct current. This current operated two 300-kw. rotary converters supplying alternating current to transformers which raise it to 22,000 volts for transmission to two sub-stations, one at Wilton, 11 miles distant, and one at Moses Kill, 14 miles in the opposite direction. A small exciter is belted to the shaft of the rotaries in the Queensbury station which excites the rotary when transforming from direct to alternating current. This is necessary because when a sudden load is thrown on the alternating current side it tends to demagnetize the field and



A. B. COLVIN.

causes the rotaries to run at an excessive speed unless exciting current is furnished to their fields.

At the Saratoga sub-station one of the rotaries is connected to a 500-h. p. engine and this set operates in the same manner as that at the Warrensburg sub-station, the alternating current being carried to Round Lake, a distance of 8 miles, where it is again re-converted. This arrangement of the station apparatus was designed and installed by Mr. J. B. Ingersoll, superintendent of power and lines, of the Hudson Valley Railway Co., and while it was only expected to operate in this way for the present summer the plan has proved so successful as an auxiliary that it will probably not be changed. While it is not claimed that this is the most efficient way of operating the road it points out the advantages of using rotary converters in a water power plant instead of a second set of generators. The company expects, however, to secure power from the Spier Falls power house of the Hudson River Water Power Co. within 60 days.

The rolling stock has been increased by the addition of ten 15-bench open cars and three double truck closed cars. Most of the cars owned by the company were built by the J. M. Jones Sons Co., of Watervliet, and are mounted on Taylor trucks. The Hudson Valley Railway Co. makes a specialty of furnishing chartered parlor and open cars from or to any point on the line at reasonable rates. A special feature of the chartered car service for the past season has been the handling of excursion cars in trains by electric locomotives

ber of cars belonging to one excursion to be moved at one time.

The officers of the company as at present organized are as follows: President, Addison B. Colvin; first vice-president, John W. Herbert; second vice-president, George E. Greene; chairman executive committee, Peter McCarthy; treasurer, Frank L. Cowles; general passenger agent, Hermon E. Smith; secretary and attorney, Joseph A. Kellogg; general counsel, Charles A. Gardiner; superintendent Waterford and Saratoga divisions, John Mahoney; superintendent Glens Falls division, F. W. Kinmouth; superintendent power and lines, J. B. Ingersoll; purchasing agent, J. G. Phillips.

OTHER ROADS.

In reviewing the electric railway lines in the territory tributary to Albany mention should be made of the Troy & New England Ry. and the Ballston Terminal R. R.

The Troy & New England Railway Co. operates about nine miles of track from Albia in the city of Troy southeast to Sand Lake and Averill Park. It has traffic agreement with the United Traction Co. whereby its cars enter the city of Troy. The road is single track with turnouts, laid with 85-lb. T-rail and gravel ballasted. It owns eight closed cars and nine open cars and is operated from a small steam-driven direct-current station near the center of the line. The company also does a small freight and express business. The officers of the company are: President, Edward F. Murray; secretary and treasurer, R. C. Bull; superintendent, C. W. Bentley, all of Troy, N. Y.

The Ballston Terminal Railroad Co. operates about 12 miles of track in and near Ballston Spa. The property has been in the hands of a receiver, but in January of last year the receiver was discharged and the company is now operating the road. Preparations are being made for extending the road to Gloversville and Johnstown.

The company operates two passenger cars, one freight car, five box and four flat cars. The passenger cars are mounted on Brill trucks and are equipped with two 50-h. p. Westinghouse motors, and the freight car with four 50-h. p. motors. The power is generated by a small steam-driven direct-current station equipped with one 350-h. p. Hamilton-Corliss engine. The boiler room, which is 100 x 60 ft., contains two Babcock & Wilcox boilers of 200 h. p. each. The generator is of the Westinghouse make and has a capacity of 205 kw. The company has one car house 60 x 30 ft., and the repair shop is located in this building. This road does considerable express and freight business, the express rates being 25 cents per hundred, with the minimum charge of 10 cents, and a freight rate of 6 cents per hundred, with a minimum charge of 15 cents. The company moves about 300 tons of freight per day, or about 20 carloads, from the Delaware & Hudson Railroad, its actual tonnage for the past year being 88,528. The passenger cars make 100 miles per day, the schedule speed being 15 miles per hour. The total track of the road is 15 miles, including three miles of siding. The regular passenger fare is 5 cents and workmen's tickets are sold 30 for \$1.00, giving a 5-cent ride for 3½ cents. School tickets are also sold in books at the rate of 1 cent per mile.

The company was chartered Mar. 14, 1896, and has an authorized capital stock of \$1,500,000, of which \$300,000 is issued. Its authorized funded debt is \$1,500,000, of which \$385,000 is issued. The officers of the company are: Thomas F. Barrett, president; T. H. Beach, vice-president and general manager; W. S. Waterbury, secretary; J. C. Trask, treasurer, and William Harrison, electrical engineer.

DO AND DO NOT.

Mr. C. H. Coss, resident manager of the Middleboro, Wareham & Buzzards Bay Street Railway Co. has posted sets of "Dos and Don'ts" in the lobby of the car house which have for their object calling the attention of the employees to various matters without the formality of a general order. These various admonitions, to which we shall give the name of "Buzzards Bay Philocophy," were printed on tracing cloth and four print copies, taken which are posted on both sides of the car house, the board being about 18 in. x 48 in. in size and provided with glass covering for both sides.

DO remember that the stockholders of this road invested their money for the purpose of making a profit.

DON'T forget that you are employed to do your share towards making it.

DO make your services so valuable that the company cannot afford to do without them.

DON'T forget that there are others who would be glad of the opportunity.

DO remember that you have the lives and limbs of the public, as well as the property of the company, in your hands at all times when on duty.

DON'T forget that accidents caused by carelessness are crimes.

Convention Programs.

AMERICAN STREET RAILWAY ASSOCIATION.

WEDNESDAY, SEPT. 2, 1903.

Morning: Registration of Delegates.

Afternoon: First Session at 1:00 p. m.

Roll Call.

Address of Welcome, Hon. A. P. Knapp.

President's Address.

Report of Secretary and Treasurer.

Appointment of Committees.

Evening, 8 p. m.: Excursion to Saratoga Lake and Casino as guests of the Hudson Valley Railway Co.

THURSDAY, SEPT. 3, 1903.

Morning: Second Session at 10 a. m.

Afternoon, 1 p. m.: Excursion to Schenectady as guests of the General Electric Co. Lunch will be served on the train or at the company's works.

FRIDAY, SEPT. 4, 1903.

Morning: Third Session at 10 a. m.

Afternoon, 1:00 p. m.: Excursion to Lake George as guests of the Hudson Valley Railway Co., returning at 6:00 p. m.

Evening, 8:00 p. m.: Annual Banquet and installation of officers elect.

The papers to be presented before the association are as follows:

"Steam Turbines," W. L. R. Emmett, General Electric Co.

"Electric Welded Joints," Worcester Consolidated Street Railway Co., by William Pestell, a superintendent of motive power and chief engineer.

"The Evils of Maintenance and Champerty in Personal Injury Cases," Detroit United Ry., by Michael Brennan, attorney.

"Train Orders and Train Signals on Interurban Roads," International Railway Co., of Buffalo, by T. E. Mitten, general manager.

"Freight and Express on Electric Railways," Birmingham Railway, Light & Power Co., by J. B. McClary, manager railway department.

"The Manufacture and Distribution of Alternating Currents for City Systems," Chicago City Ry., by Richard McCulloch, assistant general manager.

"Comparative Merits of Single and Double Truck Cars for City Service," Milwaukee Electric Railway & Light Co.

"The Right of Way," Interurban Street Railway Co., by H. H. Vreeland, president.

STREET RAILWAY ACCOUNTANTS' ASSOCIATION.

WEDNESDAY, SEPT. 2, 1903, 10 A. M.

Annual Address of the President.

Annual Report of the Executive Committee.

Annual Report of the Secretary and Treasurer.

Paper: "Freight and Express Accounts," by Irwin Fullerton, general auditor, Detroit United Railway, Detroit, Mich.

Appointment of Convention Committee on Nominations.

Appointment of Convention Committee on Resolutions.

Replies to questions.

THURSDAY, SEPT. 3, 1903, 10 A. M.

Paper: "Car Maintenance Records," by S. C. Stivers, New Jersey & Hudson River Railway Co., Edgewater, N. J.

Paper or address by a representative of the United States Census Bureau.

Report of the Committee on a Standard Form of Report for Electric Railways. Chairman, William F. Ham, comptroller Washington Railway & Electric Co., Washington, D. C.

Replies to questions.

FRIDAY, SEPT. 4, 1903, 10 A. M.

Paper: "Advantages and Disadvantages of Bag or Envelope System and of the Cashier System of Receiving Conductors' Deposits," by F. R. Henry, auditor St. Louis Transit Co., St. Louis, Mo.

Comparison of the Municipal Tramways Association of Great Britain proposed "Standard Classification and Form of Report" with the American Standard, by C. N. Dally, secretary Chicago City Railway Co., Chicago, Ill., chairman Committee on Standard Classification.

Replies to questions.

Report of Committee on Resolutions.

Report of Committee on Nominations.

Election and Installation of Officers.

Adjournment.

MECHANICAL AND ELECTRICAL ASSOCIATION.

TUESDAY, SEPTEMBER 1st, 10:30 a. m.

Address of Welcome, Hon. Edgar T. Brackett.

President's Address, Thomas Farmer.

Report of Executive Committee.

Report of the Treasurer.

Report of Special Committees.

Appointment of Committee on Nominations.

WEDNESDAY, SEPTEMBER 2d, 10:00 a. m.

Presentation and Discussion of Technical Papers.

THURSDAY, SEPTEMBER 3d, 10:00 a. m.

Presentation and Discussion of Technical Papers.

FRIDAY, SEPTEMBER 4th, 10:00 a. m.

Presentation and Discussion of Technical Papers.

Report of Committee on Nominations.

Election of Officers.

The papers before this association include the following:

"Care and Maintenance of Car Bodies," C. F. Baker, superintendent of motive power and machinery, Boston Elevated Ry., Boston.

"Improvements in Street Car Motors," E. W. Olds, superintendent of rolling stock, Milwaukee Electric Railway & Light Co.

"Type M Control," W. O. Mundy, master mechanic, St. Louis Transit Co.

"Use and Abuse of Controlling Mechanism," D. F. Carver, chief engineer, Public Service Corporation of New Jersey, Newark, N. J.

"Shop Kinks," H. H. Adams, superintendent of shops, United Railways & Electric Co., Baltimore, Md.

"Car Shop Practices," Alfred Green, master mechanic, Rochester Railway Co., Rochester, N. Y.

Messrs. C. C. Lewis, chief engineer of the Schenectady Railway Co., and Herschel A. Benedict, electrical and mechanical engineer of the United Traction Co., of Albany, represent this association upon the local committee.

OFFICERS A. S. R. A.

President—Jere C. Hutchins, president Detroit United Ry., Detroit, Mich.

First Vice-President—W. Caryl Ely, president International Railway Co., Buffalo, N. Y.

Second Vice-President—W. Kesley Schoepf, president Cincinnati Fraction Co., Cincinnati, O.

Third Vice-President—P. S. Arkwright, president Georgia Railway & Electric Co., Atlanta, Ga.

Secretary and Treasurer—T. C. Penington, treasurer Chicago City Railway Co., Chicago, Ill.

Executive Committee—The president, the vice presidents and

H. H. Vreeland, president Interurban Street Railway Co., New York, N. Y.

R. T. Laffin, general manager Worcester Street Railway Co., Worcester, Mass.

Andrew Radcl, vice-president Middlesex & Somerset Traction Co., Bridgeport, Conn.

Walter P. Read, vice-president Consolidated Railway & Power Co., Salt Lake City, Utah.

F. J. Nicholl, vice-president and general manager Rochester Railway Co., Rochester, N. Y.

Officers and Executive Committee of the American Street Railway Association.



W. CARYL ELY,
First Vice-President



J. C. HUTCHINS,
President



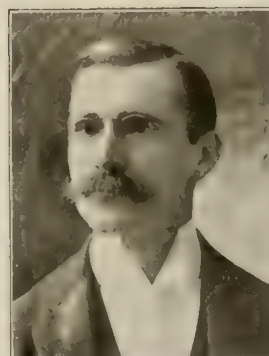
W. KESLEY SCHOEFF,
Second Vice-President



F. S. ARKWRIGHT,
Third Vice-President



H. H. VREELAND



R. T. LAFFIN



T. C. PENINGTON,
Secretary and Treasurer



A. D. A. RADCLIFF



T. J. NICHOLL



W. P. READ

OFFICERS OF THE STREET RAILWAY ACCOUNTANTS' ASSOCIATION OF AMERICA.



IRWIN FULLERTON
First Vice-President



HENRY J. DAVIES.
President.



D. DANA BARTLETT,
Second Vice-President



J. B. HOGARTH,
Third Vice-President.



W. B. BROCKWAY,
Secretary and Treasurer.



H. C. MACKAY



O. M. HOFFMAN.



E. M. WHITE.



J. J. MAGILTON

The Accountants' Association was organized at Cleveland, Ohio, March 23, 1897. The presiding officers at the several conventions have been: Morris W. Hall, (chairman); C. N. Duffy, (vice president); H. L. Wilson, J. F. Calderwood, C. D. Duffy, W. F. Ham, and H. C. Mackay. The Saratoga convention will be the seventh regular annual meeting.

The present officers are:

President—Henry J. Davies, secretary Cleveland Electric Railway Co., Cleveland, O.

First Vice-President—Irwin Fullerton, general auditor Detroit United Ry., Detroit, Mich.

Second Vice-President—D. Dana Bartlett, general auditor Boston & Northern Railroad Co., Boston, Mass.

Third Vice President—J. B. Hogarth, auditor Denver City Tramway Co., Denver, Col.

Secretary and Treasurer—W. B. Brockway, 40 Morris St., Yonkers, N. Y.; consulting accountant Birmingham Railway, Light & Power Co., Birmingham, Ala.

Executive Committee—The officers and—

H. C. Mackay, comptroller Milwaukee Electric Railway & Light Co., Milwaukee, Wis.

O. M. Hoffman, treasurer Conestoga Traction Co., Lancaster, Pa.
Elmer M. White, cashier Hartford Street Railway Co., Hartford, Conn.

John J. Magilton, assistant treasurer Schenectady Railway Co., Schenectady, N. Y.

OFFICERS OF THE AMERICAN RAILWAY MECHANICAL AND ELECTRICAL ASSOCIATION.



E. W. OLDS.
First Vice-President.



THOMAS FARMER,
President.



ALFRED GREEN.
Second Vice-President.



C. F. BAKER.
Third Vice-President.



WALTER MOWER.
Secretary and Treasurer.



W. O. MUNDY.



T. J. MULLEN.



H. H. ADAMS.



D. F. CARVER.

The American Railway Mechanical and Electrical Association owes its inception to the meeting of heads of mechanical and electrical departments held at Detroit during the last A. S. R. A. Convention, called by Mr. Farmer. The formal organization was completed at Cleveland, Ohio, Feb. 15, 1903. The meeting at Saratoga will be the first convention of the association, which now has 79 members.

The officers of the association are:

President—Thomas Farmer, Detroit, Mich.

First Vice-President—E. W. Olds, superintendent rolling stock Milwaukee Electric Railway & Light Co., Milwaukee, Wis.

Second Vice-President—Alfred Green, master mechanic Rochester Railway Co., Rochester, N. Y.

Third Vice-President—C. F. Baker, superintendent motive power and machinery Boston Elevated Railway Co., Boston, Mass.

Secretary and Treasurer—Walter Mower, Detroit United Ry., 12 Woodward Ave., Detroit, Mich.

Executive Committee—The officers and

W. O. Mundy, master mechanic St. Louis Transit Co., St. Louis, Mo.

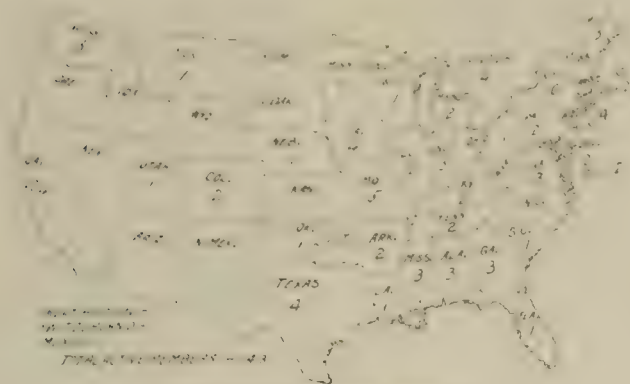
T. J. Mullen, master mechanic Scranton Railway Co., Scranton, Pa.

H. H. Adams, superintendent of shops United Railways & Electric Co., Baltimore, Md.

D. F. Carver, chief engineer railway department Public Service Corporation of New Jersey, Newark, N. J.

STREET RAILWAY ACCOUNTANTS' ASSOCIATION.

A meeting of the Association of the public utility accountants of the Street Railway Accountants' Association was held at the Street Railway Accountants' Association, New York City, on November 12, 1903. Since that date there have been added to the list of members of the association, making a total of 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100, 101, 102, 103, 104, 105, 106, 107, 108, 109, 110, 111, 112, 113, 114, 115, 116, 117, 118, 119, 120, 121, 122, 123, 124, 125, 126, 127, 128, 129, 130, 131, 132, 133, 134, 135, 136, 137, 138, 139, 140, 141, 142, 143, 144, 145, 146, 147, 148, 149, 150, 151, 152, 153, 154, 155, 156, 157, 158, 159, 160, 161, 162, 163, 164, 165, 166, 167, 168, 169, 170, 171, 172, 173, 174, 175, 176, 177, 178, 179, 180, 181, 182, 183, 184, 185, 186, 187, 188, 189, 190, 191, 192, 193, 194, 195, 196, 197, 198, 199, 200, 201, 202, 203, 204, 205, 206, 207, 208, 209, 210, 211, 212, 213, 214, 215, 216, 217, 218, 219, 220, 221, 222, 223, 224, 225, 226, 227, 228, 229, 230, 231, 232, 233, 234, 235, 236, 237, 238, 239, 240, 241, 242, 243, 244, 245, 246, 247, 248, 249, 250, 251, 252, 253, 254, 255, 256, 257, 258, 259, 260, 261, 262, 263, 264, 265, 266, 267, 268, 269, 270, 271, 272, 273, 274, 275, 276, 277, 278, 279, 280, 281, 282, 283, 284, 285, 286, 287, 288, 289, 290, 291, 292, 293, 294, 295, 296, 297, 298, 299, 300, 301, 302, 303, 304, 305, 306, 307, 308, 309, 310, 311, 312, 313, 314, 315, 316, 317, 318, 319, 320, 321, 322, 323, 324, 325, 326, 327, 328, 329, 330, 331, 332, 333, 334, 335, 336, 337, 338, 339, 340, 341, 342, 343, 344, 345, 346, 347, 348, 349, 350, 351, 352, 353, 354, 355, 356, 357, 358, 359, 360, 361, 362, 363, 364, 365, 366, 367, 368, 369, 370, 371, 372, 373, 374, 375, 376, 377, 378, 379, 380, 381, 382, 383, 384, 385, 386, 387, 388, 389, 390, 391, 392, 393, 394, 395, 396, 397, 398, 399, 400, 401, 402, 403, 404, 405, 406, 407, 408, 409, 410, 411, 412, 413, 414, 415, 416, 417, 418, 419, 420, 421, 422, 423, 424, 425, 426, 427, 428, 429, 430, 431, 432, 433, 434, 435, 436, 437, 438, 439, 440, 441, 442, 443, 444, 445, 446, 447, 448, 449, 450, 451, 452, 453, 454, 455, 456, 457, 458, 459, 460, 461, 462, 463, 464, 465, 466, 467, 468, 469, 470, 471, 472, 473, 474, 475, 476, 477, 478, 479, 480, 481, 482, 483, 484, 485, 486, 487, 488, 489, 490, 491, 492, 493, 494, 495, 496, 497, 498, 499, 500, 501, 502, 503, 504, 505, 506, 507, 508, 509, 510, 511, 512, 513, 514, 515, 516, 517, 518, 519, 520, 521, 522, 523, 524, 525, 526, 527, 528, 529, 530, 531, 532, 533, 534, 535, 536, 537, 538, 539, 540, 541, 542, 543, 544, 545, 546, 547, 548, 549, 550, 551, 552, 553, 554, 555, 556, 557, 558, 559, 560, 561, 562, 563, 564, 565, 566, 567, 568, 569, 570, 571, 572, 573, 574, 575, 576, 577, 578, 579, 580, 581, 582, 583, 584, 585, 586, 587, 588, 589, 590, 591, 592, 593, 594, 595, 596, 597, 598, 599, 600, 601, 602, 603, 604, 605, 606, 607, 608, 609, 610, 611, 612, 613, 614, 615, 616, 617, 618, 619, 620, 621, 622, 623, 624, 625, 626, 627, 628, 629, 630, 631, 632, 633, 634, 635, 636, 637, 638, 639, 640, 641, 642, 643, 644, 645, 646, 647, 648, 649, 650, 651, 652, 653, 654, 655, 656, 657, 658, 659, 660, 661, 662, 663, 664, 665, 666, 667, 668, 669, 670, 671, 672, 673, 674, 675, 676, 677, 678, 679, 680, 681, 682, 683, 684, 685, 686, 687, 688, 689, 690, 691, 692, 693, 694, 695, 696, 697, 698, 699, 700, 701, 702, 703, 704, 705, 706, 707, 708, 709, 710, 711, 712, 713, 714, 715, 716, 717, 718, 719, 720, 721, 722, 723, 724, 725, 726, 727, 728, 729, 730, 731, 732, 733, 734, 735, 736, 737, 738, 739, 740, 741, 742, 743, 744, 745, 746, 747, 748, 749, 750, 751, 752, 753, 754, 755, 756, 757, 758, 759, 760, 761, 762, 763, 764, 765, 766, 767, 768, 769, 770, 771, 772, 773, 774, 775, 776, 777, 778, 779, 780, 781, 782, 783, 784, 785, 786, 787, 788, 789, 790, 791, 792, 793, 794, 795, 796, 797, 798, 799, 800, 801, 802, 803, 804, 805, 806, 807, 808, 809, 810, 811, 812, 813, 814, 815, 816, 817, 818, 819, 820, 821, 822, 823, 824, 825, 826, 827, 828, 829, 830, 831, 832, 833, 834, 835, 836, 837, 838, 839, 840, 841, 842, 843, 844, 845, 846, 847, 848, 849, 850, 851, 852, 853, 854, 855, 856, 857, 858, 859, 860, 861, 862, 863, 864, 865, 866, 867, 868, 869, 870, 871, 872, 873, 874, 875, 876, 877, 878, 879, 880, 881, 882, 883, 884, 885, 886, 887, 888, 889, 890, 891, 892, 893, 894, 895, 896, 897, 898, 899, 900, 901, 902, 903, 904, 905, 906, 907, 908, 909, 910, 911, 912, 913, 914, 915, 916, 917, 918, 919, 920, 921, 922, 923, 924, 925, 926, 927, 928, 929, 930, 931, 932, 933, 934, 935, 936, 937, 938, 939, 940, 941, 942, 943, 944, 945, 946, 947, 948, 949, 950, 951, 952, 953, 954, 955, 956, 957, 958, 959, 960, 961, 962, 963, 964, 965, 966, 967, 968, 969, 970, 971, 972, 973, 974, 975, 976, 977, 978, 979, 980, 981, 982, 983, 984, 985, 986, 987, 988, 989, 990, 991, 992, 993, 994, 995, 996, 997, 998, 999, 1000.



WHERE THE ACCOUNTANTS ARE.

Census Bureau has also followed the suggestion of the association in the forms adopted by it for compiling data for the census.

The accompanying outline map shows the geographical location of the active members of the Accountants' Association, and the following list gives the new members since the Detroit meeting.

Nashville Railway & Light Co., Nashville, Tenn.
 Santa Barbara Consolidated Ry., Santa Barbara, Cal.
 Cleveland & Southwestern Traction Co., Cleveland, O.
 Hoosac Valley Street Railway Co., North Adams, Mass.
 Evansville Electric Ry., Evansville, Ind.
 Geneva Electric Tramways Co., Geneva, Switzerland.
 Asheville Electric Co., Asheville, N. C.
 Beaumont Street Ry., Beaumont, Tex.
 Monterey & Pacific Grove Ry., Monterey, Cal.
 Metropolitan Ry., Oklahoma City, Okla.
 Pittsburg, McKeesport & Connellsville Ry., Pittsburg, Pa.
 Little Rock Railway & Electric Co., Little Rock, Ark.
 Spokane Traction Co., Spokane, Wash.
 Stark Electric Ry., Alliance, O.
 Columbus, London & Springfield Ry., Columbus, O.
 Conneaut & Erie Traction Co., Girard, Pa.
 Sheffield Co., Sheffield, Ala.
 Cedar Rapids & Iowa City Railway & Light Co., Cedar Rapids, Ia.
 Northern Illinois Electric Ry., Dixon, Ill.
 Sanford & Cape Porpoise Ry., Sanford, Me.
 De Kalb & Sycamore Electric Co., De Kalb, Ill.

The Pittsburg, McKeesport & Greensburg Street Railway Co. decided to abandon the artificial lake in Oakford Park, near Greensburg, Pa., the retaining wall of which gave way July 5th, causing great loss of life and damage to property, and mention of which was made in the "Review" for July. The wrecked bridges have been rebuilt, the lighter buildings placed on the hillside and the theater reconstructed. The inquest held after the accident resulted in releasing the company of all responsibility.

NEW PUBLICATIONS.

THE CHICAGO LIBRARY CIRCULAR LIBRARY CATALOGUE—A supplement, corrected to April, 1903, to the "List of Serials in Publication of Chicago and Eastern Illinois" published in 1900. The original list. Price, postpaid, 20 cents. The "List of Serials," which was published in 1901, by the Chicago Library Club, contains 195 pages and 6,640 titles. The price, postpaid, is \$1.00.

MANUAL FOR ENGINEERS—Compiled by Charles E. Harris, B. S., professor of mechanical engineering, University of Tennessee. Third edition. Vest-pocket size, 3 x 6 in., 224 pages, gilt edges; flexible covers. The publisher states that the primary object in publishing this manual is to bring directly to the attention of the men of affairs of the South the value of technical training. Aside from a small amount of matter about the engineering departments of the University, it contains useful tables and much other data for engineers and business men, conveniently indexed. There have been many demands for the book from every part of the world. Published by the University of Tennessee Press, Knoxville, Tenn. Price 50 cents.

DUNCAN'S MANUAL of Tramways, Omnibuses & Electric Railways of the United Kingdom and the Foreign and Colonial Companies that are Registered in England. 20th Edition, for the year ending Dec. 31, 1902. 564 + xx pages, 6 x 7 in., cloth boards. This volume shows the dates of incorporation and, where fixed and ascertainable, the dates at which leases and concessions terminate, with abstracts of accounts. It also contains a directory of directors, officials, firms and individuals connected with the roads named and an extract of the tramways act and by-laws of the Board of Trade Metropolitan Municipal Authority in reference to working tramways. Published by T. J. Whiting & Sons, Ltd., London. Price 5 shillings.

AMERICAN RAILWAY ENGINEERING AND MAINTENANCE OF WAY ASSOCIATION BULLETIN NO. 41, for July, 1903. 78 pages, 6 x 9 in. Published under direction of the committee on publications. Contents: Structural Steel; Reaming; Unit Strains—A Compilation of Data and Discussion of Current Tendencies and Practice. Prepared by the committee on iron and steel structures, J. P. Snow, bridge engineer Boston & Maine R. R., chairman. The appendix contains specifications for material and workmanship for steel structures; also questions propounded by the committee on signaling and interlocking. Accompanying Bulletin No. 41 is Circular No. 40 containing questions to which answers are desired by the committee, relating to manually operated block signaling, manually operated telegraphic block system and manually operated electrically controlled block signals. These publications may be obtained by addressing the secretary, 1562 Monadnock Block, Chicago.

METROPOLITAN WEST SIDE ELEVATED RAILWAY OF CHICAGO—By a stockholder. This is a 23-page pamphlet, 5 x 7 1/2 in., showing what the system consists of, its earning capacity under present conditions, and its future earning power when contemplated improvements, including the new downtown terminal and interurban connections, are completed. It also points out how the capacity of the Union loop may be increased by a consolidation of the roads using it, for the purpose of governing its control. Diagrams show the location of the Metropolitan's lines, the growth of daily average fares by years, receipts for one day at loop stations, Chicago's growth in population in 60 years, and the increase in population in 10 years in the territory covered by the road. Tables show the financial condition for the year ending Mar. 1, 1903, and the range of prices of common and preferred stock from and including January, 1900, to July, 1903. Published by J. Willis Horton, Chicago Stock Exchange.

HOOSAC VALLEY STREET RAILWAY CO.

The Hoosac Valley Street Railway Co. is building a branch from North Adams to Adams, Mass., a distance of 6 miles, of which 2 1/2 miles is completed. The company has purchased 12 cars, both open and closed, for this branch, 10 of the Wason Manufacturing Co. and 2 of J. M. Jones' Sons. The capacity of the power house has been increased by the addition of a 250-kw. unit. The company recently removed its general office to Room 205 Dowlin Building, North Adams, Mass.

CHICAGO FRANCHISES.

A brief resume of the developments regarding Chicago street railway franchises is as follows:

July 17th the superintendent of streets of the city notified the receivers of the Chicago Union Traction Co. that all permits to make repairs to its property in the streets of Chicago would be revoked on July 30, 1903. The following day the receivers asked for an injunction restraining the city and all its officers, agents and employees, including its police force, from in any way interfering with the receivers in the peaceful and exclusive possession and operation of the railway property, and from doing any act tending to ultimately impair or terminate the present possession and use by the receivers. A temporary injunction was granted July 18th pending a hearing to be held July 27th. July 20th John S. Miller, special counsel representing the court, arranged a truce with the city and the hearing for injunction was postponed until Nov. 30, 1903, and the city council passed a resolution embodying the terms of this agreement, and stipulating that any new permits issued by the city to the Union Traction Co. should contain provisions that they are issued without any acquiescence by the city in the claims of the receivers that the latter are entitled to them by virtue of the 99-year act. On the same day the Chicago City Ry. was by ordinance given an extension of its rights until Nov. 30, 1903.

July 23d the stockholders' committees of the Union Traction and subsidiary companies announced the plan for a reorganization, providing for a reformation of the lease agreements made in 1899 and for scaling the guaranteed rentals on the North Chicago and West Chicago roads from 12 per cent to 8 per cent on the former and from 6 per cent to 4 per cent on the latter, these smaller percentages being preferential cumulative charges. After five years the dividends on the underlying stock will be increased to the present figures of 12 and 6 per cent respectively if warranted by the earnings of the lessee company. The 8 and 4 per cent, however, will, at the end of five years, become fixed charges the default in which is to work a forfeiture of the guarantee fund now held in trust to secure the performance of the lease. Meetings of the stockholders were called for August 18th to pass upon these plans. The United States Circuit Court appointed a special master in chancery to attend these stockholders' meetings on behalf of the court.

Some opposition on the part of the minority stockholders having been threatened, the intervention of friendly stockholders to raise the same questions was arranged for and petitions covering the various points at issue were presented to the court July 29th.

August 5th the hearing on the petition of Ernest Hanke and Peter Sherman for a receiver for the Union Traction Co. by the Cook Superior court was postponed until September 8th.

August 12th two bills were filed in the Cook Superior Court, one by Adolph Mason and Max Kollinger against the West Chicago Street Railroad Co., and one by W. K. Fifield against the North Chicago Street Railroad Co., asking for appointment of receivers by the state court to protect underlying creditors of the company. These suits, it is understood, are not in opposition to the receiver ship in the Federal court but are precautionary measures merely.

Saturday, August 15th, on the representation that certain minority stockholders were planning to have the stockholders meetings called for August 18th enjoined by the state courts, Judge Grosscup issued temporary restraining orders in each of the three receiverships. These injunctions were directed against J. J. Townsend, certain other stockholders by name, all other stockholders, and the attorneys of the firm of Moran, Mayer & Meyer, restraining them from in any way interfering with the stockholders meetings called for August 18th, and from instituting or prosecuting any litigation except in the United States Circuit Court. These orders were entered about 4 p. m., and the hearing set for Monday at 10 a. m.

On the same day, at 7 p. m. two bills in equity were filed in the Circuit Court of Cook County, on behalf of Townsend and others; one bill was against the Union Traction and North Chicago companies, the Illinois Trust & Savings Bank, Trustee; Jno. P. Wilson, who made the temporary agreement of 1899 in equity, and members of the stockholders protective committees; and the other bill was against the Union Traction and West Chicago companies, the same Wilson and others. The first bill alleged that the meeting set for August 18th was illegal, and that the North and West Chicago roads could not be operated as franchises could not be legally sold, and that the stock and the companies be enjoined from

voting the trust stock, that Wilson be enjoined from surrendering the contract in his hands, that the companies be enjoined from altering the existing leases, and that a receiver be appointed for the trust stock.

August 16th Judge Grosscup entered a rule citing Townsend and the others against whom injunctions had been issued Saturday to show cause why they should not be punished for contempt in filing the bills in the state court.

The contempt matter was heard August 17th, but it appearing that the state proceedings were commenced before service had been had by the federal authorities, the defendants were purged of contempt.

After extended argument the temporary injunction of the 15th against interference with the stockholders meetings was continued, the defendants taking an appeal. In the course of this argument the attorneys for the receivers alleged that the Townsend interests had offered to drop their threatened litigation upon payment of \$100,000; and the attorneys for Townsend alleged that the offers to settle had come from the other side. The court investigated this matter on the 18th, when the attorneys on both sides testified that John C. Spry, who had been the medium through which the negotiations had been first conducted, had represented to each party that he acted as the agent of the other. The court characterized the action of the attorneys for the receivers in taking part in such negotiations as unwise, but excused it because they believed that it was a case of "hold-up," and that the majority stockholders could better afford to buy their peace than to have the reorganization delayed by the litigation that was threatened.

On the afternoon of the 18th the stockholders of the North Chicago and the West Chicago companies ratified the proposed changes in the Union Traction leases by overwhelming majorities, the Union Traction stockholders having taken similar action that morning. At both of the afternoon meetings the minority stockholders (2,000 shares in West Chicago and 132 shares in North Chicago) made formal protests pending an appeal from Judge Grosscup's injunction.



IS AN INTERURBAN AN ADDITIONAL BURDEN ON THE FEE?

An important suit has been instituted by Mrs. Lottie A. Kmsey, of Indianapolis, against the Indianapolis Traction & Terminal Co., the Indiana Union Traction Co. and the two companies which recently merged and leased their properties to the Indiana Union Traction Co. (Indianapolis Northern Traction Co. and Union Traction Co. of Indiana). The plaintiff is the owner of residence property on College Ave. in which street the interurban lines entering Indianapolis have been granted franchises, and it is alleged that the operation of electric cars jars the house and raises so much dust and makes so much noise as to constitute a nuisance. Damages in the sum of \$2,000 are asked on the ground that the interurban electric railway is not a street railway but a commercial railroad which imposes an additional burden on the fee of abutting property. A state statute of Indiana requires that street railways operating in cities of the first class, of which Indianapolis is one, shall sell 25 tickets for \$1.00 or six for 25 cents, and shall issue transfers and this, it is alleged, the interurban lines have refused heretofore to do.



ST. LOUIS TRANSIT CO. RENTS POWER.

The St. Louis Transit Co. has contracted with the Union Electric Light & Power Co. for the surplus power which will be required to carry the heavy load during the World's Fair next summer. The company's power houses are capable of supplying about 29,000 kw. at present and 9,000 kw. will be supplied from the new plant which is now being built by the Union Electric Light & Power Co. The St. Louis Transit Co. had planned to build a new station to supply this extra power but this idea was abandoned owing to the shortness of the time available and the high price of material and labor previous to the World's Fair, and two 5,000-kw. Curtis steam turbines and 6,000-volt three phase General Electric generators as well as 24 600-h. p. Stirling boiler which had been ordered for the proposed station have been purchased by the Union Electric Light & Power Co. for its new plant.

OKLAHOMA TRACTION AND METROPOLITAN RAILWAY COMPANIES.

The Oklahoma Traction Co., of Guthrie, Okla., which is capitalized at \$1,000,000, is building an electric interurban line 30 miles long between Guthrie and Oklahoma City, and a 6-mile city system in Guthrie. The contract for the electrical equipment of the entire system was recently awarded to the Knox Engineering Co., of Chicago, while the construction work is being done by the Metropolitan Construction Co., which was organized a short time ago by the interests which control the Oklahoma Traction Co. and the Metropolitan Railway Co., of Oklahoma City. It is probable that these two traction companies will be consolidated in time. The city system in Guthrie will be in operation before the end of this year, but it is not expected that the interurban line will be completed inside of 12 months. The interurban will pass through Edmond, which is midway between Guthrie and Oklahoma City, and will also serve the villages of Waterloo, Seward and Britton. It will run through a section that abounds in gardens and orchards, so it is planned to carry express matter and light freight, as well as passengers. In anticipation of the advent of the road farms which are normally 160 acres in extent are rapidly being broken up and an unusual building boom is setting in. The road will run through a hilly country and a maximum grade of 76 ft. to the mile has been adopted. In the cities, however, the grade has been held down to 48 ft., and ultimately all grades can be reduced. Entrance into the cities will be over the company's private right of way, and in a distance of 2½ miles in Oklahoma City only 1,800 ft. of city streets will be traversed, while in entering Guthrie cars will run on 1,100 ft. of streets only. Guthrie has about 18,000 population; Edmond, 2,200, and Oklahoma City, 35,000. John W. Shartel is president of the Oklahoma Traction Co., and M. L. Spitler is secretary and treasurer, both of Oklahoma City. These and Anton H. Classen, George S. Green and U. C. Guss, of Guthrie, are the directors.

The Metropolitan Railway Co., of Oklahoma City, is building 11 miles of new track, for which the Knox Engineering Co., which equipped the present system, has also been awarded the contract for electrical equipment. The grading and track construction are being done by the company's own forces. This company already operates on 7½ miles of track, of which a little over 1 mile is double, and it is proposed to increase the double track to 3 miles this season. There are now in service eight vestibuled, closed cars, with 20-ft. bodies and Westinghouse 12-A equipments, and four 10-bench open cars similarly equipped; there have been ordered for immediate delivery 16 more cars, 8 open and 8 closed, of like style and equipment. The road is operated along standard lines and, there being no grades of consequence, rapid schedules are maintained.

Following is a statement of operating statistics from Feb. 11, 1903, when the road began operating, to August 1st (July estimated), based on operating 6.7 miles of track with 7 cars in service: Gross receipts, \$29,456; operating expenses, \$13,989; net earnings, \$15,467; deductions, taxes and interest, \$4,500; net income, \$10,967. The Metropolitan Railway Co. has a capital of \$500,000. Its officers are as follows: President, Anton H. Classen; vice-president, E. H. Cooke; secretary, John W. Shartel; treasurer, George H. Brauer. These and S. T. Alton comprise the board of directors.

LINE COMPLETED BETWEEN NEW YORK AND NEW HAVEN.

The extension of the New York & Stamford Railway Co.'s system from Greenwich to Stamford, Conn., is completed and cars are now making regular trips between Stamford and New Rochelle, N. Y. This is the last link in the direct line of trolley between New York and New Haven, and with the exception of a short stretch now being built by the Wallingford Tramway Co., outside of Meriden, completes the line between New York and Boston.

BRIDGE AT KANSAS CITY DESTROYED.

August 17th the James street bridge at Kansas City was swept away by the rising of the river Kaw and street railway communication between the two Kansas Cities was again cut off. This was a temporary pin bridge built after the June flood swept away the old bridge.

CEDAR RAPIDS-IOWA CITY RY.

The Cedar Rapids, Iowa City & Southern Ry., of Cedar Rapids, Ia., which is constructing an electric interurban line between Cedar Rapids and Iowa City, and which was mentioned in the "Review" for July, will receive power for the operation of its system from the Cedar Rapids Railway, Light & Power Co. There will be three sub-stations, one being at the power plant. Current will be generated at 2,200 volts, 60 cycles, and will be transmitted at that pressure to outside the city limits to a transforming station, where it will be stepped up to 15,000 volts, and three phase by a Scott transformer for sub-stations 2 and 3.

The company purposes to do a regular freight business in addition to passenger and express traffic, and will employ electric locomotives equipped with four 75-h. p. motors. The passenger cars will be combination passenger, smoking and baggage cars weighing about 60,000 lb. each, and each will be equipped with four 50-h. p. motors. The contract for electrical machinery and motor equipment has been awarded to the Westinghouse Electric & Manufacturing Co. The company has also contracted with the Buckeye Engine Co. for one 18¾ and 36 x 33-in. cross compound engine, and a contract was given to the American Bridge Co. for the steel bridges to be constructed along the line. The Chicago Engineering & Constructing Co. (formerly Weston Brothers) is consulting engineer for this road.

HALF FARES.

The Buffalo, Dunkirk & Western Railroad Co., which is building one of the connecting links between Buffalo and Cleveland, will establish a summer resort on Lake Erie at Angola, N. Y., where William J. Conners, president of the road, has a 350-acre farm which will be used for the purpose.

The Helena Light & Traction Co.'s new power house at Helena, Mont., will be equipped by the Westinghouse Electric & Manufacturing Co. with two 75-kw. direct current generators direct coupled to a 100-h. p. type C induction motor; two 15-h. p. motor generator sets; nine 10,000-volt transformers, and two 175-kw. rotary converters.

On July 15th the corporation counsel of Jersey City filed papers in suits instituted by the Mayor of that city to recover from the Jersey City & Bergen Railroad Co., the Consolidated Traction Co., and the North Jersey Street Railway Co., a license fee of \$10 a year for each car used on each line since 1868, at which time the companies refused to pay this fee longer on the ground that they were exempt under a law passed by the Legislature in that year. It is stated that the fees in question will amount to about \$250,000. The companies were given 30 days in which to answer.

The stockholders of the Lancaster (Pa.) County Railway & Light Co., at their annual meeting at Camden, N. J., July 21st, voted to increase the board of directors to 15, and to create the office of vice-president and invest him with the powers and authority of a comptroller. Ten directors were re-elected as follows: Samuel R. Shipley, William B. Given, P. B. Shaw, W. W. Griest, John Hertzler, P. Eckhart Slaymaker, J. W. B. Bausman, R. H. Brubaker, Charles B. Keller and Lindley B. Morrison, of New Jersey. The new directors elected are: H. L. Trout, H. K. Myers, J. Fred Sener, of Lancaster; James Brown, of Philadelphia, and H. C. Shock, of Mt. Joy, Pa.

We have received from J. W. Butler, excursion manager of the Cleveland Electric Railway Co., samples of excellent advertising matter recently issued to advertise "City Touring Car 400," which makes six two-hour descriptive tours daily "in, around and about" Cleveland. One form is a card 3 x 7½ in., orange on one side and green on the other, one side detailing the trips and the other showing the cost (25 cents) and time of starting. Another excellent advertisement is a white blotter, 3½ x 6¼ in., with green lettering. A new route was recently added to the touring car's itinerary, taking in, among other places, the Cleveland Driving Park, Collinwood, Windermere, Rockefeller's summer home, Garfield's tomb, Wade Park and Euclid Ave.

PERSONAL.

MR. JOHN GLIDDEN has resigned as manager of the Syracuse & De Kalb Electric Railway Co., of Syracuse, Ill.

MR. A. M. NIPPER, of Atlanta, Ga., has been appointed general superintendent of the Hannibal (Mo.) Railway & Electric Co.

MR. WILLIAM R. MORRISON, formerly assistant manager of the Bay Cities Consolidated Railway Co., is now superintendent of the Wichita (Kan.) Railroad & Light Co.

MR. H. P. BRADFORD, managing director of the Compagnie Genevoise des Tramways Electriques, Geneva, Switzerland, left about August 1st for an extended business trip in Siberia.

MR. ARTHUR BROWN, superintendent of the northeastern division of the Detroit United Ry., with headquarters in Pontiac, has been appointed general motor inspector of the company's entire system.

MR. W. J. JONES has resigned as treasurer and manager of the Berlin Street Ry., of Berlin, N. H., to take effect September 1st. He will take a much needed vacation of a month before taking up railway work again.

DR. H. B. ROCKWELL, who has contributed for this issue a very interesting paper on the subject of claim adjusting, is the general manager of the Electric Railway Pool, with offices at 89 State St., Boston. Dr. Rockwell is a graduate of Williams College and he took his medical degree from the University of Pennsylvania. He practiced medicine in Philadelphia some ten or twelve years and during the last eight years he has given his entire time and attention to the adjusting of accidents for street railways. He is widely known among street railway men as an expert adjuster and his knowledge of medicine and surgery, together with his genial and jovial disposition, peculiarly well adapt him to the difficult work of adjusting claims. The high degree of success that he has attained is due largely to his personal magnetism and to his close attention to the details of his work.



DR. H. B. ROCKWELL.

MR. B. R. STEPHENS, auditor of the Fort Wayne & Southwestern Traction Co., has resigned to go into other business. He was formerly purchasing agent, and later superintendent, of the Clover Leaf railroad.

MR. NEAL A. COLLINGE, formerly paymaster of the Rapid Railway System, of Detroit, has become auditor of the road, vice Mr. H. S. Swift, resigned. Mr. Collinge went to Detroit from Port Huron, Mich., in 1900.

MR. W. W. CRAWFORD resigned as superintendent of transportation of the Aurora, Elgin & Chicago Railway Co., to go with the Lake Shore Electric Railway Co., of Cleveland. The resignation became effective August 15th.

MR. WILLIAM JENNINGS has been appointed acting superintendent of power department for the Los Angeles Railway Co., vice Mr. James R. Atchison, resigned. Mr. Jennings is mechanical superintendent of the Pacific Electric Railway Co.'s lines.

MR. E. W. CHANDLER has been appointed superintendent of construction for the Joliet, Plainfield & Aurora Railroad Co. He was formerly purchasing agent of the Columbus, Delaware & Marion Electric Railroad Co., with headquarters at Delaware, O.

MR. CHARLES F. CLAY, a prominent business man of Napoleon, O., is a director of the People's Rapid Transit Railway Co., of Toledo, which is building an electric interurban system between Toledo and Cincinnati, as outlined in the "Review" for June, 1903.

MR. JOHN BENHAM has been elected vice-president of the International Register Co., of Chicago. He was for several years vice-president and general manager of the Consumers' Ice Co., also of Chicago, which was recently purchased by the Knickerbocker Ice Co.

MR. ERNEST GONZENBACH, formerly electrical engineer of the Albany & Hudson River Railroad Co. and later of the Aurora, Elgin & Chicago Ry., has been appointed electrical engineer of the

Youngstown & Southern Ry., connecting Youngstown and East Liverpool, Ohio.

MR. E. H. SYMINGTON, formerly connected with the T. H. Symington Co., of Baltimore, is now associated with the Railway Appliances Co., of Chicago and New York, as manager of the Symington journal box and dust guard, the Railway Appliances Co. being agent for the Chicago territory.

MR. CALVIN W. RICE, of the Nernst Lamp Co., of Pittsburg, has announced his resignation, which is much regretted by all of his business associates. Mr. Rice has been second vice-president of this company since May, 1902, and later added the duties of sales manager to those he previously had.

MR. F. L. DAME, for the past two years general manager of the Union Electric Co., Dubuque, Ia., has accepted the position of engineer of the Local Companies' Committee of the General Electric Co. Mr. Dame assumed his new duties with headquarters at Schenectady, N. Y., about the middle of August.

THE CENTRAL PENNSYLVANIA TRACTION CO., which was organized and began operations July 1st, has elected officers as follows: President, Mr. F. B. Musser; vice-president, Mr. B. F. Meyers; secretary and treasurer, Mr. W. J. Calder. The company was organized to operate the Harrisburg Traction Co., and all underlying companies.

MR. T. H. BAILEY WHIPPLE, who has been associated with the Sawyer-Man Electric Co., as assistant to the second vice-president, has been chosen to succeed Mr. C. W. Rice as second vice-president and sales manager of the Nernst Lamp Co. Mr. Whipple was formerly with the Jandus Electric Co., of Cleveland, and has had a wide experience in this field.

MR. G. H. T. SHAW has been elected president of the Dixon, Rock Falls & Southwestern Electric Railway Co., which will begin construction on its line between Dixon and Rock Island next spring. Mr. Shaw is also president of the Northern Illinois Electric Railway Co., of Dixon, Ill., which will operate under lease the De Kalb & Southwestern Electric Railway Co.

THE PACIFIC ELECTRIC RAILWAY CO., and the Los Angeles Railway Co. systems' operating departments have undergone slight changes in personnel, beginning August 1st, Mr. L. O. Lieber having been appointed chief operating electrician and Mr. Ed Reynolds chief engineer of steam plants. Both report directly to Mr. William Jennings, mechanical superintendent.

MR. FREDERICK BROWN, C. E., has assumed charge of the Civil Engineering Department for Knox, George & Co., consulting engineers of Chicago and New Orleans. Mr. Brown has had a number of years of experience in this line of work in the United States, Mexico and Central America. He will make his headquarters in the Tulane-Newcomb Bldg., New Orleans.

MR. GLEN E. PLUMB, who for five years was in charge of the legal department of the Chicago General Ry. and resigned when a receiver was appointed for the property in 1900, assumed charge of the road August 14th as general manager for the receiver. The change in the management is a direct consequence of the settlement of differences between the Witbeck and Bonney interests.

MR. GEORGE S. PERKINS, M. E., has become affiliated with E. P. Roberts & Co., of Cleveland, and will assume charge of that firm's Department of Cement Engineering, the new field in which it has recently engaged. Mr. Perkins is a graduate of the Stevens Institute of Technology in the class of 1891 and has had an extended experience in the design and construction of cement plants.

MR. JOSEPH M. PATTEN on August 1st resigned as general manager of the Topeka Railway Co., and the duties formerly devolving upon him will be assumed by Mr. L. E. Myers, vice-president of the company, and Mr. Albert M. Patten, who has been appointed to succeed his father as general superintendent. Previous to his retirement the officials of the company presented Mr. Patten a gold watch.

MR. JAMES R. ATCHISON has resigned as superintendent of power of the Pacific Electric Railway Co., and the Los Angeles Railway Co., to become superintendent of construction with C. C. Moore & Co., engineers, of San Francisco. Mr. Atchison was connected with the street railway companies about five years and was previously with the Los Angeles Ice & Cold Storage Co., and the Los Angeles Lighting Co.

MR. GEORGE F. PRATT, who has been connected with the Niles Car & Manufacturing Co., of Niles, O., as assistant general manager and contracting agent, resigned that position August 1st.

Mr. Pratt, who has had an experience of nearly 20 years in railroad construction and operation, resigned his position with the Star Brass Works, of Kalamazoo, Mich., July 1, 1901, in order to go with the Niles company.

MR. W. J. DAWSON on July 8th resigned as assistant superintendent of the Fourteenth Ave., Crosstown and Harper Ave. division of the Detroit United Ry., to become general superintendent of the Rapid Railway System, with headquarters at Port Huron. Mr. Dawson has been with the Detroit United Ry. since 1891, and upon the establishment of the Fourteenth Ave. and Crosstown division in 1895, he was placed in charge.

MR. H. S. SWIFT resigned as auditor of the Rapid Railway System, of Detroit, to become auditor of the Toledo Railways & Light Co., to which position he was appointed July 21st. Mr. Swift became auditor of the Rapid Railway System in 1898. Previous to 1896 he was a teller in the Iowa State National Bank at Sioux City, and from 1890 to 1898 he was secretary of the Port Huron Northwestern Elevator Co., of Port Huron, Mich.

MR. GEO. H. GIBSON has resigned as manager of the advertising and publication department of the B. F. Sturtevant Co., of Boston, Mass., to accept an appointment with the International Steam Pump Co., having offices at 114-118 Liberty St., New York City. Mr. Gibson was formerly connected with the Westinghouse Companies' publishing department, of Pittsburg, Pa., and was for two years a member of the editorial staff of the Engineering News, New York City.

MR. H. M. KOCHERSPERGER, comptroller of the New York New Haven & Hartford R. R., was on July 28th elected president of the Meriden Electric Railroad Co., Meriden, Conn., to succeed Col. N. H. Heft, resigned. Mr. John G. Parker, secretary to the president of the New York, New Haven & Hartford, was chosen secretary of the street railway company, and Mr. A. S. May was made its treasurer. These officers were also elected to similar positions in the Stamford Street Railroad Co.

MR. J. A. BUCKNELL was recently appointed general freight and passenger agent of the Jackson & Battle Creek Traction Co., with headquarters at Jackson, Mich. He was formerly agent at Jackson, for four years, for the Grand Trunk Ry., and had been connected with that system 25 years, beginning as a section hand. He was advanced to operator and ticket agent, and first assumed the position of agent at Edwardsburg. While he was agent at Jackson the business of the Grand Trunk doubled in volume.

THE METROPOLITAN STREET RAILWAY CO., of Kansas City, has reorganized its legal and claim departments, which are now located on the sixth floor of the Temple block. The legal department will be in charge of Mr. John H. Lucas, who will be assisted by Messrs. Herbert S. Hadley, Frank G. Johnson and Charles A. Loomis. Mr. Hadley was formerly prosecuting attorney of Jackson County, Missouri. The claim department will be in charge of Mr. W. A. Satterlee, assistant general manager, assisted by Mr. John Carter, superintendent of the company.

MR. WILLIAM PESTELL has resigned as superintendent of motive power of the Worcester Consolidated Street Railway Co., to join the railway engineering staff of J. G. White & Co., 29 Broadway, N. Y. Mr. Pestell was assistant engineer to the Lynn & Boston Railroad Co. from 1893 until 1899, when he became its chief engineer. He held this position until May, 1901, when he resigned to go to Worcester. During his two years in Worcester Mr. Pestell effected marked improvement in the physical condition of that railway property. Mr. Pestell is an expert on the subject of signals for electric railways.

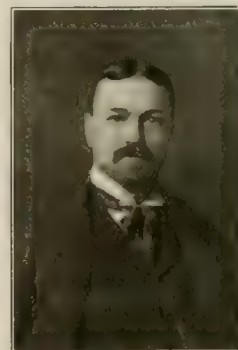
MR. MATTHEW C. BRUSH, son of Mr. George M. Brush, of Duluth, Minn., has been appointed assistant to Mr. Adams D. Claffin, president of the Boston Suburban Electric Companies, with headquarters at Newtonville, Mass. He is 25 years old and graduated from the Massachusetts Institute of Technology about two years ago after which he became roundhouse foreman for the Union Pacific R. R., at Omaha. Later Mr. Brush was foreman of shops and maintenance of the Rock Island road in western Kansas, resigning to accept his present position. When a quite young man he acted as clerk and later as purser for the Northern Steamship Co.

MR. FRANK M. NICHOLL has been appointed, vice agent for the United Fruit Co. of Troy, N. Y. Mr. Nicholl is the son of J. N. Nicholl, vice president and general manager of the Rochester Railway Co., of Rochester, N. Y., and has had an extensive training in the street railway business. He has a good knowledge of the practical side of electric railway operation, together with his wide acquaintance in the field will be of great service to him in his new position and will particularly well adapt him for the work of securing a wider sale of the well-known line of Taylor trucks. His many friends will wish him complete success in his new position.

THE DETROIT UNITED RY. has made some changes in the organization of its line, car and power departments, which were deemed desirable because of increased demands upon the different departments. The power and line departments have been placed in charge of Mr. Ellsworth J. Burdick, who has the title of superintendent of power. The car department is now in charge of Mr. Sylvester Potter with the title of master mechanic; Mr. Potter succeeded Mr. Thomas Farmer, who resigned August 27th. The car inspectors at the car house have been transferred to the transportation department; these inspectors were formerly under the master mechanic, but are now under the supervision of the general superintendent, Mr. A. H. Stanley.

MR. H. F. J. PORTER, who was recently appointed an assistant manager of the Westinghouse Companies' publishing department, in charge of articles, publications, general publicity and superintendence of department, with headquarters at East Pittsburg, was born in New York City in 1858. His early education was acquired at St. Paul's School, Concord, N. H., and he afterward entered Lehigh University at South Bethlehem, Pa., from which he was graduated as a mechanical engineer. From 1878 to 1881 he was employed in the shops and draughting room of the DeLameter Iron Works, New York City, and from 1881 to 1884 was assistant engineer of the New Jersey Steel & Iron Co.'s rolling mills at Trenton. For the succeeding six years he was engineer of the School of Mines and also superintendent of Columbia University, New York City, and resigned in 1890 to become superintendent of the Cary & Moeck Co.'s steel wire mill, also in New York. In 1891

Mr. Porter was appointed assistant mechanical engineer at the Columbian Exposition, Chicago, and in 1892 was made assistant chief of the machinery department of the exposition. During 1893-94 he conducted a business of general consulting and contracting engineer in Chicago, and then for three years acted as western sales agent of the Bethlehem Steel Co., with headquarters at Chicago. From 1897 to 1901 he was assistant sales agent for the same company, with headquarters at South Bethlehem, Pa., and in 1901 went to New York as the company's sales agent, which position he held until he resigned to go with the Westinghouse Companies. While with the Bethlehem Steel Co., Mr. Porter followed the initiative of John Trity, who first introduced hollow-forged shafts into street railway work in this country, and while in Chicago introduced this type of shaft and other high grade forgings into the various street railway plants in Chicago and other western cities. Later he placed them in the large units of the Boston Elevated Railway Co., and also in every large street railway power plant and electric light plant in New York City.



H. F. J. PORTER.

THE GALESBURG ELECTRIC MOTOR & POWER CO., of Galesburg, Ill., at its annual meeting July 13th, elected Mr. S. L. Nelson president and general manager, vice Mr. Fred Seacord, who resigned those offices, but remains a director. Mr. Nelson was formerly secretary, treasurer and general manager of the Springfield (O.) Railway Co., and until recently vice-president, general manager and purchasing agent of the Fort Wayne & Southwestern Traction Co. Other officers elected by the Galesburg company are: Vice-president, Mr. E. A. Bancroft; secretary, Mr. H. E. Davison; treasurer, Mr. Edward Woodman; superintendent, Mr. Charles Munson. Mr. Munson was superintendent of the old company. The board of directors includes these and Messrs. B. F. Arnold, George J. Price, H. J. Arnold and Captain Duncan.

THE power plant of the Pennsylvania & Maryland Valley Railway Co. is being increased by the addition of a new boiler and generator unit of 300 kw. capacity.

OBITUARY.

MR. JOHN F. MILLS, organizer and president of the Lansing St. John & St. Louis Railway Co., died August 21 at the home of his father, Mr. Nelson Mills, at Marysville, Mich.

MR. GEORGE A. COOKE, who was for several years with the Toledo Traction Co., as assistant to general manager, and superintendent of underground electrical construction, died at the home of his parents in Oak Park, Ill., July 11th, after a lingering illness. Mr. Cooke left Toledo in 1898, going first to Arizona and later to California and the Hawaiian Islands. Mr. Cooke was the son of Mr. William J. Cooke, vice-president of the McGuire Manufacturing Co.

MR. L. W. REYNOLDS, president of the Boone (Ia.) Electric Co., and owner of the Boone suburban line, died July 26th at Chicago, whither he had gone for medical treatment of a complication superinduced by paralysis. Besides his connection with the Boone companies, of which his son, Mr. John Reynolds, is secretary and manager, the deceased was the chief promoter of the proposed Boone-Webster City line, and was formerly interested in the construction of the Waterloo & Cedar Falls Rapid Transit Co., as an organizer. He was a promoter of wide scope and had also large real estate and manufacturing interests. At one time he was attorney for the Chicago & Northwestern R. R.

MR. ELIPHALET W. BLISS, founder and president of E. W. Bliss & Co., and the United States Projectile Co., which were merged last year into the E. W. Bliss Co., of Brooklyn, died at his summer home at Bay Ridge, N. Y., July 23d, of heart disease, following a week's illness due to indigestion. He was in his 68th year, having been born Apr. 12, 1836, at Cooperstown, N. Y. He left school when he was 16 years old and entered a machine shop as apprentice. He remained there five years and then worked as a journeyman in Syracuse, N. Y., and Meriden, Conn. When the civil war broke out Mr. Bliss enlisted and served until its close, when he went to Brooklyn and established the business in connection with which he became best known to electric railway interests. He was a member of the Union League and Metropolitan Clubs, of New York, and of the New York, Atlantic, Larchmont and American Yacht Clubs. He was also a member of Lafayette Post No. 4, G. A. R.

STRIKES OF THE MONTH.

On July 27th the Virginia Passenger & Power Co., whose motormen and conductors went on strike June 17th, announced that it had its complement of operatives for all lines, and that all lines were open with the regular schedule in operation. As stated in the "Review" for July, rioting was a feature of this strike and it was necessary to employ the entire state militia to maintain order. On July 20th all the out-of-town militia was ordered home, and since that date, with the exception of July 23d, when two cars were blown up, comparative peace has reigned. July 15th seven rioters (four of them strikers) were caught by the troops in Fulton, and a plot to kill from ambush was thereby frustrated. Four of those arrested were held for the grand jury. July 16th an attempt was made to wreck a car and two cars were fired upon by rioters. July 17th the police board dismissed from the force two policemen who had openly sympathized with the strikers. Three firemen were also heavily fined by the fire commissioners for a like offence. The company, in receiving applications from old employes, many of whom asked to be taken back, took the stand that it would not consider that any striker who returned to work did so as a favor, or that he demanded special consideration; each application was received on its merits. The two editors of "Opinion," the strikers' organ, who published the statement that C. B. Buchanan, the superintendent of transportation, had taken an assumed name, were each fined \$100 for libel. Mr. Buchanan had no difficulty in showing that there was no truth in the charge. The discharged strike-breaker who made the affidavit upon which the paper based its article, is a fugitive from justice. July 27th the trial of the sheriff of Henrico county was begun. His removal was asked for because he refused to issue a call for troops when asked to do so by the company officials.

July 29th 35 firemen employed at the power house of the Detroit United Ry. struck at a time when travel is usually heaviest to enforce

a demand for an eight-hour day. The city street car lines were tied up for a time, until the company could obtain substitutes, and later in the day the strikers went back to work under the old conditions pending the result of conferences which were instituted. Coincident with the strike the company's automatic coal passer was broken, and, believing it was maliciously done, the company caused the arrest of three of the striking firemen. August 6th they were released on a writ of habeas corpus.

About 100 motormen and conductors employed by the New York & Queen's County Railway Co. struck Sunday, August 9th. It was planned to tie up the entire system, but the strike was only a partial success in that respect. As it was, many persons who had gone to the Long Island resorts were considerably inconvenienced.

The strike of trolley men in Waterbury, Conn., which began January 12th, was settled August 9th, the Connecticut Railway & Lighting Co. agreeing to take back part of the strikers at once at the old wages and to make room for others as soon as practicable.

ACCIDENTS.

An electric car of the Wilkesbarre & Wyoming Valley Traction Co. ran away on a steep grade on the Edwardsville branch July 18th, jumped the track and went through a fence. A woman passenger was fatally hurt and three others were injured.

Two cars collided on the Oberlin branch of the Cleveland & Southwestern Traction Co. two miles from Elyria, O., July 19th, resulting in the death of one passenger and the injury of several others.

Three men were killed, one was fatally injured and 12 more were hurt in a collision between a Vandalia accommodation train and a car on the East St. Louis & Suburban Railway Co.'s line at Lansdowne, a suburb of East St. Louis, July 26th.

In St. Louis July 25th a collision between a Compton Heights car and a Fourth St. car of the St. Louis Transit Co. resulted in injury to 13 persons.

As a result of a collision between two cars of the Boston & Worcester Street Railway Co., at Westboro, Mass., July 25th, one person was killed and 48 were injured. The cars met on a single track near a curve.

Twelve men were injured in a head-on collision between Cincinnati, Lawrenceburg & Aurora Electric Railroad Co. cars near Cleves, O., July 25th.

Two Grand Rapids, Grand Haven & Muskegon Railway Co. cars met in rear end collision 1½ miles west of Coopersville, Mich., July 26th and seven persons were injured, but none seriously. It was a rear-end collision.

A Union Traction car going at full speed struck a short curve, jumped the track and turned over, in the suburbs of Anderson, Ind., July 29th, causing the death of one person and injuring 17 others.

A work train, consisting of two cars, went over a 30-ft. embankment near the Gates Mills power house of the Cleveland & Eastern Railroad Co., July 29th, wrecking the cars and severely, but not fatally, injuring the conductor and motorman.

A second wreck occurred on the Indiana Union Traction Co.'s system July 30th, this time at North Anderson, when a Marion car and a special car collided. Seven persons were injured, but none fatally; one of the cars was badly damaged.

August 2d two Indianapolis & Martinsville interurban cars collided three miles south of Mooresville, Ind., injuring 30 people, two of whom were expected to die. Both cars were specials and met on a curve.

A Texarkana (Ark.) street car left the track while making a curve at Broad and Hazel Sts., August 2d, and 20 people were injured, one of whom died.

A Holyoke (Mass.) Street Railway Co.'s car jumped the track between South Hadley and Holyoke August 2d and plunged down an embankment about eight feet steep, landing right side up. Three passengers were injured.

Four persons were severely injured in a head-on collision on the Cleveland & Eastern Electric Railway Co.'s line near Bethel, O., August 9th, and the cars were badly damaged.

While returning from a picnic on the evening of August 6th, a car on the Youngstown-Sharon Railway & Light Co.'s line ran into a car ahead, killing one man and injuring several others.

RECENT STREET RAILWAY DECISIONS.

EDITED BY J. L. ROSENBERGER, ATTORNEY AT LAW, CHICAGO.

STREET DEDICATED BUT NOT ACCEPTED TO BE TREATED AS PRIVATE PROPERTY SUBJECT TO CONDEMNATION.

Pease vs. Paterson & State Line Traction Co. (N. J. Sup.), 54 Atl. Rep. 524. Feb. 24, 1903.

A street or avenue laid out by an owner upon his land, and by him dedicated to the public use, the supreme court of New Jersey holds, in the absence of its acceptance by the public, is not a street or highway within the meaning of the traction act, requiring consents from the municipality and the abutting owners before the company can lay down its tracks. But the owner of land in a street thus dedicated, but not accepted, is an owner of land within the meaning of the provisions of the traction act regulating the proceedings to condemn land.

WHEN CONTRIBUTORY NEGLIGENCE NO DEFENSE.

Turnbull vs. New Orleans & C. R. Co. (U. S. C. C. A., La.), 120 Fed. Rep. 783. Feb. 17, 1903.

It was requested that the jury be charged that, "in an action like this for damages against a railroad company by the surviving parent for the injury, suffering, and loss of his son, run over and killed by a car of the defendant company, the defense of contributory negligence will not avail if, by reasonable care on the part of those in charge of the electric car, the accident could have been avoided." After a careful examination of a number of recent decisions of the courts of highest authority and of the most approved text-writers, the United States circuit court of appeals, fifth circuit, concludes that the requested charge was not too broad, and was not misleading.

SUDDENLY INCREASING SPEED TO GET OUT OF WAY OF SUDDENLY APPEARING TRAIN NOT NEGLIGENCE.

Corkhill vs. Camden & Suburban Railway Co. (N. J. Sup.), 54 Atl. Rep. 522. Feb. 24, 1903.

The motorman of an electric street railway car started his car at a moderate speed to cross an intersecting steam railroad consisting of three tracks, after his conductor had gone forward upon the crossing and had used proper care to ascertain that no railroad train was to be expected. While thus proceeding over the crossing at moderate speed, the motorman became suddenly aware of a railroad train rounding a curve near by, and coming toward his car at a high rate of speed, without timely warning by bell or whistle. A collision seemed imminent, and was in fact narrowly averted. The motorman, on seeing the danger, instantly applied all power, and increased the speed of his car to the utmost, in order to escape the collision. It was claimed that in the lurch of the street car thereby occasioned a passenger was thrown to the floor of the car and injured. The supreme court of New Jersey holds that a verdict attributing negligence to the motorman on these facts could not be supported.

TEN HOUR LAW CONSTITUTIONAL.

In re Ten Hour Law for Street Railway Corporations (R. I.), 54 Atl. Rep. 602. June 27, 1902.

In response to the question of the governor, whether the provisions of chapter 1004 of the Public Laws of Rhode Island, passed April 4, 1902, entitled "An act to regulate the hours of labor of certain employes of street railway corporations," or any of such provisions, are in violation of the constitution of the state, the supreme court of Rhode Island gives as its conclusion that the law does not violate any provision of the constitution of the state or of the United States in its scope and character, nor by reason of violating rights of contract, nor by reason of an apparent and arbitrary exercise of power in the exception from its operation of existing written contracts.

If not in violation of the state constitution, the further question was asked, is there anything in the provisions of said chapter 1004 to make it illegal for a street railway corporation to make a contract with its employes to labor more than ten hours within the twenty-four hours of the natural day, and within twelve consecutive hours, except as provided in said chapter? To this, the court replies that it is illegal for a street railway company to make a contract with its employes to labor more than 10 hours within the 24 hours of the natural day, and within 12 hours, except as provided in said chapter. The court says that the apparent purpose of the act is not to create a right in favor of the employes, which they might waive, so much as to guard the public safety from service too prolonged for alertness in the exercise of reasonable care. If this be so, the public safety cannot be made dependent upon private contracts.

Mr. Justice Blodgett filed a lengthy dissenting opinion.

HAVING NO HEADLIGHT OR SOUNDING GONG ON FOGGY MORNING—DUTY AS TO STOPPING, LOOKING AND LISTENING BEFORE CROSSING TRACK.

Frank vs. St. Louis Transit Co. (Mo. App.), 73 S. W. Rep. 239. Mar. 3, 1903.

A collision with a two-horse wagon occurred at a street crossing, at between half past 6 and 7 o'clock, on the morning of October 30. There was much testimony that the morning was very foggy, and that a person could see only a short distance, and some testimony that the fog had about cleared up when the collision occurred. The court of appeals at St. Louis, Mo., says that, it is true, having no headlight did not constitute negligence as a matter of law; neither did failure to sound the gong. There was no absolute requirement that a headlight should be burning at that time of day, nor that a gong should be sounded. This only shows, however, that there was no such breach of a mandatory duty by the car-men as justified the court in instructing that negligence on the part of the company had been established. But taking into account the difficulty of seeing but a few feet ahead in the fog, as testified to by the motorman and other witnesses, the failure to have a headlight burning or to sound the gong were facts for the jury to weigh, and from which they might infer negligence. The question in this and most similar cases is: Did the carmen use such precautions to avoid injury to persons on the street as ordinary prudence demanded, all the circumstances considered?

Again, the court says that there is no absolute duty incumbent on a person about to drive or walk across a railroad track to stop before doing so; and, while circumstances may arise, perhaps, which will justify a court in declaring a plaintiff was negligent if he did not stop, the general rule, and the one applicable to the present case, leaves it to the jury to say whether it was necessary for him to stop in order to use, to the best advantage, his eyes and ears. What a person is bound to do before he crosses a railroad track is to employ all the precautions which common prudence dictates to prevent a casualty, and whether he uses those precautions is to be ascertained by the jury from a consideration of the facts. The instructions imposed on the plaintiff, the duty of not only looking and listening, but of using care proportionate to the danger of the surroundings and the difficulty of detecting a car, which the court thinks is all the law required. It adds that he had to take only reasonable precautions to avoid injury.

DUTY OF MOTORMAN WHERE HORSE BALKS OR IS STALLED ON TRACK—REMAINING IN WAGON NOT NECESSARILY CONTRIBUTORY NEGLIGENCE.

Meyers vs. St. Louis Transit Co. (Mo. App.), 73 S. W. Rep. 379. Mar. 17, 1903.

Where a horse balked with the wagon on the track something like 100 to 125 feet in front of a car running at an excessive and prohibitive rate of speed, the court of appeals at St. Louis, Mo.,

It was no defense or excuse for the gross negligence of the motorman in making no effort whatever to slow up or stop the car to say that he had a right to assume that the party driving could drive on and across the track before the car would reach him. It says that the wagon was at a standstill, and the driver was making an effort to urge the horse on. This situation was not as it could have been seen, by the motorman, and it was his bounden duty to take cognizance of the situation as he saw or should have seen it. If such was not his duty, then a teamster about to drive over a railroad crossing (seeing no car near enough to prevent him from doing so in safety), who drives on the track, and his team balks there or is unable to pull the load over, if he remains with his team, urging it on, in the hope of getting out of the way of the car, is without remedy if he is struck and injured by the negligence of the motorman.

Whether or not the party, by remaining in his wagon, was guilty of negligence which continued down to the injury, and directly contributed thereto, the court holds was a question for the jury to determine from all the facts and circumstances in evidence. It says that he knew it was the duty of the motorman to keep a vigilant watch [under a vigilant watch ordinance] for persons and vehicles upon the track, knew that his situation was seen by the motorman, knew that it was the duty of the motorman to stop his car to avoid a collision, knew that he had time and space in which to stop, if running at a lawful speed, and had a right to assume that he would observe the ordinance and the dictates of humanity by stopping his car, which, if he had done, there would have been no collision and injury. In such circumstances, it seems to the court, it would be monstrous to hold that the party, by remaining in his wagon when he might have gotten out, was guilty of such contributory negligence as to preclude his right of recovery.

Besides, the court says that the motorman had the last fair chance of avoiding the injury, and the doctrine in Missouri is well settled that the party who has the last fair opportunity of avoiding the accident is not excused by the negligence of any one else.

RELATION OF STREET AND STEAM RAILROADS TO STREET POWER OF STATE TO REGULATE MAN- AGEMENT OF ROAD—REQUIRING SAFEGUARDS AT RAILROAD CROSSING APPORTIONING EXPENSE DIFFERENCE BETWEEN ELEC- TRIC CARS AND ORDINARY VEHICLES.

Detroit, Ft. Wayne & Belle Isle Railway vs. Osborn (U. S., Mich),
23 Sup. Ct. Rep. 540. Apr. 6, 1903.

One of the contentions in this case was that a street railway has a different relation to a street than that which a steam railroad has. The supreme court of the United States says that it may be that this difference is recognized as to abutting property owners or crossing railroads, but it cannot be recognized as limiting or affecting the power of the state to regulate the management of the roads in view of the danger of their operation to the public. Whether electricity be the motive power, or steam be the motive power, there is enough danger in the operation of either to justify regulation.

The record in this case showed that there were thirty-eight daily passenger trains crossing the avenue on which the street railway company operated its railway, and that its cars passed every few minutes. It is manifest, the supreme court says, that the crossing was a place of unusual danger, not only to the passengers in steam cars, but also to the passengers in the electric cars, and that the danger was caused by both. In such situation the city was surely not powerless to act, nor before acting must it ascertain the exact amount of damage caused by each road, and by that standard assign the cost of protecting the public.

That it thinks there is a difference between ordinary vehicles and cars propelled by electricity, which may be recognized by the state in the exercise of its police power, the supreme court deems sufficient answer to the contention that the street railway company having an equality of rights with ordinary vehicles was deprived of the equal protection of the laws by an order of the commissioner of railroads of the state requiring it and the terminal association using the crossing above mentioned, at their own cost and expense, share and share alike, to construct, maintain and operate safety gates and derailing and signaling appliances thereat. Nor does the court apparently give any weight to the point presented that the

street railway company was the first to occupy the avenue, that at that time there was no public highway or street crossing at such avenue; that subsequently the steam railroads laid their tracks.

GRATUITOUS AND INVALID TOWN VOTES AS TO CON- DITIONS TO BE INSERTED IN FRANCHISES AND TO BORROW MONEY TO CARRY OUT SCHEME.

Hood vs. Leachy (Mass.), 66 N. E. Rep. 787. Apr. 2, 1903.

At a special town meeting there were three votes. The first was that, in addition to statutory requirements, the selectmen be instructed to insert in any franchise or location that might be granted upon any petition of a certain street railway company certain conditions thereafter particularly enumerated. The conditions prescribed the size and weight of the rail upon which the street car was to be run, the portion of the street and gutter to be paved by the railway company and the kind of paving stone to be used, and required that the remaining portion of the street should be macadamized by the company. Further conditions to be imposed were that laborers resident in the town and citizens owning teams should be employed in the work in preference to any others, and the hours of labor and wages therefor should conform to the standard established by vote of the town at its annual town meeting; and that there should be but one fare of five cents from any point in the town to any point in a certain other town. The second vote provided for the appointment of a committee of five to confer with the board of selectmen or independently attend upon any board, court, or other tribunal to represent the town upon all questions of franchises, tracks, or locations that theretofore had or thereafter might be granted to or with any street railway company, its officers, servants, or agents, or any person that might have been appointed in place of said street railway company, its officers, servants, or agents, and authorized the committee to employ counsel. The third vote instructed the treasurer to borrow \$300 to carry into effect the second vote.

Of course, the supreme judicial court of Massachusetts says, the selectmen were not bound to follow the instructions contained in the first vote. In the matter of granting locations they act, not as agents of the town, but as public officers, specially designated by the lawmaking power for that purpose. It is plain that in the matter of several of the conditions the town has no corporate interest whatever—for instance, those relating to the residence and wages of the laborers to be employed, and to the rate of fare for the passengers in general. If it may be said that the town may have a corporate interest in some other of the questions involved in the granting of the locations—as, for instance, where the expense of keeping the streets in repair may be affected by the conditions which may be lawfully imposed, and that, therefore, it may raise money to protect its interest (a question upon which the court need not now express an opinion)—the reply is that, even if that be true, it is plain that the money was to be used to carry out the scheme as a whole, and the authority to borrow [for a "necessary charge"] being granted as a whole, and, there being no way of separating the valid from the invalid, the whole vote must be declared invalid.

EJECTION OF PASSENGER PRESENTING WRONGLY PUNCHED TRANSFER TICKET—PASSENGER NOT RE- QUIRED TO INSPECT TICKET, TO KNOW MEAN- ING OF SYMBOLS ON SAME, OR TO KNOW RULES PROMULGATED FOR EMPLOYEES— DUTY TO ACCEPT EXPLANATIONS OF PASSENGER AND TO CORRECT MIS- TAKES OF ONE CONDUCTOR THROUGH ANOTHER.

Indianapolis Street Railway Co. vs. Wilson (Ind.), 66 N. E. Rep.
950. Mar. 19, 1903.

By the terms of the company's franchise, a passenger, on the payment of the required fare, is entitled to demand and receive, without extra charge, from the conductor of the car upon which he first takes passage, a transfer ticket, which entitles him to be carried as a passenger over the line to which he is transferred. Moreover, it is provided particularly that the line to which the passenger is transferred "shall be plainly indicated on said transfer ticket."

In this case it appeared that in punching a transfer ticket the

conductor had awkwardly used the punch, and, instead of plainly indicating that the passenger had been transferred to the Virginia avenue line, he punched out what might be said to be the entire space opposite South East street, and also a part of the Virginia avenue space, the puncture made extending across the line dividing the two spaces. This gave rise to a controversy between the passenger and a conductor of the Virginia avenue line, the latter insisting that the ticket indicated that the former had been transferred to the South East street line, while the passenger insisted that he had requested a transfer to the Virginia avenue line, and stated that he believed the ticket indicated such transfer. The result was a demand for the payment of another fare, a refusal to pay same, an ejection from the car, an action for damages, and a judgment in favor of the passenger, which the supreme court of Indiana affirms.

The case is decided by a court divided three to two; one of the three concurring in the result only. It is possibly true, the court says, that the passenger had ample time and opportunity to inspect his transfer ticket, and thereby ascertain whether the conductor who gave it to him had properly performed his duty by correctly indicating the line of transfer. The duty of inspection, under the circumstances, the law did not exact of him, for, in the absence of any notice to the contrary, he had the right to presume that the company's conductor and agent had correctly discharged his duty in punching the ticket, and thereby indicating the transfer over the line in accordance with his request. He had nothing to do with the preparation of the ticket, for the company seemed to have prescribed the form and contents thereof, and also the method or means to be employed to indicate or point out thereon the line of its railway over which a transferee was entitled to be carried. The many words, figures, spaces, and abbreviations which the ticket furnished contained would prima facie be unintelligible to many persons, and certainly it would be an unreasonable imposition to require of a passenger, upon receiving one of these tickets, the duty to inspect the same in order to discover if the conductor had made a mistake in the performance of his duty. A mere passenger, under the circumstances, was not, in the eye of the law, either presumed or bound to know the meaning of the various figures, abbreviations, punch marks and other mystic symbols which the transfer ticket contained. These possibly could only be correctly interpreted or read in the light of the rules and regulations adopted by the company for the guidance of its conductors and employees. Neither was he presumed to know or required to take notice of these rules and regulations made by the company for the aforesaid purposes.

The fact that the wrong of which the passenger complained might be said to be due to the combined faults of two of the company's conductors or agents the court says exerted no material influence over his right to recover damages, for, under the circumstances, the company must be presumed to have been present and acting at the time through the agency of the conductor who issued the transfer ticket, and through the agency of the other, who, over the explanations of the passenger in regard to the issue of the ticket, refused to accept it, and thereupon expelled him from the car upon which he was entitled to be carried. These explanations it should have accepted as true until the contrary was shown. It was certainly as much the duty of the company to correct the mistake which it had made in punching the ticket in the first instance when the opportunity to do so was presented to it through the agency of the second conductor, as would have been its duty to have rectified the same had the attention of the first conductor been called to the mistake by the passenger before he left the first car. Consequently there was no force or merit in the contention that he should have examined the transfer ticket which he received before leaving the car, and have presented it to the conductor who issued it, in order that the mistake made by him in punching the ticket might be corrected.

NO INFERENCE AS TO LOOKING OR OF FREEDOM FROM CONTRIBUTORY NEGLIGENCE—FAILURE TO STOP IN ACCORDANCE WITH RULE—DUTY OF MOTORMAN AT CROSS STREET CONTAINING OTHER TRACKS.

O'Reilly vs. Brooklyn Heights Railroad Co. (N. Y. Sup.), 81 N. Y. App. 772. Apr. 13, 1902.

It was a person could have looked while traveling the distance between the tracks, the second appellate division of the su-

preme court of New York holds that it cannot legally be inferred that he did so. Nor can the inference of freedom from contributory negligence be drawn from the presumption that one will exercise care and prudence in regard to his own life and safety. Furthermore, where the company had a rule that cars crossing tracks must come to a full stop, and must not proceed until after a signal from the conductor, and there was testimony from which the jury might infer that the car in question did not stop in obedience to that rule, in view of which it was insisted that the party had a right to rely upon such obedience, and that this tended to establish his freedom from contributory negligence, the court holds that the mere violation of the rule did not avail anything upon the question of proof of absence of contributory negligence. The law, it says, only required the motorman to have his car under reasonable control while approaching the cross-street, in view of the probabilities of persons or vehicles attempting to pass over the tracks at that point, and in furtherance of the relative equal rights of car, vehicle, or traveler.

BUILDING PLATFORM AROUND STUMP IN STREET—NO DUTY TO REMOVE NUISANCE NOT RESPONSIBLE FOR.

Lucas vs. St. Louis & Suburban Railway Co. (Mo.), 73 S. W. Rep. 580. Mar. 18, 1903.

A wooden platform for the benefit of the traveling public was built by the company partly upon its own right of way and partly upon the sidewalk of a public street crossed. Subsequently it replaced that platform with one of granitoid. The former was built around an electric light pole, and the latter around the stump thereof which the lighting company had left standing a little to the right of the middle of the sidewalk, which stump projected about eleven inches above the granitoid platform, and a woman hastening at dusk to catch a car stumbled against the stump and was thrown against the side of the car, and seriously injured. The supreme court of Missouri, division No. 1, says that the stump was on public property, and the street railway company was under no duty and had no right to remove it. The law imposes no duty upon it to remove a nuisance in a public highway which it did not put there, and has nothing more to do with than any other citizen. The proximate cause of the accident was the stump. The only thing the company did with respect to the stump was to leave it in the highway, where some one else had placed it; and, being, under no legal duty to remove it, it could not be adjudged guilty of negligence in failing to remove it, or in building the platform around it. It never caused this defect in the sidewalk; never adopted it, used it, continued, or maintained it. It did not remove it, it is true, but it owed no duty to the city or its citizens to remove it. It was neither the active, primary, nor remote cause of its being there, and it did not keep it there for its own use or benefit or at all. It simply left it where it found it, and let it remain in no more dangerous condition than it was when it found it. It followed that the street railway company was not liable for the woman's injuries, and the trial court should have so peremptorily charged the jury.

INJURY TO PERSON STUMBLING OVER FENDER OF STATIONARY UNLIGHTED CAR—RIGHT TO HAVE CAR STAND ON TRACK A REASONABLE TIME.

Adams vs. Metropolitan Street Railway Co. (N. Y. Sup.), 81 N. Y. Supp. 553. Apr. 13, 1903.

The plaintiff after stepping off a car and walking around the rear end of it was injured by walking into and stumbling over a fender attached to a car on the opposite track. His contention was that the car was stationary, unlighted, and without any one in charge, and that the place was so dark that, although he saw the car, he could not see the fender. But there was no evidence that there was no one in charge of the car, except the fact that there was no motorman on its front end, nor any allegation or evidence as to the length of time the car was stationary before the accident. There was no evidence as to the cause of its stopping; whether it stopped to take on or let off passengers, or on account of some accident or injury to the car—simply that it was stationary. This, the second appellate division of the supreme court of New York holds, was not sufficient to predicate negligence of the company, without proof that the car had been stationary for an unreasonable length of time. Nor was it a case of contributory negligence (the matter speeded up).

which made it incumbent on the company to explain the stopping, and frequent stoppings are incident to the business of the company. Indeed, from "our" common observation, "we," the court declares, may also say the same thing as to the absence of light from a car for a momentary period; and the plaintiff proved nothing beyond an absence of light for the short period between his passing around the rear end of the car from which he alighted and his falling over the fender, which was altogether too short a time to justify an inference that the car had been stationary for an unreasonable length of time. It was error, it holds, to refuse to charge that no negligence of the company could be implied from the fact that the car stood unlighted, without evidence to show that it stood there for an unreasonable length of time. It was also error to refuse to charge that the company had the right, without being charged with any breach of duty or an unlawful obstruction of the highway, to have its cars stand on the track for a reasonable length of time.

INJURY TO CONDUCTOR WHILE REVERSING TROLLEY
BY STARTING OF CAR THROUGH NEGLIGENCE OF
MOTORMAN—CAR STARTER FELLOW SERVANT
OF CONDUCTOR AND MOTORMAN—RAIL-
ROAD FELLOW SERVANT ACT NOT AP-
PLICABLE TO STREET OR OTHER
RAILROAD COMPANY OPERATING
A STREET RAILWAY.

Sams vs. St. Louis & Missouri Railroad Co. (Mo.), 73 S. W. Rep. 680. Mar. 20, 1903.

As an electric car came a little late to a terminus where it had to be switched over to the other track, the car starter spoke angrily to the motoneer, asking him where he had been. Then, seeing that the rear trucks of the car had not cleared the switch, he motioned or called to the motoneer to move up. The motoneer, as if in obedience to that direction, set the apparatus to receive the electric current, but the car did not move, owing to the fact (which neither the motoneer nor the car starter seemed to have noticed) that at that moment the conductor was in the act of reversing the trolley, and therefore the connection of the machinery with the wire overhead was broken. The motoneer, still seeming not to see what the conductor was doing, took off the controller, leaving the apparatus open to receive the current, and started to the other end of the car, where he was to stand on the return trip. As a result, on the instant the trolley touched the wire the car shot forward and crushed the conductor against a car which was standing on the track.

There was nothing in the case, the supreme court of Missouri says, to justify a conclusion that the car starter was a vice principal of the company. He had certain duties to perform, and in that his word was the word of the master to his fellow servants; and if they refused to obey him in that particular they were, on being reported to the manager, liable to be suspended. But each of the other servants had his peculiar duty to perform, and in which his word was that of the master. The conductor, by word or signal to the motoneer, orders him to start or stop the car; and if he should refuse to obey, and the fact was reported to the manager, doubtless he would be disciplined. And there may be events in the operation of the car when the motoneer may be in duty bound to give orders to the conductor, which he is to obey. But it would never be contended that the conductor and motoneer were not fellow servants. And so is a car starter, who has no more authority than this man had, the fellow servant of the conductor and motoneer. Besides, the court does not perceive any negligence in the act of the car starter. The negligence, it says, was in the act of the motoneer attempting to execute the orders without looking to see what the conductor was doing, and in removing the controller and starting to the other end of the car without closing the apparatus against the current which he was bound to know would pass into the machinery as soon as the trolley should touch the wire.

The company, according to evidence introduced, was incorporated as an ordinary railroad company, and had exercised the right of eminent domain to condemn private property for a part of its right of way outside of the city. But its road in the city was in the city streets, and of the same character as ordinary street railroads, and the court holds that the fellow servant act of 1897 did not apply to the company, which claimed to be a corporation owning or operating a street railroad, nor to its servants engaged in the work of operating such street railroad. The act provides: "That every rail-

road corporation owning or operating a railroad in this state shall be liable for all damages sustained by any agent or servant thereof while engaged in the work of operating such railroad by reason of the negligence of any other agent or servant thereof; provided, that it may be shown in defense that the person injured was guilty of negligence contributing as a proximate cause to produce the injury." We see, the court says, that by the very words of the statute the liability is not imposed on railroad corporations, because railroad corporations, but on concerns that own and operate railroads in this state; and the liability is not for damages sustained by any servant of the company, but only by a servant engaged in the work of operating such road. The question is not what was the company authorized to do; but what in fact was it doing, and in what work was the injured servant engaged? If, therefore, a corporation and its servants, who, as a matter of fact, are engaged only in operating a street railroad, are not covered by the fellow servant statute, then the fact that the charter of the corporation authorizes it to own and operate a trunk line steam railroad will not bring them within the statute, nor estop the corporation from showing the fact.

And the court holds that the fellow servant statute does not apply to concerns operating street railroads or to their servants engaged in that work. It says that men engaged in the operation of street railroads are exposed to hazards, but not to the peculiar hazards which distinguish men engaged in operating steam railroads, and which has made them a class for special legislation.

Wherefore, the court, though divided four to three, affirms a judgment for the company.

ALLEGATION OF FAILURE TO GIVE WARNING OR KEEP
PROPER LOOKOUT AT CROSSING SUFFICIENT—
DUTY TO SOUND GONG—CARE REQUIRED OF
MOTORMAN AT STREET CROSSING—
STATEMENT OF MOTORMAN
AFTER ACCIDENT.

Koenig vs. Union Depot Railway Co. (Mo.), 73 S. W. Rep. 637. Mar. 31, 1903.

If it was true, as alleged in the petition, that the servants in charge of the car failed to sound the bell or give other warning of the approach of the car at the crossing, and it was their duty to do so, or they failed to keep a proper lookout for persons crossing the street at that point, and by reason thereof the injury sued for occurred, the supreme court of Missouri, division No. 2, holds that it was entirely unnecessary that the petition further allege negligence of those in charge of the car, after becoming aware, or after they ought to have known, of the danger.

As the law imposed no duty upon the motorman to sound the gong or bell at the approach of a street crossing, and there was no law making a failure to do so negligence per se (by itself), the court holds that such failure would become negligence only when the circumstances rendered the ringing of the bell necessary, and, if the circumstances were in dispute, whether the occasion was such as called for the sounding of the bell was a question of fact for the jury. That there are many crossings in the city of St. Louis which are much used by pedestrians and vehicles, at the crossings of which by street cars without the bell being rung or the gong sounded by the motorman in charge on approaching them would be negligence per se, must be admitted, but it is not at every crossing that a failure to do so would amount to such negligence, much depending upon the use of the street at the time.

An instruction the court holds bad for the reason that it incorrectly defined the degree of care required of the company as "being such care as to demand a very high degree of vigilance," when the law only exacted of the company the exercise of ordinary care; that is, in this case, such as a person of ordinary prudence and caution according to the usual and general experience of mankind would exercise in the same situation and circumstances as those of the motorman in charge of the car.

What the motorman said when, immediately after the car stopped, he went back to the place where the child run over was, the court holds was a narration of a past event, with respect to which he was not authorized to speak for his employer or master. His business was to control and manage the cars of which he had care, and for whose actions, within the scope of his employment, his employer was answerable, but for nothing he said which did not accompany or form part of the accident.

Power Plant of the Stark Electric Railroad Co., Alliance, O.

The Stark Electric Railroad Co. has recently put in operation its line from Canton to Sebring, Ohio (Stark and Columbiana Counties respectively), and is pushing to completion an extension to Salem, Columbiana County, making the total length of the line about 45 miles.

The power plant for the system, which was designed and built by the Arbuckle-Ryan Co., of Toledo, Ohio, is located about two miles east of Alliance (which is about the center of the line) near the Mahoning River. The intention in designing the plant was to take water from this river for boiler feed and condensing purposes, but as Alliance (a city of about 10,000 inhabitants) had no pleasure park, it was decided to establish one on the railroad, at the power house site. To make it more attractive, the company excavated a rather large tract and have made an artificial lake of several acres, and from six to eight feet deep at places. This lake is fed by a small stream. It is on much higher ground than the river, considerably above the high water mark of the river, and at the same level as the power house. It is one thousand feet distant from the power house.

As the stage of water in the Mahoning River is uncertain, it was decided to use this artificial lake for boiler supply and condensing purposes, returning the surplus to the lake, after passing through the condenser. This arrangement insures a supply of water for condensing purposes even in the driest of weather.

The building was designed to be attractive in appearance as well as useful. The inside dimensions of the engine room are 72 ft. 2 in. by 50 ft., and of the boiler room are 72 ft. 2 in. by 40 ft. 1 in. The condenser pit, below the engine room, is large and roomy, being 14 ft. deep.

There is a difference of 7 ft. between engine and boiler room floor levels. The outer walls are 13 in. thick, with heavy pilasters, while the center wall is 17 in. thick, reaching to cone of roof. The outer walls are of selected hard burned red brick, with stone trimmings, and laid with black mortar.

The trusses are of steel, light, but so designed as to have a large margin of strength, and are supported from the outer walls only—

The foundations for both building and machinery are of hard burned brick laid in American portland cement.

The plant was designed for possible extension in either direction,



EXTERIOR OF POWER HOUSE.

without the changing of any of the machinery now installed, as well as for the most economical operation.

It was not considered advisable (due to the small amount of power required, until the other end of the line is complete) to install a coal



MAIN GENERATING UNIT—STARK ELECTRIC R. R.
Russell Engine, Westinghouse Generator

the center wall acting as a fire wall. The roof is slate. All floors are of concrete, that in the engine room being built on arches, supported by steel structural work. The building is practically fireproof. The engine room is served by a traveling crane of 20,000 lb. maximum lift.

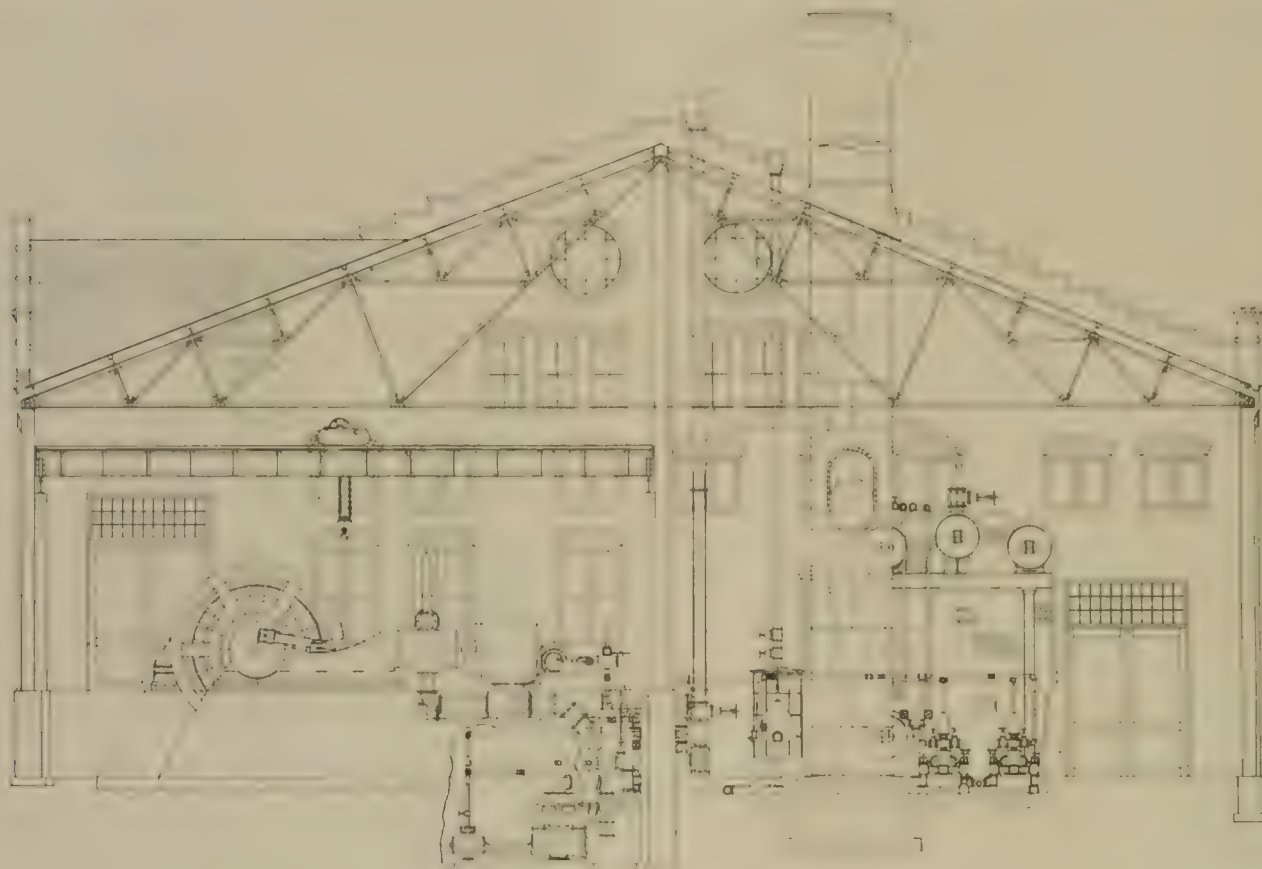
handling device and stokers, but the plant is designed so that they can easily be installed later.

There are two 500-kw. Westinghouse alternating current generators, delivering 300 volt, three phase current, 25 cycles, and two 30-kw. 110 volt, direct current machines for exciting the fields of

generators. Each main generator is direct connected to a 22 and 40 h. p. non-reversible compound four-valve Russell engine, with carburetor. The engines run at a speed of 125 r. p. m., making a piston speed of about 625 ft. per minute, which is considered a low rate for engines of this size.

The exciter generators are direct connected to 7 x 10 in. Russell four-valve engines, designed for 150 lb. working pressure. These engines are equipped with rollers and central oiling device, and operate at 125 r. p. m.

There is space left in the engine room for the installation of a



CROSS-SECTIONAL ELEVATION OF POWER PLANT STARK ELECTRIC R. R.

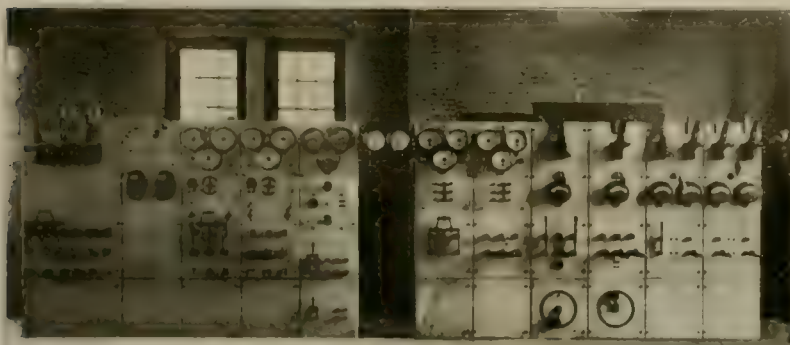
The engines are as regularly furnished by the Russell Engine Co.; they are without superheater or steam jackets, and are supplied with cast iron sole plates, covering the entire top of the engine bed and outer bearing foundation, which gives an opportunity for finishing the foundation above floor line in a satisfactory manner.

13 and 26 x 20-in. cross-compound four-valve engine, to be direct connected to a 200-kw. 60-cycle Westinghouse alternator, for lighting purposes, and this unit may be installed later for lighting the near-by towns.

The sub-station equipment at the power house, which is located in the engine room, consists of two 250-kw. Westinghouse rotary converters, with a complete and modern switchboard. The high tension board is elevated.

There are now installed three (with room for the fourth) of the well-known Stirling water tube boilers, of the "F" type, which are set 12 in. higher than usual, in order to permit the installation of a chain grate later. The horizontal seams of the drums are double-butt strapped, triple riveted, and constructed for a continuous working pressure of 160 lb. per. sq. in. The heating surface in each boiler is 3,500 sq. ft. and the three boilers are rated at 1,050 h. p. The boilers, as installed, under a 25 per cent overload test, showed less than 1 per cent moisture in the steam at boilers.

Natural draft is used, the chimney being of steel, 78 in. diameter inside, and 150 ft. high from floor line. The stack has an ornamental top of galvanized iron, and ladder, and is guyed with eight 9-16-in. galvanized stranded cables. The stack is riveted to, and rests on, a heavy cast iron base, anchored to a substantial foundation. The bottom section is of ¼-in. material, and the upper part 3-16 in. thick. While the stack was not designed to be self-supporting, nevertheless it would act as such in all ordinary weather, and the guys are provided for safety in severe weather. The stack shows 1.01



SWITCHBOARDS.

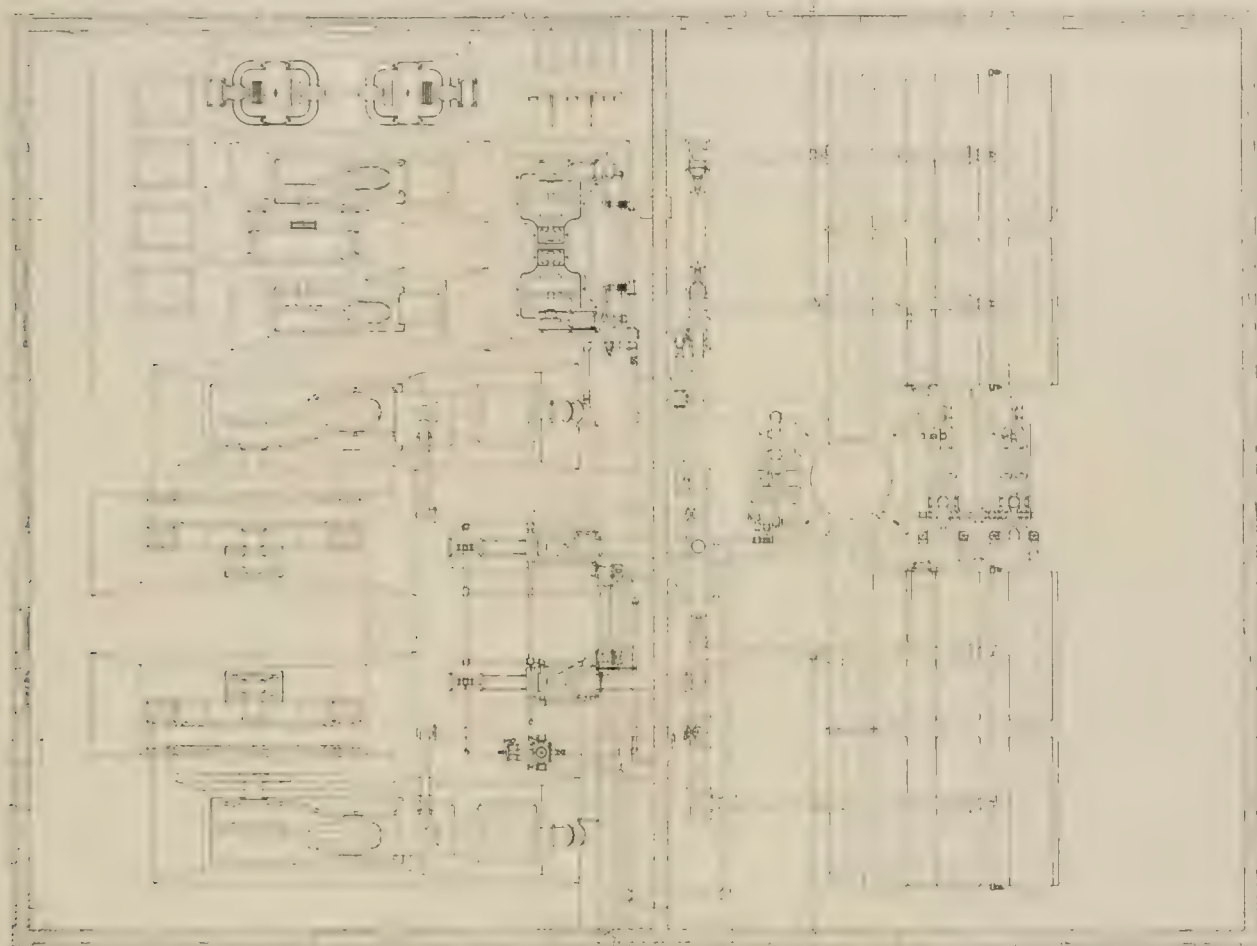
The fly wheels are 14 ft. diameter, weigh 30,000 lb., and have a rim speed of 5,500 ft. per minute.

The engines are designed for 150 lb. working pressure; and all parts subject to severe strain (such as crank disk, crossheads, pistons, etc.) are of cast steel.

m. draft, with one boiler working to rating, with a temperature of 525 degrees in uptake.

There is installed a 1,250 h. p. standard Cochran open feed water heater, which is supplied with water at 100 degrees from the hot well by a low pressure pump (4' x 6 x 6 in.) of Laidlaw-Dunn-Gordon make. This pump is located in condenser pit, and its supply comes

hammer. When the condenser has regained the vacuum it will throw the valve in the opposite direction, and the engine will again operate condensing. To demonstrate the workings of this valve during the test, the vacuum was broken on one of the engines (while under ordinary load) and the engine was operated from condensing to atmosphere, and back to condensing, in less than one minute.



PLAN OF POWER STATION—STARK ELECTRIC R. R., ALLIANCE, O.

by gravity from hot well just outside of the building. The heater is placed immediately back of the stack, and takes up space of but little consequence.

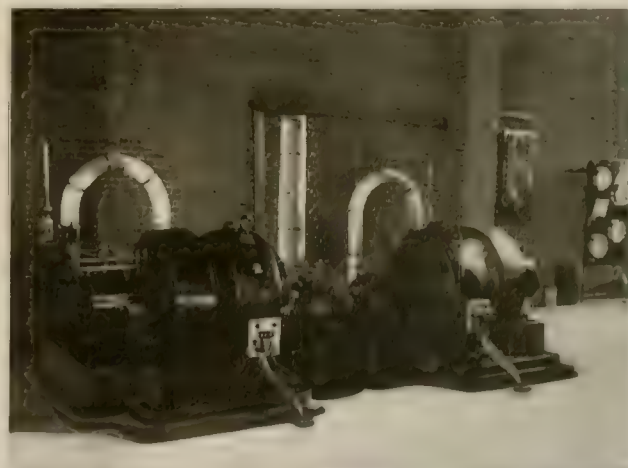
The steam supply of the heater is the exhaust of boiler feed pumps, low pressure pump, condensers and exciter engines. Under ordinary conditions there would be more exhaust steam than required, so the condensers and exciter engines are arranged to run condensing at will. However, it will require the exhaust steam of all the auxiliaries to maintain a feed temperature of 200 degrees or more, when the entire plant is working to its rating.

A recent test of 15,000 lb. of water passing through heater, with exhaust steam from one boiler feed pump, one condenser and one exciter engine, raised the feed water from 100 degrees (hot well) to 210 degrees.

The steam from each large engine is condensed by a 14 x 18 x 24 in. single double acting Laidlaw-Dunn-Gordon air pump and jet condenser, placed in the condenser pit. The suction is taken from a well just outside of building, which is supplied by gravity from the lake, takes the lift to the pump is 6 ft. The discharge is elevated about 2 ft. and is delivered to a hot well just out of the building. The overflow from this well is returned to the lake by gravity. The opening attachment of the condenser is permanent, and the engine is controlled by a bypass valve in the suction line, operated from the engine room floor. The vacuum obtained is shown by a standard barometer reading.

On top of the condenser chamber is placed an automatic three-way valve which will throw the engine exhaust into the atmosphere in case of loss of vacuum, closing the opening into the condenser

The boiler feed pumps are 10 x 6 x 10 in., outside center packed, of Laidlaw-Dunn-Gordon make, with sole plates, and are cross connected in such a manner that either or both can deliver to one,



EXCITER UNITS.

or all boilers, and the suction is cross-connected so that one can draw from the heater while the other works from hot well or cold well, or vice versa.

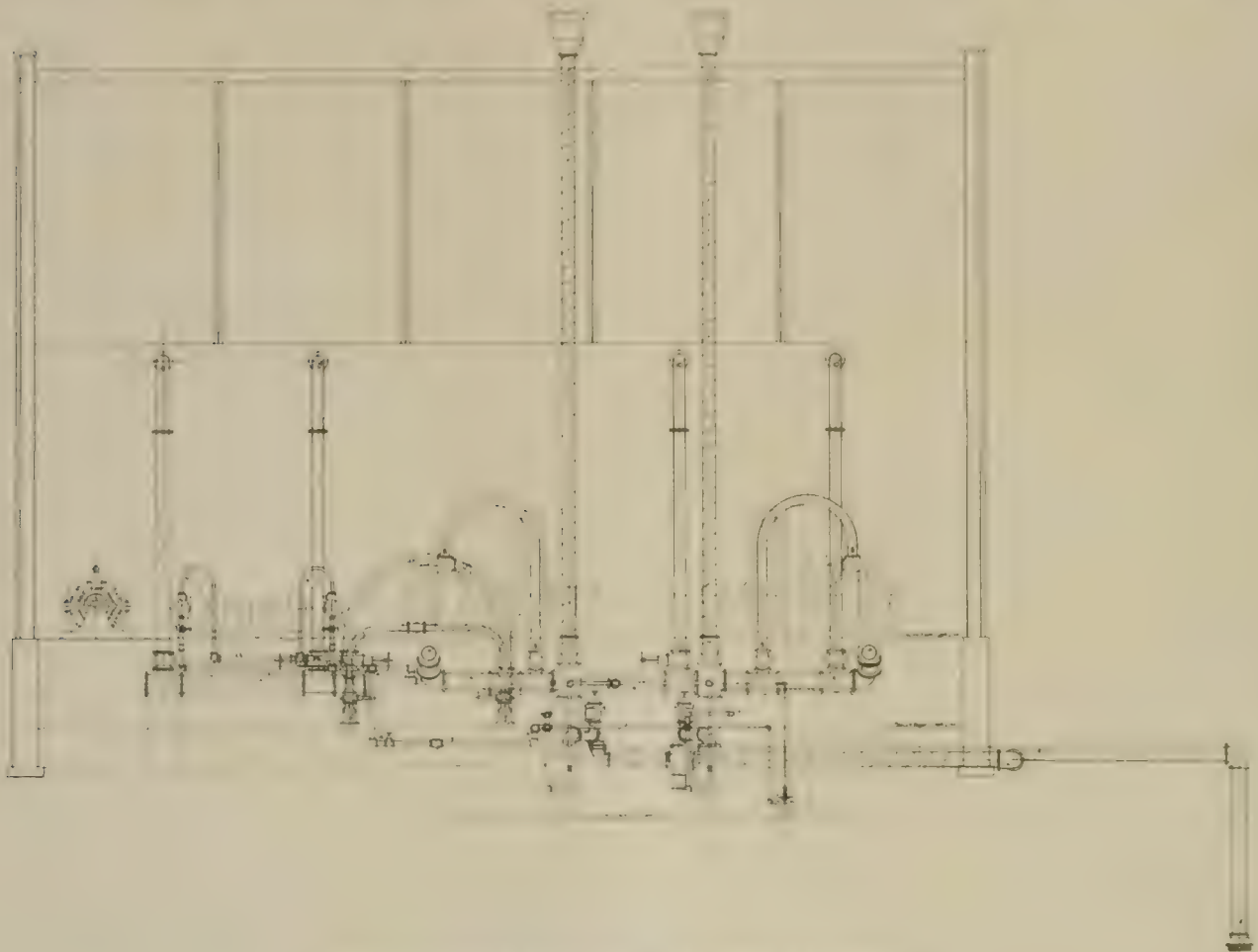
The piping has been specially designed to provide for expansion, drainage and accessibility. The main header is near the floor line of boiler room, and below the floor line of engine room. It is 14 in. in diameter and is in two sections. The connections between the boilers and header are of extra heavy 10-in. pipe, with long radius bends. The connections from the header to the engines are 8 in. in diameter and are below the floor line of engine room; the leads to engines above floor line have long radius goose neck bends. The valves are of the outside screw and yoke type, and were built for 250 lb. pressure; the steam pipe and fittings are all extra heavy. The header is drained by two 2-in. steam traps, discharging to a Worthington egg shape receiver with a 3 x 2 x 3-in. automatic pump attached, which in turn discharges direct to the boiler feed line or heater. All other pipes are standard weight.

The station has a gravity oiling system with 50-gallon tanks, ele-

Several attempts were made to throw the circuit breaker in on a water rheostat load exceeding 1,000 kw., but breaker would not hold.

The steam consumption per indicated horse power hour on a four hour run of 480 kw., was 13.4 lb. per horse power hour, or less than 20 lb. per kw. h. This was with 150 lb. boiler pressure, and 24-in. vacuum.

The Stark Electric Railroad Co. is a consolidation of the Alliance Electric Railway Co. and the Stark Electric Railway Co. The road, when completed, will connect Canton, Sebring and Salem, O. The portion at present operated comprises 24 miles which was opened for traffic May 1, 1903. The officers of the company are: President, C. R. Morley; vice-president, D. Morrison; secretary, E. S. Cook; treasurer, E. Wiebenson; superintendent, W. J. Berry; chief engineer, L. W. Glass. The consulting engineer for the company is



LONGITUDINAL SECTIONAL ELEVATION OF PIPING.

vated 20 ft., in boiler room, and piped direct to a central oiling device of each engine; the refuse oil passes down into a filter in condenser pit, from which it is pumped, by a steam pump, back into the supply tank. By this system it is found that the fresh oil required does not exceed 25 per cent of that required without such an arrangement. The cylinder oil is kept in a roll top oil cabinet, specially designed for this purpose. One-half of the cabinet is zinc lined, and acts as a waste chest.

The gage board is of ebonized slate, 5 ft. square, and has mounted on it, one steam, two vacuum and two receiver gages, and one marine clock, all with 10-in. faces, and having nickel finish and back connections.

All piping in the engine room is below the floor line, except the goose neck to each engine. This method of piping does away with all vibration and requires very little, if any, bracing, as the main header rests on solid foundations.

This plant was tested in the latter part of March, 1903, for the purchasers, by Chicago engineers, and the following results obtained. The maximum load carried on the engine was 1,097 h. p.

G. W. Knox, of Chicago, and the attorneys are Webber & Turner, of Canton, O.

The Arbuckle-Ryan Co. has under design and construction at the present time power plants as follows: A 1,200-h. p. for the Indian Territory Traction Co.; 1,200 h. p. for the Cleveland, Painesville & Ashtabula Railroad Co.; 1,500 h. p. for the Toledo & Indiana Railroad Co.; 2,000 h. p. for the Toledo & Chicago Railroad Co.; 750 h. p. for the Wichita Railroad & Light Co.; 500 h. p. at Danville; 1,000 h. p. at Champaign, Ill., the two latter being for the interurban railroad between these two points.

The Peterborough Hydraulic Power Co.'s new plant on the Otonabee River at Peterborough, Ont., will be equipped with the following apparatus purchased from the Westinghouse Electric & Manufacturing Co.: A 1,500-kw., 2,240-volt generator, to be directly connected to water wheels, and two 125-volt d. c. exciters of 75 kw. capacity each, together with switchboard. This power house will furnish power for the American Cereal Co.'s plant, the Peterborough Light & Power Co., and other plants.

WOVEN RATTAN AS A SEAT COVERING MATERIAL.

BY HEYWOOD BROTHERS & WAKEFIELD CO.

In the rapid development of railway enterprises, car building and general equipment which has taken place during the past few years, the study of the most advantageous methods of seating in the various styles of cars has not been neglected and the improved types of seats now on the market serve to confirm this statement and to indicate that this branch of car equipment has kept pace with the general advance. When considering the style of seat to include in their specifications, master car builders find that one of the important points to be taken into account is the covering material, as on this will depend the appearance of the car and to a large extent the lasting qualities of the seat.

Plush and carpet make rich and comfortable looking cars so long as they are kept well cleaned. Both of these materials will show wear in a few years of service, however, and require constant attention in order to keep them even reasonably free from dirt and dust. If this care is not exercised, as it is not likely to be, the seats soon look dingy and worn, destroying the fine appearance of the car. In addition to these objections, the materials mentioned are so expensive as to make the first cost of a seat very much more than that of one covered with rattan.

Genuine leather increases the objection as to advanced cost, and leather either genuine or artificial will become sticky in damp weather and hold the dust, while it will stretch and show wrinkles after the springs become set.

Woven rattan has the advantage of overcoming these objections to the greatest extent and its phenomenal growth in popularity as a seat covering material testifies to its efficiency and to the satisfactory results obtained by its use. Although it could hardly be claimed that rattan covered seats give a car the same rich appearance as is obtained by using plush or carpet seats which are in good condition, it is none the less true that they do produce a clean and neat effect which is not secured by any other covering. Rattan will not readily catch and hold dust and dirt. It is a thoroughly sanitary covering and if after continued use it does become soiled, it is easily washed clean by using soap and water or possibly a little ammonia or oxalic acid. It does not show the wear and will last the life of the car if used on a proper spring construction. The first cost is lower than that of any other covering and the cost of maintenance is materially less, while the durability far exceeds that of any other material.

MOHAIR PLUSH AS A SEAT COVERING.

BY THE MASSACHUSETTS MOHAIR PLUSH CO., BOSTON, MASS.

Mohair plush being made from hair of the Angora goat is very easily cleaned, the fibre being bright and very lustrous; it sheds dirt and soil of all kinds very much more than any other material used in car seat work. The back of the mohair plush is very closely woven, which prevents dirt and dust of travel from working down through the upholstery of the seat. This same dirt or dust being on the face of the plush is easily removed by brushing; many railroads use a pneumatic air brush which proves very satisfactory, completely removing dirt, dust and germs of all kinds. Some other fabrics in use on car seats, being more open in their weave, allow the dirt, dust and germs to work down through them into the stuffing of the car seat, and this objectionable matter cannot be dislodged except by re-upholstering the seat. This, to us, seems a great disadvantage, in comparison with plush, on account of the expense of re-upholstering the seats.

On the ground of durability it is generally conceded by those in position to make comparison that mohair plush is the most durable fabric for car seats on the market at present. For example, a representative of a large railway system told the writer that he had recently had removed from some car seats plush that had been put on twenty years ago. Again, a purchasing agent of a large railroad system stated that they had never had a plush wear out, that they always told him when taken from their seats to be used for some other purpose.

It does not have the disadvantage of some other fabrics on the market used on car seats of causing any damage to persons' cloth-

ing, if for any reason it should get torn and damaged in any way, or by its slipperiness causing accidents to people by slipping from seats when cars are going over rough places and sharp curves. In fact, plush would tend to hold them securely against such accidents. This might seem a remote advantage, but in actual practice it is a very important advantage.

Mohair plush is capable of being dyed to any shade to harmonize with the color scheme of any designer or decorator, and instead of disfiguring a finely decorated car, adds to its attractiveness. It also can be woven into many patterns; these patterns also can be made to harmonize with the general design of the car.

Mohair plush is used in the seats of all the well advertised lines running on the principal railroad systems, including the Pullman trains on which no money is spared to insure comfort and all possible luxury, the car builders appreciating its attractiveness and durability, and by recommending its use practically bear out all the statements made above.

SPECIFICATIONS FOR PLUSH COVERINGS ON PENNSYLVANIA R. R.

Through the courtesy of Mr. Chas. B. Dudley, chemist for the Pennsylvania R. R., we are enabled to give the specifications under which all plush for car seats and backs are purchased by the Pennsylvania R. R. It is believed these will be interesting and instructive to electric railway officials who are giving attention to the subject of car seat coverings.

The specifications follow:

I. Plush will be bought in amounts as the demands of the service indicate. Two kinds of plush will be purchased, known as "Standard Crimson" and "Standard Seal Brown." Quotations must be made and bills rendered by the linear yard. The width of the plush must be as ordered, and in determining the width of material received it will be measured across the mohair, excluding the selvedge. All plush must be made of good quality mohair, free from kemp and free from wool, with linen warp and cotton filling, and all plush must be evenly finished on top and a slight slant given to the pile. All plush must have mohair loops held in place by the "W" weave.

II. The standard crimson plush must correspond in shade to sample which will be furnished. It must be dyed with the best permanent dyes, and the upper surface must be free from any streaky or spotted appearance. The dyes must be of such a nature and the treatment of the material such that the plush will not crock. Samples from the shipment will be exposed to the sun or other source of light from time to time, and the information obtained from these exposures will be used subsequently in placing orders. This grade of plush must weigh not less than 19¼ ounces per square yard, excluding the selvedge, and excluding any starch or other material used for stiffening backs, or any make-weight or filling material. The linen warp must weigh not less than 3 ounces, the cotton filling not less than 4¼ ounces, and the mohair not less than 12 ounces per square yard, excluding the selvedge. The number of linen threads must not be less than 37, the number of cotton threads not less than 62 per inch, and the number of free ends of mohair threads not less than 1147 per square inch. The fineness of the mohair must be such that the average of ten loops selected at random across the piece must show not less than 48 hairs each. The thickness of the plush, including the back and pile, must be not less than 0.135 of an inch, nor more than 0.140 of an inch. The tensile strength of a strip one inch broad of the linen, must be not less than 80 pounds, and the cotton, not less than 90 pounds. The plush must be so well washed that a piece three inches square does not contain more free acid than is neutralized by 0.3 of a cubic centimeter of half normal standard alkali. The amount of ash must not exceed 0.10 of an ounce per square yard.

III. The standard seal brown plush must correspond in shade to sample which will be furnished. It must be dyed with best permanent dyes, and the upper surface must be free from any streaky or spotted appearance. The dyes must be of such a nature and the treatment of the material such that the plush will not crock. Samples from shipments will be exposed to the sun or other source of light from time to time, and the information obtained from these exposures will be used subsequently in placing orders. This grade of plush must weigh not less than 20¾ ounces per square yard, excluding the selvedge, and excluding any starch or other material

for stuffing backs or any make weight or filling material. The linen warp must weigh not less than 4 ounces, the cotton filling not less than 4 1/2 ounces and the mohair not less than 3 ounces per square yard, excluding the selledge. The number of linen threads must not be less than 37, and the number of cotton threads not less than 62 per inch, and the number of free ends of mohair thread must not be less than 1147 per square yard. The fineness of the mohair must be such that the average of ten loops selected at random across the piece must show not less than 48 hairs each. The thickness of the plush, including the back and pile, must not be less than 0.165 of an inch, nor more than 0.170 of an inch. The tensile strength of a strip one inch broad of the linen, must not be less than 80 pounds, and of the cotton, not less than 60 pounds. The plush must be so well washed that a piece 3 inches square does not contain more free acid than is neutralized by 0.5 of a cubic centimeter of half normal standard alkali. The amount of ash must not exceed 0.10 of an ounce per square yard.

IV. A shipment of plush being received at any shops, a sample, full width of the piece, about 6 inches broad, must be sent by Railroad Service to C. B. Dudley, Chemist, Altoona, Penna. One such sample must be sent for every five pieces or less of plush of the shipment, and each sample must be accompanied by a "sample for test" tag properly filled out. If there are more than five pieces in the shipment, two tags must be sent, if more than ten, three, and so on, and each tag must bear a designating mark, and the same mark must be put on each of the pieces of plush which the tagged sample represents. The various samples will represent the shipment, and each five pieces or less, will be accepted or rejected according as its sample meets the requirements or not. The shops must verify the number of yards in the shipment before passing the bill, and none of the shipments must be used until a satisfactory test report is received, except by special permission from the superintendent of motive power.

In answer to an inquiry Mr. A. W. Gibbs, general superintendent of motive power for the Pennsylvania R. R. gives the following information regarding the method of cleaning plush seats and backs:

"It is our practice at the Altoona shop, when the plush is good and not faded, to beat and blow the dust out of it with compressed air. When the plush is dirty and not faded the same practice is followed, after which it is scrubbed with the French renovating material. If the plush is faded, it is cleaned with the same material and then dyed, using the crimson renovator on standard plush, and the plain renovator and seal brown on the seal brown plush.

"At our West Philadelphia shops, the practice is to first dust the seats and backs with compressed air, and after the necessary repairs are made, they are scrubbed with a solution of water, benzine and ammonia, mixed in the proportion of one-half pint benzine, one-half pint ammonia, and twenty gallons of water. This, of course, may be reduced as to the amounts of benzine and ammonia to suit the conditions of the seats. If it is necessary to dye them, we use material known as "Klenzine" dyer "A," mixed to suit the conditions of the seats. The latter operations we have found entirely satisfactory."



FROM INDIANAPOLIS TO NEWARK, O.

On July 18th the last rail was laid on the electric interurban connection between Richmond Ind., and Eaton, O., a distance of 20 miles, thereby closing the last gap in the 250-mile electric trunk line between Indianapolis and Newark, O. The first car to run over the entire route made the trip on July 26th. When a slight difficulty in regard to a railroad overhead bridge at Richmond can be obviated, and through cars can be put on, the sleeping cars of the Holland Palace Car Co., described in the "Review" for June, will have arrived at Indianapolis and will be put in service on this trunk line. It is planned to have the sleeping cars leave Indianapolis and Columbus at 9 p. m., and they will arrive at their destinations at 6 o'clock the next morning, having covered the 190 miles between the two cities in nine hours.

In going from Indianapolis to Newark the systems traversed are those of the following companies: Indianapolis & Eastern Traction Co., which runs to Dublin, a distance of 46 miles from the city limits of Indianapolis; the Richmond Street & Interurban Railroad Co.,

from Dublin to three miles east of Richmond; the Dayton & Western Traction Co., from three miles east of Richmond to Dayton, a distance of 37 miles; the Dayton, Springfield & Columbus Electric Railway Co., the Columbus, London & Springfield Railway Co., and the Columbus, Buckeye Lake & Newark Traction Co., the three last mentioned being Appleyard syndicate lines.

The Appleyard system will be extended to Wheeling, and will have connection from there to Pittsburg, soon after the first of the year. In consequence, it is intended to employ observation, dining and sleeping cars for the through run from Indianapolis to Pittsburg. The syndicate also plans through connections from Columbus to Cleveland, via Canton, next spring and arrangements are being made for a through service from Indianapolis to Cleveland. The Appleyard syndicate is stated to be contracting with the Holland company for several 60-ft. combination sleeping and dining cars.

In addition to these plans, the Ohio and Indiana companies named, and the interests that control the Indiana Union Traction Co., together with St. Louis interests and the McKinley syndicate, of Illinois, are said to be planning a through electric railway service from Pittsburg through Columbus, Indianapolis and Terre Haute to St. Louis, a distance of 1700 miles.



CONGRESS HALL, SARATOGA SPRINGS.

Congress Hall is a very popular hotel, conveniently located on Broadway, Saratoga Springs, between the celebrated Congress and Hathorn Springs and within one minute's walk of each. The hotel is admirably arranged for witnessing all of the attractive phases of Saratoga life, being in the center the fashionable portion of the



CONGRESS HALL, SARATOGA

village. It is open from June to October. There is a promenade piazza, 250 ft. long and 20 ft. wide, overlooking Broadway, the south front presenting a picturesque view of Congress Spring and Park. An ample piazza also extends around the rear of the part of the building that faces Broadway, overlooking an interior park.

Congress Hall accommodates comfortably 1,000 guests. The rooms are spacious, admirably ventilated, and furnished with a degree of comfort and luxury not often found. The walls of this hotel are 20 in. thick, hollow in the center, thereby securing protection from the heat of summer. In the cool days of summer and early autumn there is steam heat, besides grate fires in the halls and public rooms. The hotel is protected against spread of fire by massive fireproof walls, with iron doors, that extend from cellar to roof. The ball room is located on the opposite side of Spring St., connected with the hotel by a handsome bridge, which at night, when illuminated by colored lights, presents an attractive appearance.

Two immense wings 300 ft. in length extend from Broadway to Putnam St. The north wing overlooks the celebrated Hathorn Spring, while from the south wing there is a fine view of Congress Spring and Park. The hotel has all of the modern improvements, and the cuisine is renowned for its perfection. A fine orchestra gives morning and evening concerts daily, with hops in the ball room twice weekly.



It is reported that the Norfolk, Portsmouth & Newport News Co. has been dissolved owing to failure to negotiate the bonds.

NEW CARS FOR THE RAPID RAILWAY, DETROIT.

Six fine cars like that shown in the illustration were built by the J. G. Brill Co. and lately placed in service on the lines of the Rapid Railway, Detroit. Those who attended the street railway convention at Detroit last year and took the opportunity to ride to Port Huron over the Rapid Railway will remember the excellent service on the 70-mile run between the two cities, the fine scenery along the Lake and River St. Clair and the prosperous appearance of towns along the route and the thickly populated country between. A large number of passengers are carried every day to and from the lakeside resorts and on Sunday a double service is necessary to handle the crowds from Detroit and other cities along the lines.

The new cars are mounted on Brill No. 27 A 2 trucks, capable of making very fast time. The cars have smoking compartments seating 19 passengers, six reversible back seats, two against the partition and one for three passengers at the forward end. The regular compartment seats 15, twelve reversible back seats, two against the partition and one against the closet containing the heater. The partition is of solid cherry, with glass in the upper portion. The side windows, including those in the vestibule and the ends, are arranged to drop into pockets, and flaps are provided for the pocket openings. A saloon of the usual steam car type is located next the door leading to the rear platform. It is intended to run the cars in one direction only, and therefore the forward end

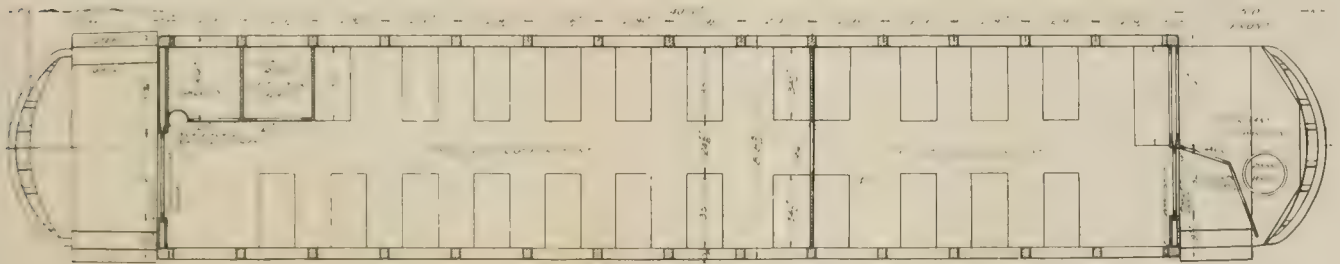
the floor. The needle beams are double trussed, the longitudinal rods being $1\frac{1}{2}$ in. in diameter. The side sills are double, with $\frac{3}{8}$ x 12-in. steel plates between. The outside sills are $4 \times 8\frac{3}{4}$ in., bolted through the plates to timbers $2\frac{3}{4} \times 7\frac{7}{8}$ in. The intermediate sills are $3\frac{3}{4} \times 6\frac{3}{4}$ in., the center sills $3\frac{3}{4} \times 7\frac{7}{8}$ in. and end sills $5\frac{1}{4} \times 6\frac{3}{4}$ in. The flooring is double with one inch of mineral wool packed between to deaden sound. The sill plates extend $\frac{1}{4}$ in. above the sills and are screwed to the posts. The side posts are



BRILL CAR FOR RAPID RY

$3\frac{1}{4}$ in. thick and the corner posts $3\frac{3}{4} \times 5\frac{1}{2}$ in. The general dimensions of the cars are as follows: Length over end panels, 40 ft.; length over crown pieces, 50 ft.; length of passenger compartment, $25\frac{1}{4}$ ft.; length of smoking compartment, 14 ft.; width over side sheathing and posts, 8 ft. 834 in.

The interiors are finished in cherry of natural color, with ceilings of decorated birch. The inside trim is of solid bronze through



FLOOR PLAN RAPID RAILWAY CAR

is vestibuled, while the rear platform is open. The arrangement of the front platform is somewhat novel. A partition extends at an angle from the vestibule corner post and is met by a swing door hinged to door post of the car. In the corner of the motorman's cab thus made is situated a 20-in. horizontal brake wheel. There are two risers to the platform 12 in. in depth each and the lower one, 10 in. from the rail. From platform to car

out, including basket racks, which are placed over every other window. Among the patented specialties of the builders' make which are furnished are angle iron bumpers, "Dedenda" gongs, radial draw bars of channel iron and "Dumpit" sand boxes. In addition to the regular draw bars, heavy forged 6-ft. portable draw bars are swung on hooks under the side sills. The trucks are the builders' No. 27 A 2, with 36-in. wheels, wheel base of 6 ft. 6 in. and axles 5 in. in diameter. The cars are equipped with 76-h. p. motors. The weight of a car with trucks and motors is 58,440 lb.



INTERIOR, RAPID RY CAR

floor is 8 in. The platforms at both ends are 3 ft. from end panel over crown piece. Besides the end doors, angle iron knees extend from the body bolter to the crown piece.

The construction of the car throughout is unusually strong. In side sills and floor beams are placed upon the posts 20 in. from

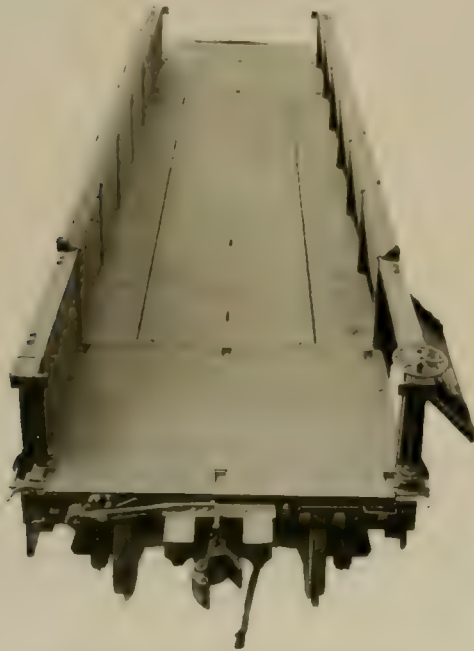
CONTACT RAIL BONDS FOR NEW YORK SUBWAY.

The Interborough Rapid Transit Co., of New York City, recently awarded the contract for the rail bonds required for the contact rail in the subway system to the Mayer & England Co., of Philadelphia, for its "Protected" rail bond. A few months ago this company received the contract for the bonds for the wheel rail. There will be four bonds at each joint, two under the joint plates and two under the base of the rail. The bonds will be applied to the base of the rail with special hydraulic tools supplied by the Mayer & England Co. The holes for the bond studs will be cut through the rail base by a 100-ton hydraulic punch designed expressly for this purpose. The bond terminals will then be placed in these holes and compressed by a hydraulic compressor of 35 tons indicated power. As the cutting punch produces a tapered hole, with the large diameter at the top, and the copper in the bond terminal is compressed into the holes against the small end, the contact obtained under the 35-ton pressure exerted is exceptionally good and is said to be entirely moisture proof.

THE HART CONVERTIBLE CONSTRUCTION AND GONDOLA CAR.

Some time ago we illustrated in the "Review" a new type of convertible car built by the Rodger Ballast Car Co., of Chicago, for use in the construction and maintenance of steam and street railways, which was designed to accomplish something not hitherto attained; that is, a practical car that can readily be converted anywhere on the line without tools, expense or loss of time, into a car suitable for any one of three distinct classes of service, so as to make it available at all times as a dividend earner and prevent its entering into the list of a "class car", suitable only for special service at special seasons of the year.

This car is built so that it will automatically dump the entire contents into the center of the track, the flow of material onto the track being regulated so that small or large quantities can be de-



RODGER BALLAST CAR—SIDE DUMP.

posited, as may be needed for track raising, tamping in or top dressing. The car can also be arranged to use with a top plow, depositing its entire contents on the sides of the track if desired and by opening the side doors about two-thirds of the load can be dumped on the sides of the track automatically. When not needed as a center dump ballast car or a side dump car for plowing off on the sides of the track, it can quickly and easily be converted into a standard flat bottom gondola car, suitable for all gondola purposes.

As an automatic center dump car this has been found very valuable for interurban construction, and the plan followed is to make excavations either in the country or city streets, to the grade desired, throwing the dirt to one or both sides, then the track is laid just where wanted and thoroughly ballasted, allowing traffic to be started at once and leaving the work of cleaning up and grading alongside of the track to be done later, while the road is earning a revenue.

By the use of this type of car several distinct and decided advantages are obtained, all tending to expedite construction and lessen the cost. First, the gravel, broken stone or other ballast is deposited in the center of the track just where needed for use, saving two handlings as compared to the use of flat cars where the ballast is first thrown off onto the sides of the track and afterward shoveled into the track. Second, a safe and permanent roadway is assured, as the ballast is not allowed to become mixed with soil. Third, the waste of ballast incident to shoveling and its becoming intermingled with soil is entirely eliminated.

The car is designed so that all kinds of dumpable materials may be readily handled, and is provided with large openings in the bottom for use as an automatic center dump and equally spacious openings for side dump or top plow work.

Another decided advantage of the Rodger car is that it carries as much material as four flat cars of the same length and breadth and as much material as from six to ten small hopper cars, thus greatly saving in first cost of equipment, in train service, trackage, switching, maintenance of cars, etc. The capacity of these cars is from 80,000 to 100,000 lb. (the cubic capacity being up to 38 cu. yd. per car) this being the capacity of the standard car. Smaller cars of 30-ton capacity are also built upon special request.

The Rodger company claims that ten years' constant service on the leading railways of the United States and three years' use by interurban electric railways have established the fact that ballasting material, whether gravel, broken stone, burnt clay, chat, pebbles, cinders or dry sand, can be hauled, handled and distributed in no other way so rapidly and economically as with Rodger cars, the average cost of this method being only about one-half the cost of doing the same work under old-time practice. Also that the fact



RODGER BALLAST CAR—CENTER DROP.

that the car can quickly and inexpensively be converted into a standard flat bottom gondola and turned into general freight or coal service, greatly enhances its value in construction, maintenance and operation on both electric and steam railways.

PARK AMUSEMENTS.

Two of the attractions which have done a great deal to make the street railway pleasure resort popular and at the same time make it a financial success are specialties of the Ingersoll Construction Co., of 307 Fourth Ave., Pittsburg, Pa. These are the celebrated figure-8 roller coaster and the "Laughing Gaiety", and it is perhaps not too much to say that all of the successful park resorts have one or both of these attractions. Wherever installed the figure-8 coaster has been a drawing card and consequently a good investment for street railway companies.

The Ingersoll company has for its officers two men who are well known in the amusement field, both of whom have had a long and successful career in this business, the success of which they attribute to the fact that they have confined themselves entirely to legitimate attractions. The president is Frederick Ingersoll, and the secretary and manager E. E. Gregg. The company believes its plan for erecting and operating the various plants at its own expense and giving the company owning the park a percentage of the gross receipts for the privilege is an impressive guarantee, and the plan is one that commends itself to many park companies who hesitate to make any considerable investment for amusements. The Ingersoll company will be represented at the Saratoga conventions in September, and promises a very attractive display.

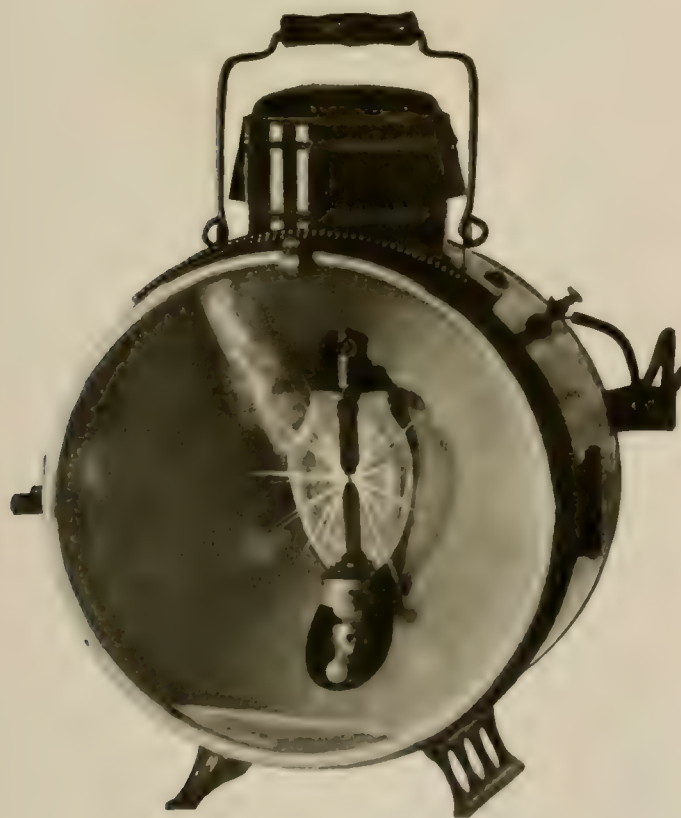
SOME ST. LOUIS CAR CO. SPECIALTIES.

An innovation has recently been introduced by the St. Louis Car Co. in the use of arc lights for interior car lighting. The mechanism of these arc lamps was designed by Messrs. Anderson and Smith of the Los Angeles & Pasadena Electric Railway Co. several years ago and has recently been perfected by the St. Louis Car Co. These lamps are of about 800 c. p. capacity each, are 12 in. in length and weigh six pounds. The lamps are secured on the head lining of the upper deck and are arranged so that they can be attached or taken down as rapidly as an incandescent globe.

Headlights using the same style of lamp are also furnished by this company with a capacity of 2,500 c. p. These headlights are furnished with a 14 in. reflector and weigh 22 lb. complete. Where the variation in potential does not exceed 75 volts two interior lamps can be connected in series with the headlight. It has been found more satisfactory, however, to burn the headlight on a circuit separate from that of the interior lamps for the reason that it is sometimes necessary to have the lights in the car burning and the headlight out or vice versa. Resistance coils for these lamps are wound according to the number of lamps which are used in series.

While at first sight it seems almost impossible that arc lights could be used on electric cars on account of the constant jarring which would tend to put out the arc in an ordinary lamp, the clutch used in this lamp has been found to entirely obviate this trouble. In fact, the lamp may be subjected to the most severe jarring without putting out the arc. Two of these arcs in series will stand a variation in voltage of 200 volts and not go out; three will stand a variation of 100 volts and five a variation of 50 volts where the station voltage is from 500 to 550 volts direct current. A large variety of globes and fittings may be used with the lamps to suit any interior finish.

The arc headlights are also arranged to be fitted with a dimmer



ST. LOUIS CAR CO. ARC HEADLIGHT

for use when it is desired to subdue the intense light. The dimmer consists of a separate attachment made up of a perforated metal disk mounted in a brass ring and secured so that it may be readily opened or closed or entirely removed when desirable.

The general design of the reversible back car seat made by the company is shown in one of the accompanying illustrations. The

frame for this seat is made of ash tenoned and glued, and forms the base for the springs. After the springs are assembled on the frame they are, in upholsterers parlance, harnessed. After this heavy duck is put on which in turn is covered with a sheet of pure hair felt one inch thick. The corners are rounded by the introduc-



ST. LOUIS CAR CO. SEAT.

tion of curled hair encased in cotton duck and next the whole is covered with the best enameled twill weave canvas-lined rattan, plush or leather as the case may be.

The seat back is made in practically the same way, the only difference being in the length of the springs. Five years' experience has proved that this is a strong and satisfactory seat and while the cover may wear out the frame never will.

THE H. W. JOHNS-MANVILLE CO'S. CHICAGO STORE.

A short time ago the H. W. Johns-Manville Co's. branch store at 173 Randolph St., Chicago, which it has occupied more than five years, was enlarged to meet the growing demands of the business by the leasing of the adjoining store at 171 Randolph St. The major part of the partition between the stores was removed, thereby giving the company a store double the size of the old one. In addition, it occupies the basement, which extends the full width from Randolph St. to the alley at the rear of the building. The store and basement are each 160 x 40 ft. in size. The front half of one side of the street floor is occupied by the office and the salesmen's desks; the other half is used for the retail salesroom and for the storage and display of "Noark" materials and asbestos sundries. The rear portion of the store, with the exception of the shipping department, and the entire basement are given over to a stock of the Johns-Manville specialties, including asbestos and magnesia coverings, packings, roofing material, trolley line insulation, mica weatherproof sockets, the "Vulcabeston" packings, etc. The alley at the rear is exceptionally wide and affords excellent shipping facilities. The manager of the Chicago branch of the H. W. Johns-Manville Co. is T. G. Younglove.

On August 13 the establishment of electric interurban connection between Indiana and Ohio was celebrated by a demonstration at Richmond, Ind., in which over 10,000 persons participated. On the same day the officials of the Indianapolis & Eastern Traction Co., with a number of invited guests, started from Indianapolis for a trip to Newark, O., the longest journey ever made over electric lines.

INTERESTING CARS FOR DES MOINES.

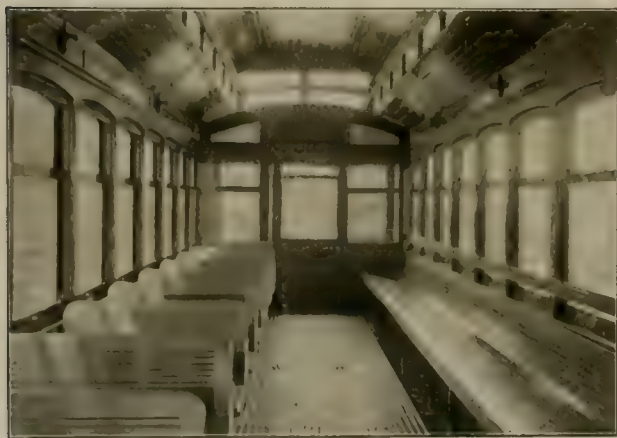
The American Car Co. of St. Louis, recently completed eight cars for the Des Moines City Railway Co., which have an interesting seating arrangement, as will be seen in the accompanying illustrations. The purpose of this arrangement is to secure the largest seating and standing capacity possible with the area of the floor. The transverse seats are 32 in. long, arranged so that a person's body may extend a trifle over the end without discomfort. The wide aisle obtained by having the seats on one side placed longi-



AMERICAN CAR FOR DES MOINES. 1A.

tudinally accelerates movement of passengers in and out, an important consideration in city service.

Octagonal vestibules are provided at the ends of the car with openings on the same side. The interiors are finished in cherry, with ceilings of the same, composed of tongued and grooved boards. The windows are arranged with double sash, the upper stationary and the lower to raise. The length of the cars over end panels is 28 ft.; over crown pieces, 37 ft.; from panel over crown piece, 4 ft. 6 in.; width over sills, including panels, 8 ft.; from center to center of posts, 2 ft. 8 $\frac{1}{4}$ in.; side sills, 43 $\frac{1}{4}$ x 7 $\frac{3}{4}$ in.; end



INTERIOR DES MOINES CAR.

sills, 4 x 7 $\frac{3}{4}$ in. The side sills are plated on the outside with 5 $\frac{1}{8}$ x 8 in. steel. The thickness of the corner posts is 4 $\frac{1}{2}$ in. and of side posts 2 $\frac{1}{2}$ in. From the rail to top of step is 18 in., and from step to platform 14 in. The cars are furnished with the builders' sand boxes and with angle iron bumpers (Brill patent). The cars are mounted on Brill No. 27-G trucks, with 4-ft. wheel base and 33-in. wheels, having 2 $\frac{1}{2}$ -in. tread and $\frac{3}{4}$ -in. flange. The trucks are equipped with 38-h. p. motors.

The act passed to remedy alleged defects in the 50-year franchise of the Cincinnati Traction Co. has been declared unconstitutional by the Superior Court before which the case was brought.

SOME NEW MCGUIRE APPARATUS.

The McGuire Manufacturing Co., of Chicago, has under way at its works a combined sweeper and sprinkler for the city of Wellington, Australia, which is of most unique design. When completed the machine will have the appearance of an ordinary street-car. Two tanks 14 ft. long by 6 ft. high with a capacity of 1,500 gallons each form the body of the car. A passage way 2 ft. 6 in. wide separates the tanks and is covered in a manner similar to the ordinary street car with a provision made for the trolley board. The sweepers are at each end and being of small diameter are placed under the over-hang. The sprinklers are so arranged that the street may be sprinkled ahead of the sweeper or after the sweeper has operated, as may be desired.

One of the particular advantages of such construction is the possibility of knocking the machine down and shipping it in small packages which are easily put together at the destination.

The McGuire Manufacturing Co. shipped two sprinklers to South Africa early in the spring and another to Sao Paulo, Brazil, and has but lately shipped trucks to Bangkok, Siam, and North Sydney, Nova Scotia. The fact that orders come from such distant points to a company located so far inland as Chicago is certainly complimentary to the method of advertising or perhaps to the product of the McGuire company.

There is in the yards of the McGuire company a 4,500-gallon pneumatic sprinkler just about completed for the Rhode Island Railway Co.; this machine or one similar to it will be exhibited at the street railway convention at Saratoga. It is claimed for this machine that it will sprinkle a street 100 ft. wide and 6 miles long with one charge. It is equipped with the new sprinkler head designed by the McGuire Manufacturing Co. The interesting features of the new head are that the quantity of water used can be regulated by the motorman to correspond with the speed at which the machine is run and a series of levers enables the operator to control the spray of water completely. It may be permitted to sprinkle 50 ft. from the side of the car or lessened to any desired distance or the sprinkling may be confined to the track only. The great feature of the machine is that the last gallon of water can be driven by means of the air compressor, through the same distance obtained when the tank is full.

We understand that the McGuire company is to give a demonstration of the working of the machine at the coming convention, and inasmuch as the plan of having the street railways do the street sprinkling is being advocated in many cities, the McGuire exhibit should be particularly interesting and attractive.

ORGANIZATION OF PUBLIC SERVICE CORPORATION OF NEW JERSEY.

The Public Service Corporation of New Jersey announced August 1st that for purposes of operation its lines have been divided and grouped into three districts and district superintendents appointed, as follows:

First District: Lines of North Jersey Street Railway Co. east of the Hackensack River; lines of Jersey City, Hoboken & Paterson Street Railway Co., excepting those north of Park Ave., East Rutherford; Bergen Turnpike Co. (both toll road and railway); People's Elevating Co.; Port Richmond & Bergen Point Ferry Co. District superintendent, Newton W. Bolen; office, 21 Hudson Pl., Hoboken.

Second District: Lines of North Jersey Street Railway Co. west of the Hackensack River and south of Passaic St., Passaic; lines of Orange & Passaic Valley Railway Co.; lines of Elizabeth, Plainfield & Central Jersey Railway Co. District superintendent, Warren S. Hall; office, 315 Market St., Newark.

Third District: Lines of Jersey City, Hoboken & Paterson Street Railway Co. north of Park Ave., East Rutherford. District Superintendent, Thomas W. McAndrews; office, Market and Jersey Sts., Paterson.

On July 22d the first spike, a silver one, was driven for the track construction of the Biloxi (Miss.) Electric Railway & Power Co.

STREET RAILWAY OUTINGS.

One-half of the employees of the Grand Rapids Railway Co., with their families, were given an outing at Reed's Lake and Ramona Park July 27th, and the next day the other half were treated to a like recreation. Several of the road's directors participated on both occasions. There were free transportation, free entertainment and free refreshments for all, under the supervision of the superintendent, J. C. Madigan.

The 10th annual picnic and games of the Toronto Railway Employees' Union and Benefit Society occurred July 25th.

On July 28th the Topeka Railway Co.'s employees held an outing at Vineyard Park.

FRESH EMERGENCY CAR BRAKE.

The Fresh emergency brake, which was described in detail in the "Review" for February, 1903, is shown applied to a car in the accompanying illustration. This shows one of the single equipments on a Brill single truck car, and, as will be noticed, the only part of the mechanism in sight is the chuck end of the roller bar. Besides this the brake staff on the platform is all that is visible. The rest of the mechanism is entirely out of sight, and there are no obtrusive parts to spoil the appearance of the car.

The car shown in the illustration was equipped with this brake



FRESH EMERGENCY BRAKE.

last November and has been used for testing purposes throughout the past winter under all conditions of weather and rail, and is reported to have given highly satisfactory results. The makers have been experimenting with a number of different materials to overcome the difficulty of slippery rails, caused by fog or mist, in order to determine the most effective material to secure the best braking efficiency. They have also made a number of changes lately in the method of attaching the brake so as to provide uniform attachments suitable for all kinds of trucks. For double truck cars a double equipment of these brakes is used, one for each truck, and circle bars are used on the draw bars so as to give the trucks the necessary freedom of motion.

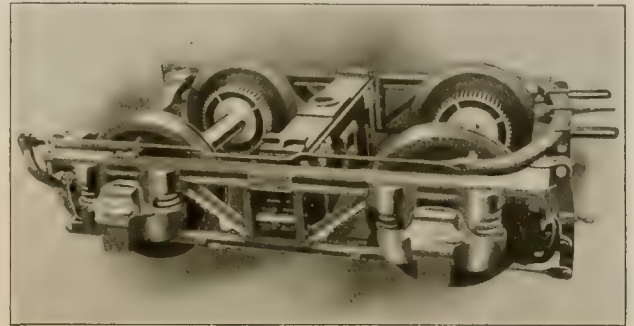
The makers are now ready to submit these brakes to tests on either single or double truck cars, or they will furnish brake equipments on 30 days' trial. This brake is claimed to be highly efficient, and one of its chief advantages is that it can be applied practically without muscular effort. It is simple in construction and can be readily attached to all styles of cars. It is made by Fresh & Spedden, of Cumberland, Md.

HERSCHELL, SPILLMAN & CO'S. OUTING.

The third annual outing of the employees of Herschell, Spillman & Co., manufacturers of merry-go-rounds, of North Tonawanda, N. Y., took place August 1st. Invitations were issued, each in the form of a warrant commanding the recipient to attend, the penalty for failure to do so being the loss of the "best day of his life." There was a gathering of all sorts, including football, 200 yd. foot race and running high jump contests between teams representing different departments, and Tussing's Military Band furnished music. J. C. Kinsel, of Washington, delivered an address on "My experience in the advertising North Tonawanda has had by the Merry-go-Rounds shipped by Herschell, Spillman & Co." The printed program contained the menu, a happy conceit comprising a list of names of persons who had been the guests of these fortunate manufacturers on the previous day.

BRUSH HEAVY-SERVICE TRUCKS.

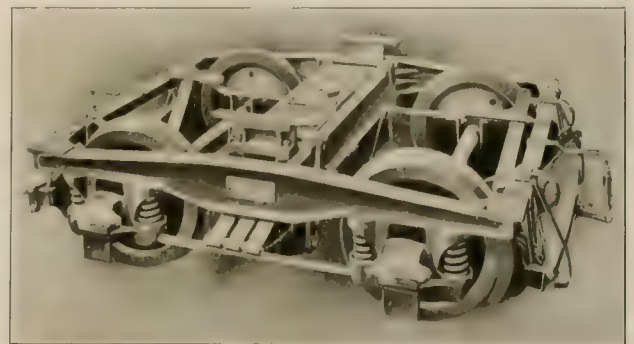
The accompanying illustrations show the type F heavy service motor truck and the type F heavy-service trail truck made by the Brush Electrical Engineering Co., Ltd., of London, Eng. This type of motor truck is used on many of the electric railways in the United Kingdom, and has also been adopted by the Metropolitan District Ry., of London, as standard. It is claimed for it that it will with-



BRUSH HEAVY SERVICE MOTOR TRUCK

stand the working stress of two 175 h. p. motors, carry a load of 30 tons at a speed of from 25 to 30 miles per hour, and sustain successfully the action of the most powerful air brake. It is machine fitted throughout and braced for diagonal strains with heavy gusset plates riveted to each corner. It is built in three different weights, for either light railways, main-line rolling stock, or heavy electric locomotives.

The side frames are of cast steel, and are tested at the works to five times their maximum load. The bolster is box-shaped; the sides consist of two pieces of channel steel with a top and bottom of flat steel plate, the whole being riveted together. The bolster shrouding is made of flat steel secured to the side frames with rivets at each end. The end sills are of channel steel secured to the end of each side frame by three 3/4-in. rivets. Four elliptic springs and two helical springs are suspended beneath the bolster, while eight helical springs of sufficient capacity to carry the entire load are in-



BRUSH HEAVY SERVICE TRAIL TRUCK

serted between the journal boxes and side frames. The brakes are suspended from the end sill of the truck; they have a leverage of 10 to 1. The heavy-service trail truck shown was designed to run in conjunction with the other and is equally substantial.

DECATUR TRACTION & ELECTRIC CO.

The property of the Decatur Traction & Electric Co., of Decatur, Ill., was sold last month to the McKinley syndicate and the new organization has elected officers as follows: President, W. B. McKinley, of Champaign, Ill.; secretary and treasurer, T. B. Macaulay, of Montreal, Can.; manager, W. A. Bixby, of Decatur, Ill. The board of directors comprises these officers and S. H. Ewing and J. E. Johnson. There are no local extensions of the line contemplated for the year, but the Decatur, Springfield & St. Louis Railway Co., which is controlled by the same company, expect to build from Decatur toward Springfield this fall.

AUBURN & SYRACUSE INTERURBAN LINE.

The Auburn & Syracuse Electric Railroad Co. began operating its 26-mile interurban line between Auburn and Syracuse, N. Y., Jan. 2nd last and the president Mr. C. D. Beebe, reports that the business has exceeded expectation. This is a single track road and

compartment contains an upper and a lower berth. During the day time the chairs are arranged as shown in Fig. 3, the dotted lines on which illustrate the space in the car occupied by one compartment. The compartment walls are made of the same material and operate very similar to the cover of a roll top desk, which will be seen in Fig. 4 in which the section is made up for the night. A

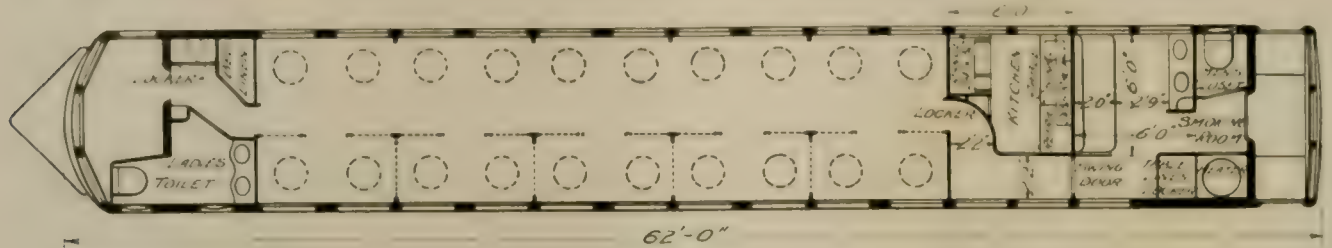


FIG. 1 FLOOR PLAN OF HOLLAND SLEEPING CAR

passes through Skaneateles and Marcellus, in the heart of a good farming country. The running time is one hour. The rolling stock includes four new passenger cars, equipped with 300-h. p. motors, and two large baggage cars, all built by the G. C. Kuhlman Co. The company also controls the Auburn city street railway system, operating three cars equipped with 200-h. p. motors.

HOLLAND SLEEPING CARS.

The accompanying illustrations show the details and general arrangement of the palace sleeping cars which are being put in service by the Holland Palace Car Co. of Indianapolis. A brief description

floor is built four inches above the regular floor of the car and the roll curtain goes down in chambers between the two floors. This construction does not in any way detract from the strength of the



FIG. 3 SECTION OF COMPARTMENT, SHOWING CHAIRS FOR DAY USE.

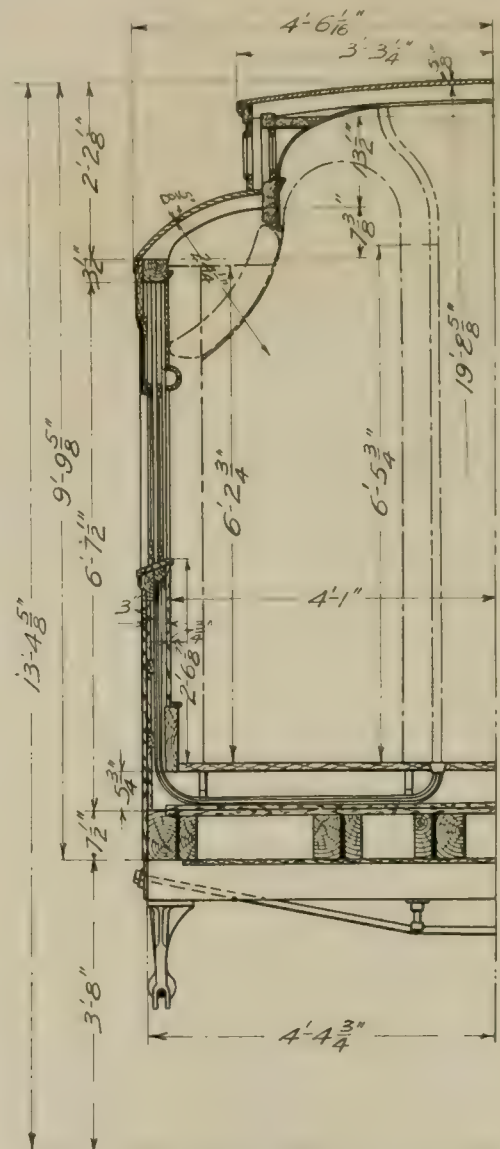


FIG. 2 END SECTION HOLLAND CAR

of these cars and the service in which they are to be used was given in the "Review" for June. Fig. 1 shows the floor plan of one of these cars from which the location of the kitchen, smoking room, toilet room, etc., will be seen. Fig. 2 shows a half cross section of the frame of the car and its general dimensions. The car is an open parlor car in the day time and a compartment sleeping car at night having ten compartments, five on each side of a center aisle. Each

car and the Harlan & Hollingsworth Co. of Wilmington, Del., by whom these cars are made, state that they have stronger frames than any other cars which the company has built. The inside of the roll curtains of the compartments are covered with handsome tap-

estry, making each compartment a tapestry room. The front edges of the berths in these compartments are 15 in. inside of the roll curtain, thereby giving a dressing space 15 in. wide and 6 ft. 10 in. long, the latter dimension being the length of the compartment. The lower berth is made up with two revolving parlor car chairs, the

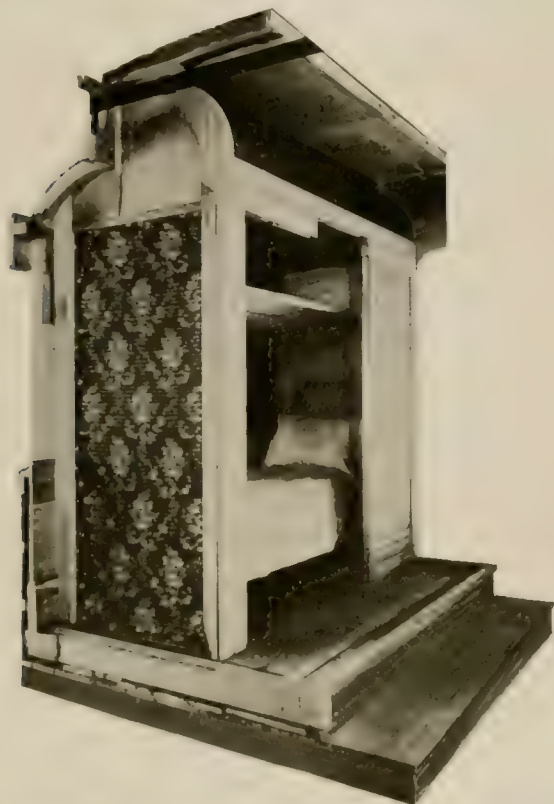


FIG. 1. SECTION OF COMPARTMENT, SHOWING BERTH MADE UP.

cushions of which slide forward and down to form the mattress of the berth. The upper berth is similar in construction to that of any standard sleeping car.

A SYSTEM FOR PROTECTING THE CONDUCTOR RAIL ON THIRD-RAIL ELECTRIC RAILWAYS.

Letter patents have recently been granted to Mr. George E. Linker, of 442 Miller Ave., Brooklyn, N. Y., for a new method of protecting the conductor rail on third-rail electric railway systems from sleet and snow. The invention comprises a conduit formed of



THIRD-RAIL PROTECTION.

brackets of transversely disposed brackets of essentially C shape, each having an opening at one of its vertical sides, the brackets being provided with lips adapted to engage an insulated or non-conducting support. Around the brackets is arranged a non-conducting sheathing forming a complete tube, the sheathing having an opening conforming to the openings in the bracket, so that the contact shoe and its arm may be protected through these openings and engaged with the conductor-rail, which is fastened to the

brackets. From the cross section drawing it will be seen that the system is designed to effectually prevent ice, snow and other foreign matter from coming in contact with the third rail, so that the contact-shoe may make effectual contact with the third rail at all times. At crossings or wherever the third rail is broken, the protecting conduit is also broken and the ends of the opening in which the shoe arm travels are fitted with flaring approaches, so that the arm, after leaving one section of the conduit, is guided without shock into the opening of the next section.

The system is designed not only to overcome the obstacles to third-rail operation caused by sleet and snow on the conductor rail, but also to prevent short circuiting of this rail by reason of foreign objects falling across it. The conduit also serves as a protection to persons who might accidentally come in contact with the conductor rail. The top side of the conduit or tube is hinged so access to the conductor rail may be had readily for inspection or repair. The non-conducting sheathing or lining within the conduit may be asbestos or other suitable material.



DICK HAM TROLLEY RETRACTOR.

A device known as the Dick Ham trolley retractor for catching and retracting a trolley pole when the trolley wheel leaves the wire, is being placed on the market by Mr. Richard H. Ham of Stockport, N. Y. The device is intended to be used in connection with any one of the several trolley catching devices now in use. The engravings show the Dick Ham retractor in connection with a Wilson trolley catcher. The retracting device is simple in detail and consists of a pivoted arm to which the trolley catcher is secured; that is, the retractor is attached to the car and the catcher is mounted on the



RETRACTOR AND CATCHER IN UPRIGHT POSITION WITH TROLLEY WHEEL ON WIRE.



RETRACTOR ACTUATED TO PULL TROLLEY POLE DOWN.

arm of the retractor so that when the trolley slips off the wire and locks the catcher, the same jerk that locks the catcher immediately unlocks the arm of the retractor, which is then thrown down by means of a spring, aided by the weight of the catcher. The device thus makes a retractor of the trolley catcher and by its use any road having trolley catchers of any make can convert them into retractors as well, so that when the trolley wheel slips from the wire, the pole will not only be caught but will be pulled down from 15 to 16 in. below the cross arms or span wires. After having been actuated, the arm is reset simply by lifting it up to its upright position where it is automatically locked. One of the engravings shows the catcher in an upright position with the trolley wheel on the wire and the other shows the catcher after the retractor has operated to throw the catcher over and thus pull the trolley wheel from the wire. Mr. Ham will show the device at the Saratoga Convention.

"ALL WIRE" RAIL BONDS.

The Ohio Electric Co., of Marietta, Ohio, the manufacturer of the "All Wire" rail bond will shortly announce to the trade through the medium of a new catalog which is now in press, a number of new types and forms of these well known bonds. The unit or "one

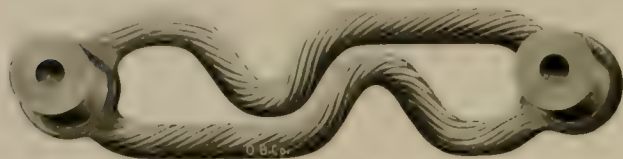


FIG. 1 TYPE F FORM 3 "ALL WIRE" RAIL BOND.

piece" principle on which these bonds are made was adopted to avoid all cast welded joints and thus secure a greater degree of mechanical strength and electrical efficiency than would otherwise be possible. The weakest part of a bond being at the junction point between the terminals and strands, the "All Wire" bond was designed to have no joint at this point and give a bond with uniform strength.

The Type F bond, one form of which is illustrated in Fig. 1, is especially designed for use under the fish plate, and as the strand enters the terminals at points almost diametrically opposite, the

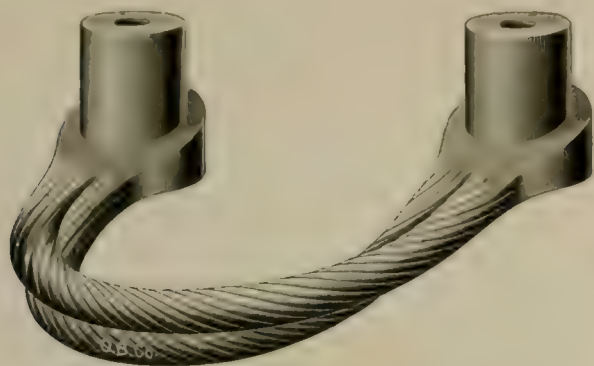


FIG. 2 TYPE D FORM 1 "ALL WIRE" RAIL BOND.

bond holes may be located close to the bolt holes in the rails, so that a relatively short bond of this type can often be used to advantage.

In Fig. 2 is shown the Type D Form 1 "All Wire" bond which is intended especially for use on elevated structures and third rail systems, where the bond can be placed underneath the rails and close to their extremities. The taper in the head of the terminals is such as to compensate for the taper of the rail base.

The Type G bond, illustrated in Fig. 3, while somewhat different from the other forms of "All Wire" bonds, has the same fundamental principle in its make-up, being made of a number of strips of soft, cold rolled copper the ends of which are perfectly welded together



FIG. 3 TYPE G FORM 1 "ALL WIRE" RAIL BOND.

forming solid copper terminals. The bond is applied to the rail ends by being soldered to them, and special tools are furnished for cleaning the ends of the rails and soldering the bonds in place. The form illustrated is intended for use on the lower surface of the rail base, or the upper surface of the rail where it will not interfere with the fish plates. Another form of this bond is made which is

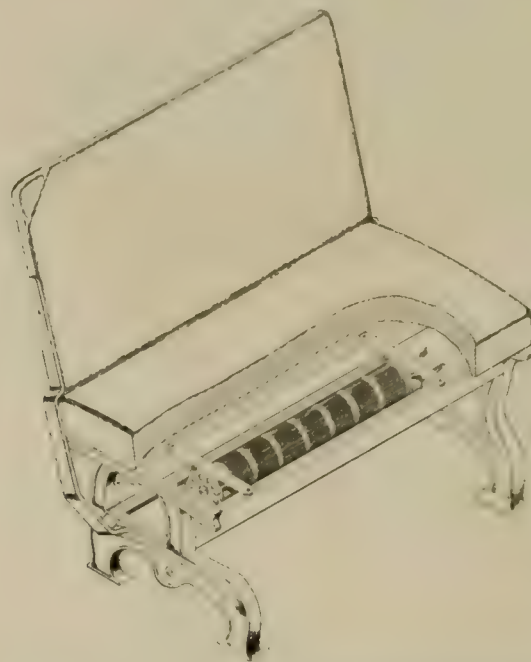
designed for attaching to the outer side of the ball of the rail, or to the lower side of the rail, or to the track of girder rails. Where bonds of this type are properly soldered to the rails the probability for them to become loose as only a violent and determined effort will detach them. The maker claims that this bond possesses a greater degree of flexibility than is possible in any other form of bond now on the market.

NEW ELECTRIC HEATER FOR CROSS-SEAT CARS.

A new electric heater for cross-seat cars, developed by the Consolidated Car Heating Co. to meet a demand for a small efficient heater, has been put on the market and is already popular. Equipments of this heater have been sold for 700 cars.

The construction is such that all lead wires are brought to one end and carried in molding along the side of the car; no wires are fastened to the seat frame. One or two coils are used, as desired. The hole in the porcelain spindle through which the supporting rod runs is set a little off center, and this gives space for a second small hole in the porcelain through which copper wire carries the return current.

The total length of the heater is 20¼ in. and the diameter of the single coil heater but 3¼ in. The case is perforated sheet steel and the hangers are cast iron. The porcelain spindle, the spiral coil,



NEW "CONSOLIDATED HEATER" NO. 122 UNDER CROSS SEAT.

and the method of supporting it are in every way the same as all the Consolidated heaters.

The spindles are 50 per cent longer than many of the cross-seat heaters now in use and the current consumption in watts per inch of length is about that of heaters now used. This is designed to absolutely prevent overheating the seats.

WEST VIRGINIA COMPANIES AT ODDS.

Alleging that the Fairmount & Clarksburg Electric Railroad Co. was laying track on the Salem Terminal Co.'s, right of way, contrary to an injunction which had been obtained by the latter, the Salem company, it is stated, caused several hundred feet of the other's track to be torn up at Adamston, W. Va., July 21st, and thrown into Limestone Creek, and in front of the post office at Wilsonburg a quarter of a mile of ties and rails were taken up. Later in the day an injunction was issued against the Salem company restraining it from tearing up the other's tracks. The companies are building electric lines between Clarksburg and Salem, W. Va.

THE NATIONAL BRAKE.

A new brake known as the "National" has recently been put upon the market, the general arrangement of which will be understood by reference to the accompanying illustrations. Fig. 1 shows a general view of the assembled brake mechanism which is contained in a frame bolted beneath the car platform. An ordinary brake spindle and handle is used, the spindle projecting through the upper part of the frame beneath the platform floor. The lower end of the pinion carries a gear wheel which meshes with a gear wheel; beneath this gear is a cam forming part of the same casting and placed eccentric to the gear wheel. The brake chain is then attached to the

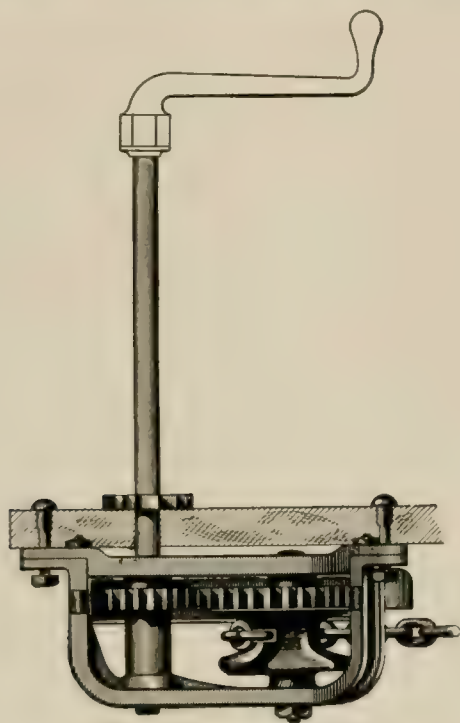


FIG. 1.

eccentrically geared cam as shown in Fig. 2. The same chain, shoes and handles used on ordinary brake spindles may be used with the "National" brake. In applying the brake the slack in the chain is rapidly taken up over the part of the cam having the largest diameter and when this slack is taken up the chain is in the position shown in Fig. 3. This design of the cam permits the slack to be taken up very rapidly when starting to apply the brake and as the handle is continued around the leverage is gradually increased from a 13-in. handle to the equivalent of a 39-in. handle, the gradual increase of the leverage being intended to give the effect of a cushion stop so that passengers are not annoyed by the jerks while

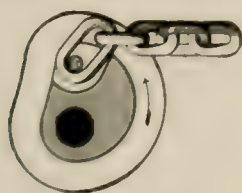


FIG. 2.



FIG. 3.

the car is being brought to a stop. While no special provision is made in this brake for avoiding skidding the brake is so easily released and applied again in a moment that when the motorman feels the wheels are skidding he can throw in brake off and on again.

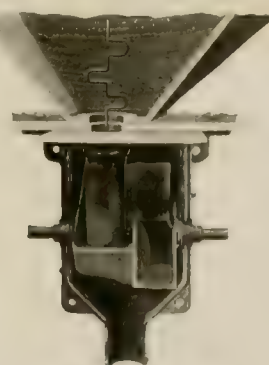
The mechanism of the brake is bolted beneath the car floor, the same hole being used for the spindle that is provided with ordinary brake, and the entire construction is very strong and durable. The device measures but 17 in. over so and the parts are all made strong enough to withstand several times the most severe strain

that can be applied to them. One of the most advantageous points claimed for this brake is the speed at which it may be operated as on account of the eccentric cam only part of one revolution is required to take up all the slack in the brake chain and apply the power. Ratcheting is not necessary with this brake. This device is made by the National Brake Co., of Buffalo, N. Y., and will be found on exhibition at the A. S. R. A. Convention at Saratoga.

RAIL-SANDING DEVICE.

The accompanying illustration shows the "Dimer" sander which has just been placed upon the market and is attracting the attention of electric railway managers. It is designed to provide either a continuous discharge of sand, or an intermittent discharge, as desired. The device, which is attached to the under side of the car body or car platform and is operated by a pedal, consists of an outer shell composed of two castings from the same pattern, fitted together to form a box with a tapering bottom that ends in a tube; a pipe to convey the sand from a box on the platform, and a tilting hopper for discharging the sand. The entire device consists of only four castings, with no wearing parts, and without a valve to get out of order. The edge of each half of the outer shell is grooved the entire length and the grooves packed with prepared wicking to render the box absolutely water-tight. The tilting hopper is shaped like a scoop, swings on axles in bearings in the sides of the box, and is operated from the outside by means of a lever and spring attachment. It is divided into two compartments in one of which is a hole for the straight discharge of the sand, while the other forms the aperture for intermittent discharge. If the sand should cake and plug up the straight discharge hole it is bound to be discharged through the intermittent side. For that reason, too, only a small outlet is needed when the straight discharge is used, although the size of the hole for the straight discharge depends upon the flow of sand desired.

Inside of the sand tube shown in the illustration, and extending up into the storage box, is a wire "agitator", the lower end of which is attached to the hopper in such a manner that through the tilting of the hopper the agitator is kept in motion, agitating the sand to



DIMER SANDER.

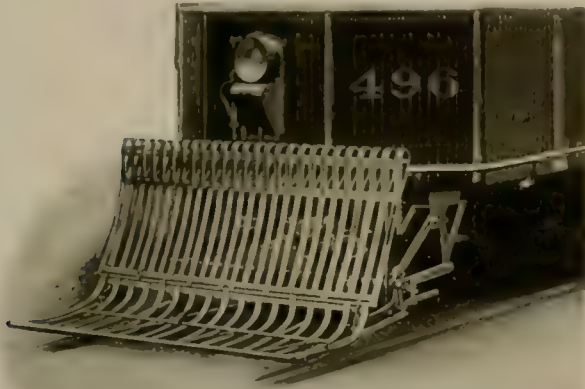
prevent clogging. The bottom of the sand tube is $\frac{5}{8}$ in. from the hopper and when the device is at rest a mound of sand forms at the bottom of the tube and acts as a plug which effectually closes the tube and is not disturbed by jolting. This self-plugging prevents the sand spilling or flowing out until the motorman releases it by tilting the hopper. When the hopper is tilted, if a straight discharge is desired, the small hole in the side of the hopper is brought into line with the bottom of the tube and the sand flows out in a steady stream until the hopper is righted again. If an intermittent discharge is wanted, the small hole is plugged or left out entirely in the casting. The hopper is then tilted forward and backward at the will of the operator, and at each forward movement the sand is discharged. The sand tube in the box is 1 1/4 in. in diameter, the box is 10 in. x 8 in. x 9 in. in size. John C. Dimer, 116 So. Clinton St., Chicago, is the inventor and manufacturer.

The Toledo Railway & Light Co. recently applied to the city for the extension of all its city franchises for 25 years.

THE WATSON LIFE SAVING DEVICES FOR ELECTRIC CARS.

The Watson automatic fender and automatic wheel guard are two of the latest types of life-saving devices for preventing injury to persons who may be struck by the front end of an electric car.

The automatic fender is self-acting but can also be dropped by the motorman's foot. It is built entirely of metal with interchangeable parts and is resilient in its action, being cushioned throughout so that the person struck receives no hard blow or shock. The frame is telescopic and very strong. The automatic trip bar can be



WATSON AUTOMATIC CAR FENDER.

turned up against the back of the fender whenever necessary to prevent it from coming in contact with snow drifts during snow storms, and when in that position the weight of a person falling on the fender acts on an independent release, causing the fender to drop to the roadbed. Whenever the fender is pressed or dropped to within an inch of the track the automatic release is brought into action, and then the fender is locked to the rails with a simple locking arrangement. The hangers by which the fender is attached to

and does not oscillate; it is directly over the rails at all times. The trip bar arms being attached to pilot board act as a guard to prevent any obstacle or body from rolling onto track at the sides, there being no opening between the trip and the guard. Four bolts only are required to hold the wheel guard in position on the pilot board of single or double trucks. The wheel guard is provided with a special front or buffer to prevent it striking against any unevenness in roadbed.

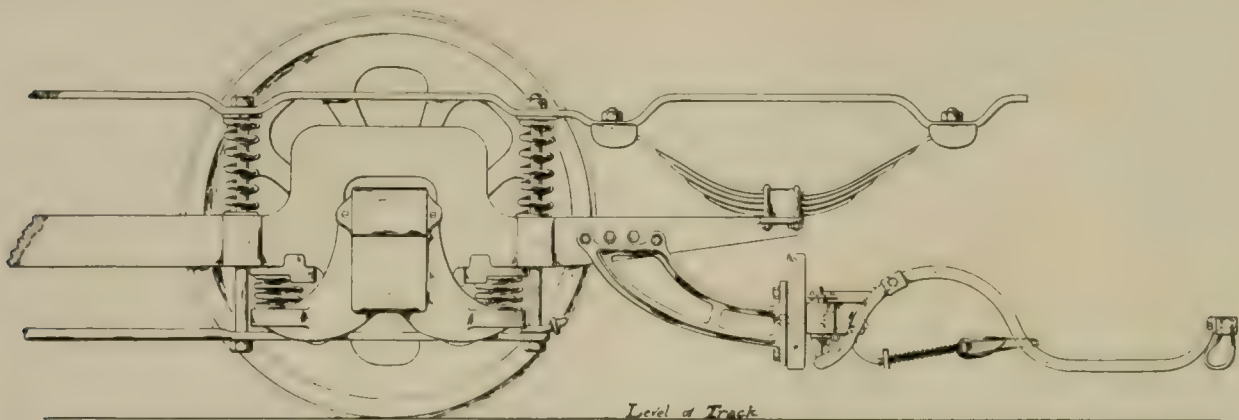
A sample fender or wheel guard will be sent for trial to any electric railway company in the United States or Canada that is in the market for fender equipment. The devices are handled by W. T. Watson, Box 243, Newark, N. J., to whom application should be made for further particulars.

THE R. D. NUTTALL CO.

Some idea of the magnitude of the gear and pinion business of the R. D. Nuttall Co., of Pittsburg, may be derived from the announcement that, although the company has expended a large sum of money for new machinery during the past two years, in order to properly care for its rapidly increasing trade, it has found it necessary recently to add 23 of the latest type gear-cutting machines, as well as individual worm gear machinery, mills, lathes, etc., to correspond. In regard to the new gear-cutting machinery, this is believed to have been the largest individual order for this type of machines ever placed, and it swells the total number of these machines at this plant now in operation and being set up to over 100, which is believed to be the largest and most complete gear-cutting equipment in the world. The company has also made a corresponding increase in the capacity of its power plant.

The R. D. Nuttall Co. first began the manufacture of gears and pinions for street railway service about 13 years ago, when the demand for this class of material required the use of but one gear-cutting machine. In the interim the company has established many foreign agencies and the orders received through this source have constantly increased in number and size.

The almost universal adoption of heavy cars and powerful motors for high speed and interurban service has made it necessary to correspondingly increase the weight and improve the design of motor gearing, and the company has placed on the market a very complete line of gearing for this particular service. It also manufactures trol-



WATSON AUTOMATIC WHEEL GUARD

the car are practically diamond frames, chosen as being a strong design, and are placed so as not to bring undue strain on the platform sills. The rods used in the drop device are $\frac{3}{8}$ in. in diameter. The strips are cold rolled steel of suitable width and thickness. The cushioned front of fender is rubber tubing with a small steel wire cable passing through it, which in addition to the telescopic frame gives great flexibility. The Watson fender is used on all the cars of the Toronto Street Railway Co., of Toronto, Can.

The Watson automatic wheel guard can be used in conjunction with any make of fender and is designed to prevent the person struck from passing under the wheels, should the body by any chance pass under the fender. The guard is entirely automatic and has no connection with any part of the car body and will, therefore, swing around curves with the truck. It runs at one height from rails

leys and trolley repair parts for every kind of trolley service, this being no inconsiderable part of the business.

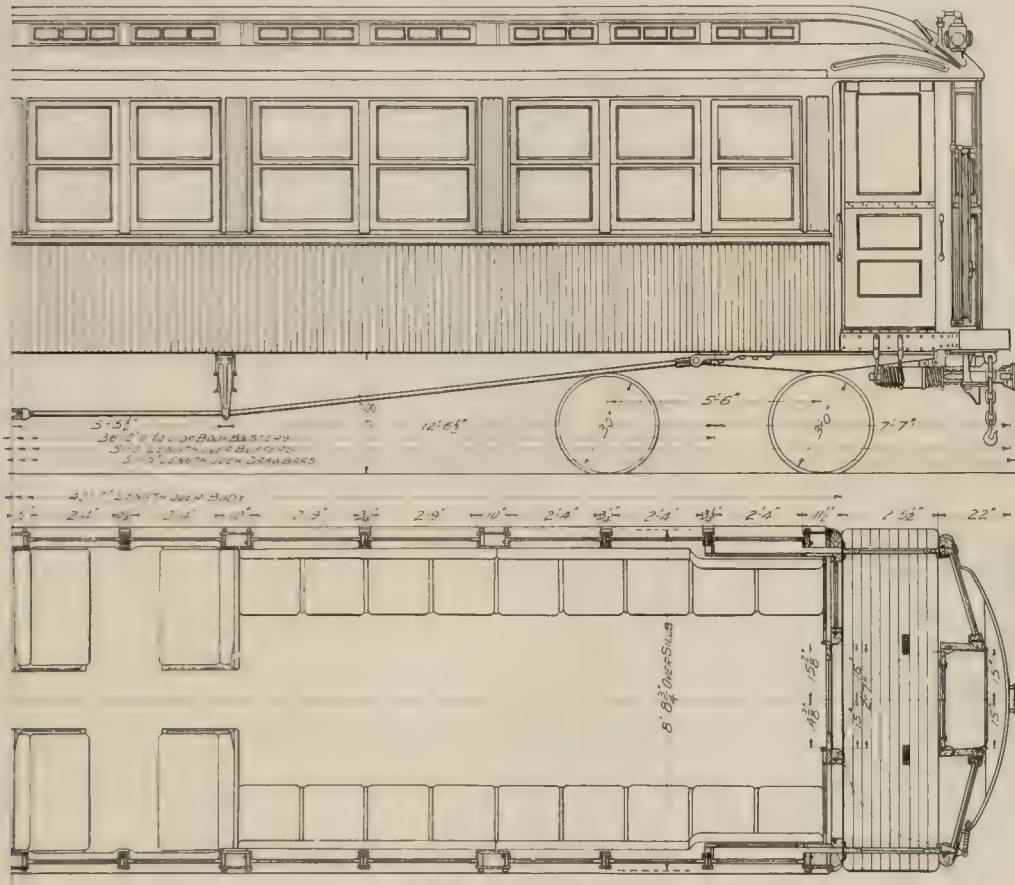
Under the able management of the president, Mr. F. A. Estep, the company has attained an enviable position in the street railway supply business, and its reputable business methods are a guarantee of its continuance in favor.

The T. H. Buckley Car Manufacturing Co. has been incorporated with a capital of \$250,000 to manufacture steam and electric cars, etc., and to absorb the business of the T. H. Buckley Lunch Wagon Manufacturing & Catering Co. The company has purchased land at Worcester, Mass., on which is being erected a car manufacturing plant to cost about \$50,000, for which plans were prepared by Frost, Briggs & Chamberlain, of Worcester.

JEWETT CARS FOR THE INTERBOROUGH COMPANY.

A large order of cars for the Interborough Rapid Transit Co., of New York City, is being completed by the Jewett Car Co., of Newark, O., and these cars contain a number of interesting features

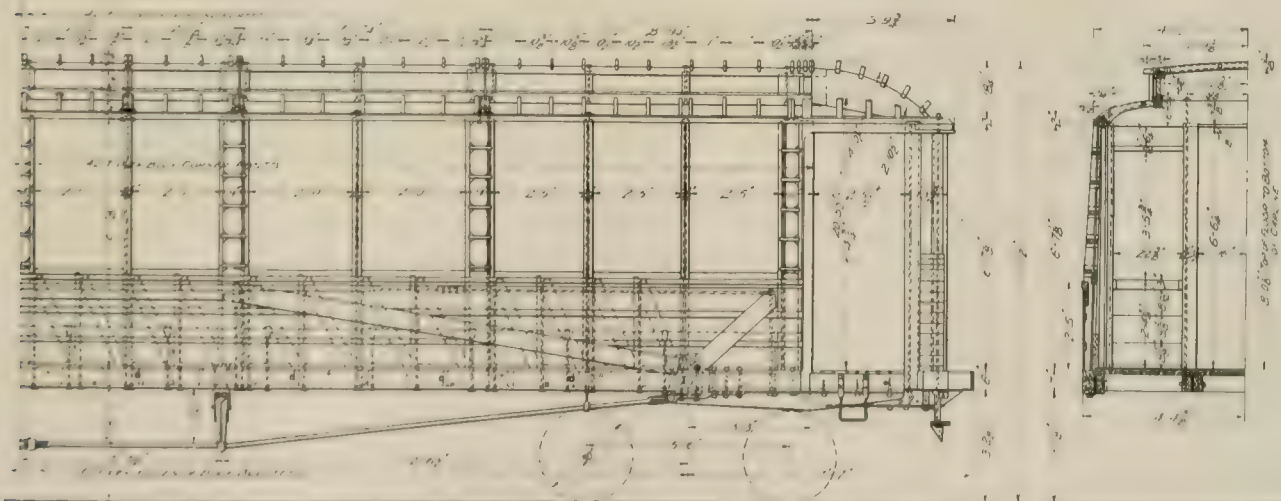
sheathing, 8 ft. 10 in.; total width of roof, 8 ft. 6 in.; height of body from bottom of sill to top of roof, 8 ft. 10 in.; height from rail to top of roof, 12 ft. There are four longitudinal sills in the floor framing. The side sills each consists of a 6-in. channel, 8 lb. per ft., running from buffer to buffer, which is reinforced with a 3¼ x 7 in. yellow pine sill on the outside and a 3¼ x 6 in. yellow



HALF PLAN AND ELEVATION OF INTERBOROUGH CARS.

among which the provisions for making them practically fire proof may be specially mentioned. The general design of these cars and the seating arrangement, as well as the side and end framing are shown in the accompanying illustrations.

pine sill on the inside. The center sills are of 5 in. I beams, 12¼ lb. per ft., running from buffer to buffer, which are reinforced on each side by a 3 x 5-in. yellow pine sill. The end sills are 5-in. channels, 11½ lb. per ft., reinforced with oak. The needle beams are made of



ELEVATION OF FRAMING, INTERBOROUGH CAR.

The general dimensions of the car are as follows: Length over body, 42 ft. 7 in.; length over buffers, 44 ft. 6 in.; length over draw bar, 47 ft. 6 in.; width over body, 8 ft. 6 in.; width over

5-in. I-beams, 9¼ lb. per ft., the ends of which are fastened to the body cross rod support. All angle, channel, and I beams for the bottom framing are thoroughly riveted together before any wood is

applied and most of the castings used throughout the car are made of iron.

There are three floors in the car, the bottom one being laid crosswise, the second one lengthwise as is also the top or grooved floor covering. All the floors are made of maple, this wood being least liable to ignite. Between the two bottom floors a layer of asbestos felt and felt is placed. The under trusses are made of 1 1/4-in. round iron, there being two to a car. The bottom of the car over the motor truck is sheathed with No. 8 steel and the rest of the bottom is covered with 7/8-in. yellow poplar and 1/4-in. "transite" board. The bolsters are made with two steel plates, the top one being 9 x 3/4 in. and the bottom one 9 x 1 in.

The side framing of the car is well braced as will be seen by reference to one of the accompanying illustrations. Each of the vestibule posts is strengthened by a 2 1/2 x 3/4-in. wheel bar fastened to the buffer and to the hood bow. The hood is strengthened by a 2 x 2 x 1/8-in. angle which extends all around the hood and runs back 4 ft. over the body side plates at each side of the car. The roof is strengthened with seven steel carlines. The sheathing on the side of the car below the sash rest is covered with copper which is buffed and lacquered.

The cars are finished in mahogany with neat marquetry and the seating arrangements are the same as on standard elevated railroad cars as shown in one of the illustrations. The seats are of the Hale & Kilburn make and are covered with rattan. The head lining is made of composite board 3/8 in. thick and painted. Polished plate glass is used throughout the car except for the decks which have ornamental glass. All the cars are equipped with Van Dorn draw bars and Pitt safety gates. The vestibules for these cars are what are known as the Gibbs patent vestibule designed by Mr. George Gibbs, consulting engineer of the New York Interborough Rapid Transit Co. The wiring of the cars is all contained in metallic conduit and the equipment includes automatic air brakes as well as hand brakes.

THE UNI SIGNAL.

It is now generally recognized by the management of single track electric railroads that a strong necessity exists for reliable signals and the "Uni" signal made by the Uni Signal Co., of Cambridge, Mass., embodies many points of excellence which are claimed to particularly adapt it to this class of service. This signal is the joint invention of Prof. Charles H. Morse, Charles F. Hopewell and Frederick Turner and the inventors have produced a signal system of great simplicity and which has been pronounced highly reliable. One of the chief characteristics of the mechanism is the absence of

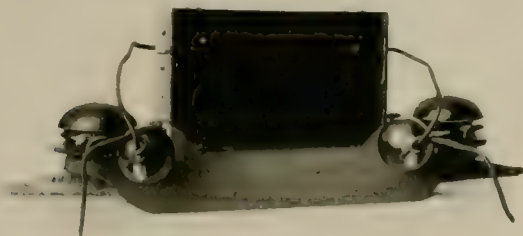


FIG. 1.

all springs in the signal movement which contains but comparatively few moving parts. A special study has also been given to the insulation of all current carrying parts.

The operation of the signal is as follows: A car on entering a block section has its trolley wheel run under an automatic trolley switch which is shown in Fig. 1. This switch lights a green lamp in the signal box directly in advance of the car and also lights a red lamp, wired in series with the former, in the signal box at the distant end of the block. When the car passes under the switch at the distant end of the block both lamps are extinguished. When either lamp is lighted the section contains no cars. The signal is double acting; that is to say, a car entering from the other end of the block will, under normal conditions, light the lamps in the opposite manner to that just described.

When a car has once entered a block and lighted its lamps another car following will not affect the signals nor will a car from the opposite direction running under the trolley switch with a red

lamp set against it put out this signal. The signal can only be restored when once set by running under the leaving-end trolley switch in the proper direction. Fig. 2 shows a view of the signal box with its front cover open and Fig. 3 shows one of the signal movements taken apart, for which only a screw driver and pair of pliers are required. In the rear of this illustration is the iron back-plate with the three slate switchboards attached. In front are the two large lighting and extinguishing magnets and a small magnet

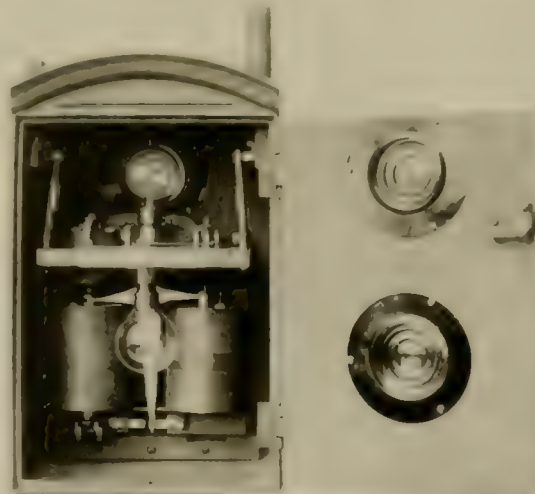


FIG. 2.

used for a magnetic lock. All of these magnets have internal armatures and can be directly attached to the iron back-plate without loss of magnetism. This allows the back-plate to act as a heat radiating surface. The single switch lever shown in the foreground is made of aluminum to reduce its inertia. There are but three points where the circuit is broken in the box and the circuit breakers are of the disk type and operate with a quick break. The resistance plate used is of the enameled type.

Among the advantages claimed for the "Uni" signal are visibility of the green or safety signal in both directions thereby allowing the conductor to see that the safety lamp is lighted and thus protect against carelessness of the motorman; the provision of a terminal box equipped with lightning arresters; the ability to remove the entire signal movement from the box without the aid of any tools; the absence of all springs, gravity being the only restoring force. The use of a detent spring in the trolley switch has been over-

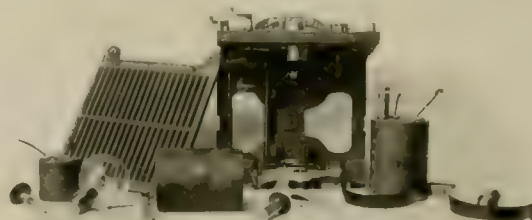


FIG. 3.

come in a novel manner which obviates the liability of the trolley being thrown off the wire at this point.

This signal contains all the automatic, non-interfering and interlocking features found in other systems and it shows evidence of great care and study in its design.

THE COLUMBIA TROLLEY POLE.

The Columbia Machine Works & Malleable Iron Co., of Chestnut St., Brooklyn, N. Y., makes the Columbia trolley pole, which has been used extensively in this country with universal satisfaction. The pole is made from the best steel tubing, tapered down beginning at a point 42 in. from the top, from 1 1/2-in. diameter to 1-in. diameter. The company is turning out 300 trolley poles a day and is in a position to fill orders with promptness and dispatch. The poles are made either plain or reinforced.

FENDERS VS. LIFE-GUARDS.

Editor "Review":

The subject of fenders for electric railway cars is one that seems to irritate nearly every president, general manager or superintendent when it is brought to their attention and particularly so if it happens to be through a representative of a car fender company. There are a great many reasons why this is so and were I a railroad official I am not sure but that I would feel the same as they do when called upon by a fender man. It goes without saying that every inventor of a new car fender or representative of a fender company claims that his is the best, and superior to any on the market—and as this claim is made by all alike it is not surprising that the railroad official has a look of incredulity and a tired feeling when a fender man does succeed in invading the privacy of his sanctum sanctorum.

It is an undeniable fact that there have been and still are on the market a great many so-called fenders that are not worthy of the name and only assist in mangling the victim who has been so unfortunate as to be struck by one of them. The truth is that in many cases the parties might have saved their lives but for the apology called a fender on the front end of a car which is there only for the purpose of complying with some local ordinance.

There have been so many worthless fenders on the market from time to time that the mere mention of the subject is all that is necessary to bring forth a tirade of abuse from some railroad managers. While this applies to some, I am thankful to say that the vast majority of railroad officials are both courteous and progressive and more than willing to give their time to investigate if a fender of any merit is brought to their attention. They want it and what is more, are willing to pay a fair price for it if they can be convinced that it will save life and reduce the claims for damages against them in case of accidents.

I appreciate the fact that managers are humane and do not wish to needlessly sacrifice human life, but they are the responsible agents of the corporation which they serve. They cannot well spend both their time and the company's money to investigate and try the thousand and one devices that are brought to their attention each year. However, when one can show them a device which is going to save their company money (more than the cost of the device) the railway men are always willing and interested listeners. But the subject is fenders, not managers. By referring to the dictionary you will see that the word fender means to ward off; to parry; to thrust aside, etc., and unfortunately the word applies only too well to many of the alleged safeguards on the front end of our electric cars. That they are fenders indeed is easily proved by referring to the statistics of the dead, the maimed, and the halt who have been struck by them.

I do not believe that any sane railroad manager wants to equip his cars with a fender, although I heard one remark that a life cost \$5,000 while a limb may cost the company much more. But progress has been made in the past decade, even in fenders, and some are not so deadly as others.

What the electric car needs is a life guard and not a fender. The developments of the past few months have been such as to demonstrate that it is possible to equip each and every electric car in the country with a life guard that will not fend but will positively pick up and retain on the guard, absolutely uninjured, every man, woman or child who is unfortunate enough to be in the way of the car so stopped and moving at an speed from one to twenty-two miles per hour.

The guard to which I have reference has saved the lives of a score of persons in the past few months, including not only men and women but children from three to seven years of age. As a result of their actual operation they have been pronounced by the lines using them the best device for the purpose on the market. The guard in question has been out but a few months, but several lines have already been equipped and more have placed their orders for them. It is not surprising that this is so, as the company handling them has, in the past three months, put trial guards on fifteen different roads throughout the country and in every case have demonstrated its merits by picking up men (not dummies) with cars moving at various speeds from one to twenty-two miles per hour and in every instance the persons have been released unharmed. It is not alone the successful operation of the guard that has made these trial demonstrations, but the fact that the persons who have been picked up have voluntarily tested it themselves. The results obtained by the use of the guard have been such that the company is willing to guar-

antee a saving of 50 per cent in damage claims in all front end accidents and while it will guarantee 50 per cent it claims the saving will, in reality, be over 90 per cent. These claims may appear boastful, but the results of work on lines already equipped and the demonstrations which they have made, certainly bear out all that is claimed for the device.

It is not the purpose of this article to run down fenders, but to praise life guards that do not fend but save both life and limb.

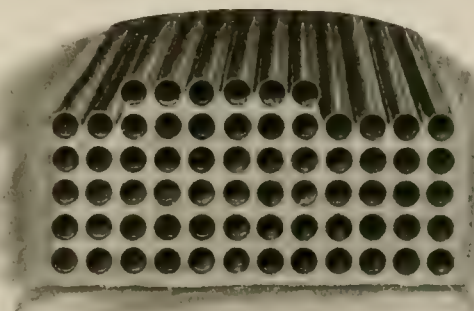
There will undoubtedly be many fenders on exhibition at the convention at Saratoga in September, but those interested should not stop with the examination of fenders. Look for the life guard, you will find it in evidence there. Once seen in operation you will never equip the cars of your line with fenders.

Yours for humanity,

Dr. Chauncey B. Forward.

BITUMINIZED FIBER CONDUIT.

The American Conduit Co., of 170 Broadway, New York City, has recently issued a handsomely illustrated catalog devoted to a description of its bituminized fiber conduit. This conduit is claimed to be specially desirable for underground systems of ducts used in connection with railway, telephone and telegraph or lighting circuits and it has a number of characteristics which adapt it specially for this service. Among these may be mentioned, it is non-corrosive and not subject to deterioration or decay, its insulating quali-



SECTION OF CONDUIT IN TRENCH.

ties are high, it is dry and moisture proof and its joints are water tight and air tight. Its joints are self aligning and it is light in weight, which insures low cost in freighting, handling and laying.

The accompanying illustration shows an open trench with conduit in place. One of the most important features in laying this conduit is the method of joining unit to unit. Bituminized fiber conduit has a male and female slip joint turned true in a lathe. Such a joint is strictly self aligning, which makes it possible to easily slip unit after unit together in the trench, and no wrapping with burlap or trowel work is required. A pot of liquid compound is kept conveniently at hand into which the workman dips the ends of each unit as he passes it into the trench.

This conduit has been in successful use in Chicago, Kansas City, Omaha, San Francisco and numerous other large cities. The company has just established a large new factory at Philadelphia which, together with its original plant at Los Angeles, will enable it to accept contracts and make prompt delivery in any part of the United States and Canada.

A Brooklyn law firm has been retained by nearly 100 persons to bring suits against the Brooklyn Rapid Transit Co., to test the right of the company to charge a double fare on the ordinary cars within the city limits and to run parlor cars in which patrons must pay 25 cents for a seat.

Anderson, Ind., has decided to install a municipal electric lighting plant the equipment of which will comprise two 400-kw. Parsons-Watkinson steam turbines, three 300 h. p. Stirling boilers and Roney stokers. E. R. Vincent, M. E., of Indianapolis, is consulting engineer for the City of Anderson.

NEW AIR BRAKE SYSTEM.

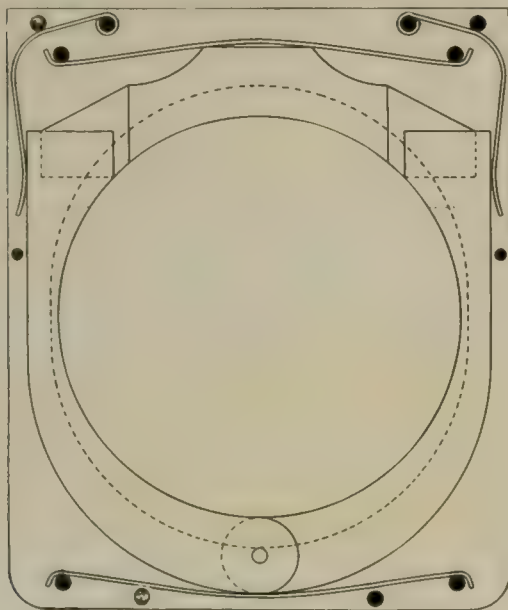
The National Air Brake Co., of 231 Broadway, New York City, is placing on the market a new air brake system for electric cars. For service on city cars or wherever cars are run in single units, the company has developed a system known as the automatic straight air system which comprises all the features of the straight air brake together with an automatic feature, whereby the brakes are immediately and automatically applied, if, for any reason, there is a leak or break in the air tank or pipes. Thus the motorman can depend upon his brakes at all times, for if the air pressure becomes low for any reason, the brakes will be applied automatically and the car brought to a stop. Therefore, if the motorman is able to run his car, he knows that the brake is in working order and the danger of an accident due to defective brakes is claimed to be entirely eliminated.

For service where the cars are run in trains, a different system has been developed whereby there is a pressure of from 10 to 15 lb. of air on the train pipe at all times, and if any part of the braking system develops a leak or becomes defective, a tell-tale signal in the motorman's cab at once announces the fact, thereby giving the motorman a chance to repair the defect before an accident occurs.

Both systems employ a motor-driven air compressor with automatic regulator for maintaining the working pressure of air in the main cylinder.

ECONOMY LUBRICATOR AND DUST GUARD.

The "Economy" lubricator and dust guard, which is illustrated herewith, is made by the Railway Journal Lubricating Co., of Milwaukee and Chicago. It is a practically new device which has been attracting considerable attention, especially on a number of electric roads where it has been submitted to very severe tests for efficiency and durability. The lubricating feature is simply a ball-bearing metal wheel, about $2\frac{1}{2}$ in. in diameter, with 1 in. face, which runs in oil and carries the oil to the journal. This wheel is contained in a sheave directly supported on one side by a stud in the side of the journal box, the opposite side of the sheave being at

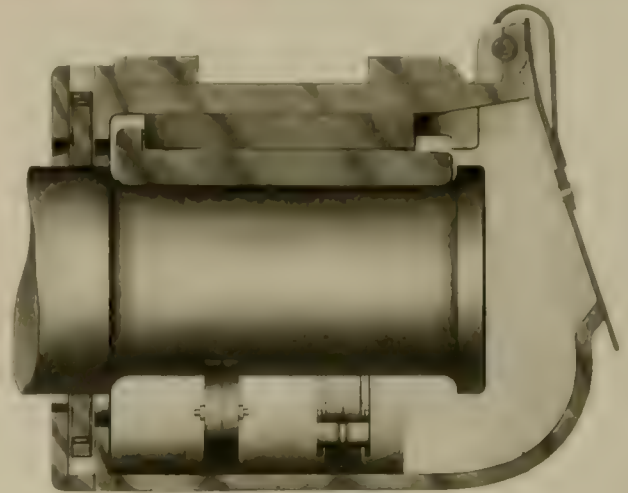


DUST GUARD.

tached by a tension spring to a stud in the other side of the box. This arrangement holds the face of the wheel in constant contact with the under side of the journal, and when the journal revolves the wheel revolves. The oil supply is in the bottom of the journal box, which is oil-tight, the lower half of the wheel being submerged in the oil. As the wheel revolves the oil is carried by it to the journal which in turn carries it up to the journal brass, where it is distributed over the entire length of the journal at the point of

contact with the brass. On short journals one wheel is all that is required, but on longer journals two wheels are used.

The dust guard which is used in connection with this device is designed essentially to prevent the waste of oil, especially through the opening in the back of the box. It is constructed of three sections of fiber placed between two steel plates, which are firmly riveted, yet allow for the play of the fiber between them. The two side pieces of fiber are pivoted at the bottom; the top section is fitted in with the side pieces so that it will slide up and down, and



ECONOMY LUBRICATOR.

there is a spring on each of the four sides to press the fiber into constant contact with the journal. This guard fits into the ordinary dust guard slot, and as the oil runs back toward it on the journal the oil is turned back into the box, whereas in common practice it would be wasted.

The entire apparatus is so constructed that its application does not affect the standard make of journal or journal box, nor does it interfere with the changing of the journal brass. It is stated that tests have shown that by using this device a great saving in the journal brasses is obtained, the life of the brass being doubled, because of the perfect lubrication. No grit from sediment in the box is carried up to the journal, the wheel being $\frac{5}{8}$ in. from the bottom of the oil chamber.

The "Economy" lubricator and dust guard will be on exhibition at the street railway convention, in charge of those who have perfected the device and have had personal charge of all demonstrations made by the company. The Chicago office of the company is at 1232 Monadnock Block, Chicago, Ill.

"A RUBEROID ALBUM."

The Standard Paint Co., of 100 William St., New York City, has published a unique "souvenir" of the twelfth year of success of "Ruberoid Roofing", which is said to have been the first prepared roofing placed on the market, which was absolutely weather-proof, acid-proof, elastic, odorless and fire-resisting. The souvenir is a 48-page publication devoted to telling the story of "Ruberoid Roofing", what it is, and what it does. A considerable portion of the work is taken up with reproductions from photographs of a large variety of buildings, churches, factories, dwelling houses, etc., which have been roofed with "Ruberoid". The versatility, so to speak, of this compound is strikingly indicated in this collection, and the pictures together with the many testimonial letters produced are ample proof of the claims made by the maker. The covers of the publication are reproduced in imitation of the roofing, and all in all the work is ample evidence of the superior prestige enjoyed by ruberoid roofing.

Ruberoid roofing is made of the finest quality of selected wool felt, every fibre of which is saturated with "Ruberoid Compound" or "Gum", a material manufactured solely and exclusively by the Standard Paint Co. In appearance this gum resembles rubber in its crude form, and it has all the elasticity and toughness of rubber but partakes of none of the corrosive or oxidizing nature of rubber.

JOHNS-MANVILLE HEATERS AND LINE MATERIALS.

The wall heater, class B, shown in Fig. 1 is a new style of car heater for large interurban cars which has recently been placed on the market by the H. W. Johns-Manville Co. These heaters are 30 in. long and 5 in. high and their construction is similar to that of the company's well-known class K heater which has been on the market for several years and which is used for cars having cross seats. Each heater contains twenty, in double enameled angle irons held firmly in place by reconstructed granite heads at each end of the heater. These irons support the resistance coils and act as in-

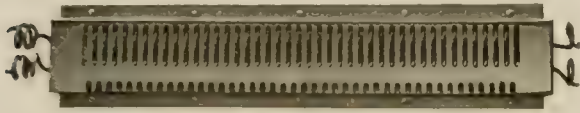


FIG. 1.

sulation, preventing short circuits due to contact formed by sagging coils. The casing is strong as well as ornamental and will stand the pressure of a foot without injury.

For cars requiring a large number of heaters the H. W. Johns-Manville Co. has enlarged the capacity of its three-point car heater regulating switch, increasing its capacity to 60 amperes. A Sachs "Noark" enclosed fuse is mounted in the insulating base of these switches. The complete device is enclosed in an iron box of smaller dimensions than those formerly made and it is stated to be safe and reliable under all conditions. By closing the quick-break knife blade the switch is automatically locked and this is necessary before the cover of the box can be closed. All movement of the regulator handle is prevented until the knife blade is released.

The overhead construction material of this company has recently been ordered for the 55 mile line of the Cincinnati & Columbus

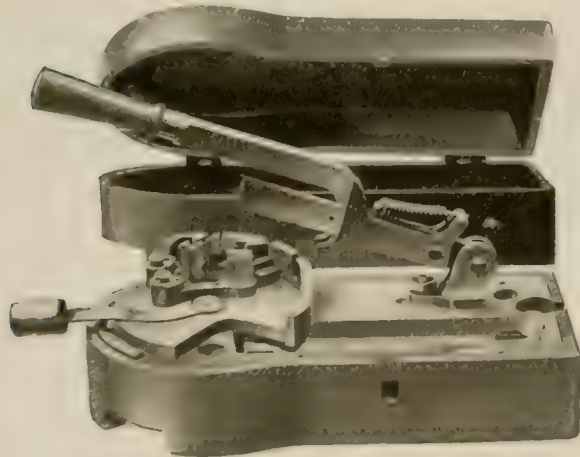


FIG. 2.

Traction Co., of Cincinnati, O. The construction of this line will include parallel trolley wires of No. 000 grooved wire which will be supported by the Johns-Manville extra heavy galvanized round top hangers with 3/4-in. studs and provided with deep petticoats insuring good surface insulation. These are attached to galvanized straight line yokes holding the trolley wires 6 in. apart. This road will also use the combination mechanical and soldered clip 15 in. long, in one piece only, which has proved very successful on extra heavy trolley wires. There will also be used extra heavy hangers, "Giant" pull-overs, "Giant" strain insulators, and "Phila-

delphia" pull-overs. The new line is to run from Hoboken to the Oranges, Bloomfield and Montclair, which was first proposed by David S. Moore, at Oranges, about seven years ago, and is now being built by the New Jersey Electric Railway Co. The company has also ordered the Excelsior Electric Railway Co. to supply the street car heaters for the same line.

CONCERNING LE VALLEY-VITAE CARBON BRUSHES.

The Le Valley Vitae Carbon Brush Co., of 110 East 42d St., New York City, makes the following announcement to the trade:

"As stated in newspaper reports, Abraham I. Levy, one of our clerks, under the name of the Excelsior Electric Co., of 133 Park Row, New York, solicited orders from many of our customers and others, claiming to have been appointed sole agent for the sale of our Le Valley-Vitae carbon brushes, and able to sell them at prices much lower than even the manufacturer. Letters sent us inquiring as to the authority of the Excelsior Electric Co., never reached us, but were taken out of the mail and answered in our name by him in the affirmative. Orders received by the Excelsior Electric Co., for Le Valley-Vitae carbon brushes, he filled with brushes stolen from our factory and as all was profit to him, he could sell at any figure.

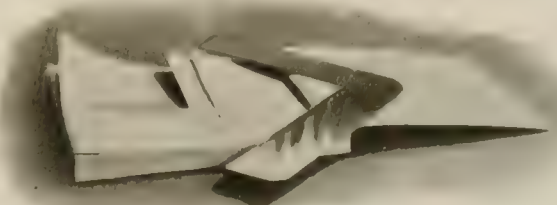
"The Excelsior Electric Co. was not incorporated or registered and had no place of business, but simply a letter box in a cigar store. Its mail has been stopped by the postal authorities, and therefore no communication can be had with it. If you have unfilled orders for Le Valley-Vitae carbon brushes, you will be unable to obtain them as these brushes can only be had through us direct or through legitimate supply houses, and as we are carrying over 1,000 different sizes in stock we can fill any order you may favor us with promptly.

"On August 3d, Levy had an examination before a magistrate and was committed."

"A TICKET THAT HELPS EARNINGS."

The National Ticket Co., of Cleveland, O., has in its patented "tear" cash fare receipt a form of ticket that has given the best of satisfaction to the roads using it. This ticket was originally designed to meet the requirements of the Cleveland, Painesville & Eastern R. R., which found that the duplex ticket formerly used required too much time in handling. The cash fare receipt is a form of ticket whose advantages are now becoming well understood by street railway men. The names of the stations are printed in two rows at right angles to each other along two edges of the tickets and the remainder of the ticket is filled in with the rates of fare between the several stations named.

In using the ticket the conductor is furnished with a small brass square by means of which he tears out a corner of the ticket at the names of the stations between which the passenger travels and which shows at the same time the amount of fare collected for the portion of the ticket torn off. This cash fare receipt book with some of the tickets torn off and the brass square are shown in the accompanying illustration. The stubs remaining in the book are an effective check on the conductor's collections. This ticket was



"TEAR" CASH FARE RECEIPT BOOK AND BRASS RULE.

adopted by many of the Everitt Moore lines and within a short time after its introduction its use extended throughout the country. The reports regarding this form of tickets are to the effect that while its appearance is not wholly in its favor and the advantages it possesses are not always apparent until it has been given a trial, such a trial demonstrates its practicability and time-saving quality, as well as the excellent check it affords on the amount of the fares collected.

REMARKABLE GROWTH OF AIR BRAKE BUSINESS.

The constantly increasing development of electric railway with the corresponding increase in the use of heavy, high speed cars is reflected in the remarkable growth of the National Electric Co.-an brake business. During the first half of the present year this company's shipments of Christensen air brakes is reported as equal to the entire business of 1902 which was the largest year in the company's history. Among the recent orders received are the following: Birmingham (Ala.) Railway, Light & Power Co., 37 equipments; Little Rock (Ark.) Railway & Electric Co., 25; United Railroads of San Francisco, 58; Pacific Electric Railway Co., Los Angeles, Cal., 90; Denver (Col.) City Tramway Co., 25; Connecticut Railway & Lighting Co., Bridgeport, Conn., 36; Chicago City Railway Co., 20; Lake Street Elevated R. R., Chicago, 40; Northwestern Elevated Railroad Co., Chicago, 35; Indianapolis Traction & Terminal Co., 25; Tri-City Railway Co., Davenport, Ia., 16; Middleton & Danvers (Mass.) Street Railway Co., 16; Boston & Worcester Street Ry., 27; Twin City Rapid Transit Co., Minneapolis, Minn., 177; Metropolitan Street Railway Co., Kansas City, 60; New Jersey & Seashore Railway Co., Atlantic City, N. J., 50; New Jersey & Hudson River Railway & Ferry Co., Edgewater, N. J., 18; Public Service Corporation, Jersey City, N. J., 150; International Traction Co., Buffalo, N. Y., 41; Brooklyn (N. Y.) Rapid Transit Co., 52; Interborough Rapid Transit Co., New York City, 350; Cincinnati (O.) Traction Co., 70; Northern Ohio Traction Co., Akron, O., 18; Philadelphia Rapid Transit Co., 175; Rhode Island Co., Providence, R. I., 233; Nashville (Tenn.) Railway Co., 16; Chesapeake Transit Co., Norfolk, Va., 18; Seattle (Wash.) Electric Co., 16; Tacoma (Wash.) Railway & Power Co., 26 equipments.

STANDARD VITRIFIED CONDUIT CO.

The Standard Vitrified Conduit Co. of No. 39 Cortlandt St., New York City, which is well known in the trade is possibly the only independent corporation outside of the so-called clay trust, which is manufacturing conduits. The company's new factories situated at South River, N. J., which are now completed, are represented as being the largest conduit factories in the world; in fact the company states that its factories can produce more conduit than any six of the other factories in the United States. The company manufactures conduit and third rail insulators, exclusively, and as it has unlimited quantities of pure stoneware clay on its property, the quality of its product material should be of the highest.

The factories are now in full operation, producing 100,000 ft. of conduit per day, and also making the "Manhattan" third rail insulators on a very large scale. A recent order was for upwards of 43,000 insulators for the Scioto Valley syndicate in Ohio. The principal steel companies in Pennsylvania have adopted this insulator throughout their plants; the Manhattan Elevated railroad is equipped with them, and a number of other large third rail systems are reported to be considering the adoption of this same insulator, which is noted for its electrical tests, strength and low first cost. The business of this company especially east of the Ohio River, with more or less for export, is from the representative buyers of the country.

The catalog recently published by the company is possibly the most complete book ever issued in this line.

At the street railway conventions in Saratoga, this company will be represented by Mr. B. S. Barnard, vice-president and secretary, and will have a complete exhibit of its products.

WESTINGHOUSE COMPANIES' PUBLISHING DEPARTMENT.

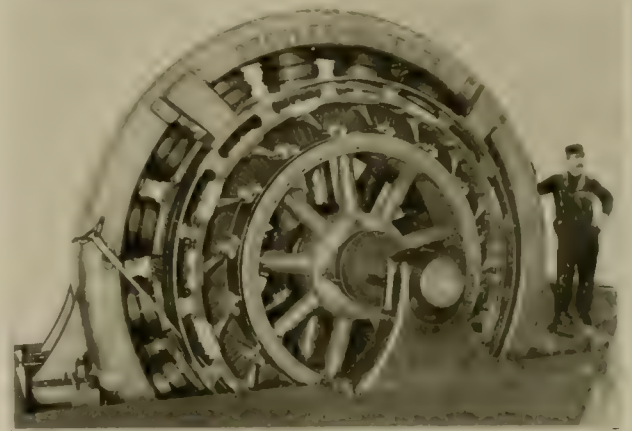
Some important changes have recently been made in the organization of the Westinghouse Companies' Publishing Department with a view to extending the field which it covers. Mr. W. M. Probasco, who has been identified with the Westinghouse interests for a long time and for several years has been in the publishing department, has been appointed assistant manager of the department in charge of advertising, exhibitions and conventions; his headquarters are in New York City. Mr. H. F. J. Porter, who was for years

with the Bethlehem Steel Co., of Bethlehem, Pa., has been appointed assistant manager in charge of articles, publications, general publicity and superintendence of the department, with headquarters in East Pittsburg, Pa.

CROCKER-WHEELER RAILWAY GENERATORS.

The Crocker-Wheeler Co., Ampere, N. J., has recently put upon the market a new line of railway generators, one of which is shown in the accompanying illustration. This machine is of 750-kw. capacity and is wound for 550 volts. It is shown set up in the testing pit and the shaft is a temporary one used merely for testing, the regular engine shaft on which it is connected having a diameter of 22 in. The magnet frame is of the internally flanged type which is characteristic of all the Crocker-Wheeler apparatus, giving great rigidity and strength in proportion to the cross section of metal used. The machine has 16 poles and a noticeable feature is the taping of the field coils into several sections, these sections being separated by wooden blocking to facilitate the radiation of heat. Each section is wrapped, taped and insulated as a unit, rendering the fields practically impervious to moisture.

The armature is of the ironclad type, having the windings protected in the slots by wooden wedges and firmly held in place by



CROCKER-WHEELER RAILWAY GENERATOR.

band wires at the ends of the core. The commutator is of ample size for the radiation of heat and its bars are held in place by clamping rings at each end supported on a commutator spider. A distinctive feature of the Crocker-Wheeler machines shown in this illustration is the brush rigging with parallel movement type of brush holder. The current is carried by four sets of copper strips fastened so as to permit of the movement of the brushes around the commutator while always maintaining the same angle with the bearing surface. The tension of the brushes is regulated by means of a helical spring which does not carry any of the current and is therefore not subject to heating. This type of holder maintains a constant position of the brushes on the commutator and as they wear away keeps them properly fed so that they wear equally on all parts of the surface. The various brush holder arms can be moved independently to compensate for any inequalities which occur in the different magnetic circuits and the entire rocker ring is revolved by means of a hand wheel, shown in the illustration.

The company has recently made a number of these large machines for railway work and the strength of their various parts and their ability to carry heavy overloads and fluctuating loads especially adapt them for satisfactory operation in railway service.

C. A. Willard, a retired merchant of St. Louis, has invented a device in the form of a rod which may be shot out from the rear of a car to prevent accident to persons who pass around the rear platform of the car from which they have just alighted and step directly in front of another car approaching from the opposite direction on a parallel track. At night the rod would be equipped with an electric light.

THE ROBB-MUMFORD BOILER.

The Robb-Mumford Boiler Co., Incorporated, of New York and Boston, has recently issued a 34-page catalog describing and illustrating the Robb-Mumford boiler, which is the outgrowth of the Mumford boiler designed by Mr. J. A. Mumford in 1885. The present type of boiler was designed in 1896 and intended for the American market, but it was first introduced into Canada by the Robb Engineering Co. The Robb-Mumford boiler is especially designed to carry high pressures with safety. It consists of two cylindrical shells, the lower containing a round furnace and tubes, and the upper forming the steam drum, the two being connected by two necks. The lower shell inclines about one inch per foot to promote draught and circulation. Combustion takes place in the furnace, which is surrounded entirely by water, and the gases after leaving the furnace pass through the tubes and return between the lower and upper shells to the outlet at the front of the boiler. The water, together with the steam formed by contact with the furnace and tubes, circulates rapidly up the rear neck into the steam drum, where the steam is released, the water passing along the upper drum toward the front of the boiler and down the front neck; a semi-circular baffle plate around the furnace causing the down-flowing water to circulate to the lowest part of the lower shell under the furnace.

The steel casing is asbestos lined and the top of the upper drum and bottom of the lower shell are covered with non-conducting material. As every part of the boiler is cylindrical, except the tube sheets, no staying is required. Every part of the boiler is open to inspection and it is easily cleaned. The Robb-Mumford boiler is said to combine to a remarkable extent the advantages of the Scotch and English types of internally fired boilers with the lighter weight, less floor space and more perfect circulation of the best American boilers of the water tube type.

COLORADO ELECTRIC LIGHT, POWER & RAILWAY ASSOCIATION.

The Colorado Electric Light, Power & Railway Association was organized August 12th at Denver, Col., and officers were elected as follows: President, J. F. Vail, general manager Pueblo & Suburban Traction & Lighting Co., of Pueblo; vice-president, William Mayher, manager Greeley Power & Light Co., of Greeley; secretary and treasurer, George B. Tripp, general manager Colorado Springs Electric Co., of Colorado Springs. The headquarters of the association will be at Colorado Springs. It was voted to hold the annual convention at Denver, Col., October 28th and 29th next. The object of the association is "to foster and promote the common interests of its members and to advance scientific and practical knowledge in all matters relating to electric light, power and railway companies; also to establish cordial and beneficial relations with kindred associations and between the manufacturers of apparatus and the purchaser." It is expected that nearly all of the 55 companies in the state will become members.

ADVERTISING LITERATURE.

THE H. W. JOHNS-MANVILLE CO., 100 William St., New York, has just issued a new "Noark" fire bulletin, 4 pages, 3½ x 6 in., illustrated.

THE SPRAGUE ELECTRIC CO., of New York, has issued Bulletin No. 206, third edition, for July, 1903, on "Lundell Motors, Direct Current."

THE ELECTRIC STORAGE BATTERY CO., of Philadelphia, Bulletin No. 79 for June, 1903, describing the installation of "Chloride Accumulators" in the building of the Ferguson-McKinney Dry Goods Co., St. Louis.

THE PULLEY SUPPLY CO. of Canton, O., has issued an illustrated 8-page booklet, 6 x 9 in., on the subject of the Kuntson roller. The cover of the booklet bears the suggestive title "Rolling Right." It is illustrated.

HARTSHORN'S ROLLER for August is brim full of timely and instructive information. It has a distinctive character, the price of the booklet being 10 cents per page, covering the "Chloride Accumulators" Bulletin No. 206, third edition, for July, 1903, on "Lundell Motors, Direct Current."

fetching. Editorially "a few hints on shade cloth" are served up in instructive fashion, the idea being to emphasize the merits of the Hartshorn shade roller, made by the Stewart Hartshorn Co., of East Newark, N. J.

THE WESTINGHOUSE ELECTRIC & MANUFACTURING CO., of Pittsburg, has issued the following publications: Circular No. 1,037 (revised edition, superseding that of January, 1902), "Engine Type Alternators." Circular No. 1,067, "Air Blast Transformers."

THE UNDER-FEED STOKER CO. OF AMERICA, Marquette Building, Chicago, in "The Publicity Magazine" for July, published a likeness and short sketch of Evan William Jones, the inventor of the Jones stoker. There are a good many interesting items in this little magazine each month, combining a judicious admixture of business and pleasure.

THE R. WOODMAN MANUFACTURING & SUPPLY CO., 63 Oliver St., Boston, Mass., has issued a complete catalog, 32 pages, 3½ x 6 in., describing and illustrating ticket punches, badges, uniform buttons, sealing devices, car pushers, speed indicators and baggage checks made by it. It also issues a descriptive circular treating of its hand tally register, or automatic register.

THE MAN WITH THE SHOVEL is the title of a booklet which is published by the Eagle Oil & Supply Co., 104 Broad St., Boston, Mass. It treats of scale solvent and incrustation and gives much information which would be of interest to our readers who have anything to do with steam boilers. A copy will be sent free to anyone mentioning this publication when writing.

THE NEW BEDFORD BOILER & MACHINE CO., of New Bedford, Mass., has just issued a new valve catalog, 14 pages, 7 x 11 in., illustrated, giving dimensions, description and prices of its high pressure boiler stop valves, superheated steam valves, reverse current automatic boiler stop valves, throttle valves with pilot disk, and special valves designed for special places.

THE MAYER & ENGLUND CO., of Philadelphia, in "The Keystone Traveller" for July, under the caption, "We certainly have captured New York," announces that it was awarded the second large contract for bonding the New York subway, the contract calling for "Protected" rail bonds for the third or contact rail. The contract awarded to the "Protected" rail bond a few months ago was for the track or traffic rail.

THE COMPOSITE PULLEY & CLUTCH CO., 620 Atlantic Ave., Boston, has issued a 22-page illustrated pamphlet, 6 x 9 in., treating of the "Compo" pulley and clutch, the chief feature of which is the introduction of cork inserts to increase friction, while decreasing wear, and to prevent slipping, etc. The pamphlet contains some excellent arguments substantiated by test tables and strong testimonials. The company also issues a folder showing the number of square feet in pulley faces.

THE MCGUIRE MANUFACTURING CO., of Chicago, has issued an attractive office wall calendar for the last half of 1903. It is 16 x 18 in. in size and has a leaf for each month, the calendar proper being 6 x 13 in. On each leaf, above the calendar, is printed a large engraving of one of the company's specialties, which include the pneumatic sprinkling car, rotary snow sweeper, No. 35 motor car truck, the "Solid Steel Columbian" truck, No. 39 A double truck and maximum traction truck No. 3.

THE HOPPE'S MANUFACTURING CO., of Springfield, O., has just issued a new catalog, 6 x 9 in., 40 pages, describing and illustrating its full line of machinery, including feed water heaters and purifiers, steam separators, oil eliminators and exhaust heads. It is well illustrated by views showing design, construction and use of heaters and purifiers, and containing a number of shop views. The company has also issued an attractive 20-page booklet showing steam separators, oil eliminators and exhaust heads.

THE JOSEPH DIXON CRUCIBLE CO., of Jersey City, has issued "Dixon's Index for Pencil Users," which will be found a very helpful little book by those who have difficulty in finding a pencil that is "just right." In it the 1,000 different Dixon pencils are indexed under 54 classifications, so that the manager, clerk or other employe can tell at a glance upon which page the pencil he or she needs is described and illustrated. The suggestions contained in the book make the selection of a pencil extremely easy. Another feature of the book, which contains 32 pages, 5 x 8 in., is an interesting sketch of how Dixon's pencils are made, "from the ground up." The company has also issued an 8-page booklet that tells all about

Green, or made the pencil that writes black and copies proper. Graphite for August contains view of two iron and steel bridges which are protected by Dexion's strong graphite paint, one of them being the Union R. R. bridge at Pittsburg, and the other the Santa Cruz bridge at Manila, which is the first steel bridge in the Philippines.

THE STIRLING CO., of Chicago, manufacturer of the well-known Stirling water-tube boiler, has reprinted in pamphlet form a paper entitled "The Water-tube Boiler in the American Mercantile Marine", by William A. Fairburn, which was read before the Society of Naval Architects and Marine Engineers at its meeting in New York City, Nov. 20, 1902. The discussion on this paper is also included in the reprint and the whole forms a very interesting review of the subject which should be in the hands of all engineers interested in boilers.

THE FRANK RIDGON CO., of Boston, in Ridgon's Representative for August, announces that it proposes to keep telling the same old story (only in different ways) until every street railway line is equipped with the Wilson trolley-catcher, and every street-car barn has a Weld babbiting device, and every car has a Kilbourn track sanding device upon it. It also calls attention to three things regarding which it will not acknowledge any superior field coils, armature coils and assembled segments. The front cover of this number of the Representative is adorned by a half-tone view of a disciple of Isaak Walton displaying an exceptionally fine catch of lake trout.

THE GENERAL ELECTRIC CO. has issued the following publications: Bulletin No. 4327 (supersedes No. 4276), "Small Continuous Current Stationary Motors." Bulletin No. 4328 (supersedes No. 4230), "Direct Connected Railway Generators." Bulletin No. 4329, "Motor Starting Rheostat." Bulletin No. 4330, "Automatic Carbon-Break Circuit Breakers Type C, Form G." Bulletin No. 4331, "Portable Torque Balance." Bulletin No. 4332 (supersedes No. 4301), "Arc Lamps." Supply Catalog No. 7579, "Parts of Thomson Recording Watt Meters." Supply Catalog No. 7580, "Parts of Form 2 Direct Current Power Circuit Enclosed Arc Lamps." Price List No. 5111 (supersedes No. 5098), "Snap, Pendant and Punched Clip Switches."

TRADE NOTES.

THE CHICAGO RAILWAY EQUIPMENT CO., which is building a new plant at Detroit, Mich., has contracted for a 300-h. p. battery of high pressure boilers with the Morse Power Co., 204 Dearborn St., Chicago.

AMONG RECENT LARGE ORDERS, the Heywood Brothers & Wakefield Co. reports it has just filled one for over 3,000 reversible seats for 120 semi-convertible cars for Brooklyn Heights R. R. for service on the elevated division.

THE MORSE POWER CO., 204 Dearborn St., Chicago, reports satisfactory sales and that inquiries continue numerous. The company is the direct selling representative of prominent manufacturers of various types of high class corliss and automatic engines, boilers and other power station equipment concerns with a combined capitalization of several million dollars.

THE R. D. NUTTALL CO., of Pittsburg, reports a large number of street railways are taking advantage of its very liberal offer to sell Union standard trolleys and take as part payment one old or obsolete trolley for each new one ordered. The claim is made that by this arrangement the trolley equipment of street railways can be modernized at a minimum expense.

THE CHICAGO ENGINEERING & CONSTRUCTING CO., of Chicago, has taken a contract for overhead line work on the Illinois Valley Traction Co.'s line from Ottawa to La Salle, Ill. This is one of the properties under construction by the Portland (Me.) syndicate of which W. B. McKinley, of Champaign, Ill., is the representative in this field. H. E. Chubbuck is general manager of the company.

J. N. BRUCK, vice-president and general manager of the Bruck Solidified Oil Co. of Boston, recently made a Western trip and reports business in excellent condition. During his stop at Dayton, O., Mr. Bruck received a very complimentary notice from the Dayton Daily News, in which his method of solidifying oil was mentioned at length. The Bruck solidified oil has proved a satisfactory lubricant for electric car motors and journals and is now used on many of the more prominent roads of the country. This plan of

using oil saves a vast amount of waste, trouble, time and labor, as it is claimed that one application of 11 ounces of this lubricant has been sufficient to run a car 16,000 miles, and the journals, when examined by an inspector, were found to be in perfect condition.

THE LANGDON MANUFACTURING CO., of Springfield, O., advises us that it is in receipt of a letter from O. E. Randolph, general superintendent of the Union Waxed & Parchment Paper Co., of Franklin, O., which reads as follows: "We used your Weinland No. 8 water power cleaner to clean a battery of four Babcock & Wilcox boilers with the result that we are now saving 20 per cent on our fuel. We consider it a great machine."

W. N. MATTHEWS & BRO., of St. Louis, advise us that the Stombaugh guy anchor, for which the company is sole distributor, was recently subjected to a severe test when the stacks of the power house of the East St. Louis & Suburban Railway Co. were wrecked by a storm. All of the $\frac{3}{4}$ -in. guy cables were broken without moving the anchors. The stacks were 160 ft. high and 6 ft. in diameter. They were guyed by cables secured to twenty-four 12-in. guy anchors screwed into the ground their full length.

THE AMERICAN CONDUIT CO., which is the manufacturer of the electrolysis proof bituminized fiber conduit, has found the demand for this material such that it was necessary to open an office in New York City, in addition to the offices maintained in Philadelphia, Chicago and Los Angeles. Mr. F. C. Mott, who for some time past has been associated with Mr. G. M. Gest, the conduit contractor, will represent the company in the East.

THE FIRM OF KNOX, GEORGE & CO., of which George W. Knox and James Z. George are the principal partners, has found it desirable to organize a department of civil engineering work in connection with the development of the electric railway enterprises the firm has in hand. This department will be in charge of Frederick Brown, C. E., with headquarters in the Tulane-Newcomb Bldg., New Orleans. The Chicago office of Knox, George & Co. is in the Fisher Bldg.

THE NEW BEDFORD BOILER AND MACHINE CO., New Bedford, Mass., reports that among its recent orders are contracts to equip with its reverse-current automatic stop-valves the power stations of the following companies: The Brooklyn Heights Railroad Co., Kent Ave. power station, Brooklyn, N. Y.; Larkins Soap Co., Buffalo, N. Y.; Hotel Belmont, New York City; F. W. Bird & Sons, E. Walpole, Mass.; Trenton Municipal Lighting Plant, Taunton, Mass.; Drew Lumber Co., Columbia, Fla.

THE TAYLOR ELECTRIC TRUCK CO., of Troy, has added to its plant a complete line of machinery for manufacturing full and half elliptic springs, for which the best quality of crucible spring steel is used. A testing machine has also been installed and every spring is tested before it is shipped, and when desired the company will furnish accurate tests of the springs ordered. It believes that it is producing much better springs than it could buy in the market, and solicits orders from the electric railways.

THE R. D. NUTTALL CO., of Pittsburg, advises us that it has in preparation, and will place on the market at the proper time, a practical and perfect sleet-cutting device that is light, strong and compact, and that can be carried by the motorman without inconvenience and can be quickly adjusted without removing the wheel and without tools of any description. This device is the invention of an experienced street railway man, it is stated, and has been thoroughly tested. The company carries a large stock of both standard and high speed sizes and will fill all orders from stock.

THE WHEEL TRUING BRAKE SHOE CO., of Detroit, Mich., advises us that in July last the supreme court of Canada rendered a decision in favor of J. M. Griffin and W. E. Brinkerhoff, of the Wheel Truing Brake Shoe Co., of Detroit, Mich., in a suit against M. Power and the Toronto Railway Co., on account of infringement by the latter of patents on abrasive brake shoes owned by Griffin and Brinkerhoff, and also that at the suit of the Wheel Truing Brake Shoe Co., of Detroit, Mich., the United States Court for the Western District of New York has ordered a decree for a perpetual injunction and an accounting for damages against the Car Wheel Truing Brake Shoe Co., of Buffalo, N. Y., organized by M. Power, of Toronto.

THE WESTINGHOUSE TRACTION BRAKE CO., of New York, reports the following recent contracts for motor-driven compressor air brake equipments: Los Angeles Railway Co., 16; North Shore Railroad Co., San Francisco, 17; Indianapolis & Northwestern

traction Co.; 12; Indiana Railway Co., South Bend, 10; Evansville & Princeton Traction Co.; 5; Wooster & Southbridge Street Railway Co.; 7; Concord & Manchester Co.; 8; Concord Street Railway Co.; 12; Holland Palace Car Co.; 1. The company recently equipped a number of cars with its magnetic brake and car heating apparatus, including those for the following: Pennsylvania & Mahoning Valley Railway Co.; 16; Morgantown Electric & Traction Co.; 12; Washington & Camonsburg Railway Co.; 15; Altoona & Logan Valley Electric Railway Co.; 8.

ADAM COOK'S SONS, 313 West St., New York City, who are the only makers of "Albany Grease," report a brisk demand for this famous lubricating compound among users of automobiles. The superiority of "Albany" grease for use on machinery of this kind is attested in a letter recently received by them from Mr. R. H. Megginson of the Wilmington & Newcastle Electrical Railway Co., New Castle, Del., who writes: "I wish to say a word in favor of your 'Albany' lubricating compound and particularly recommend it to users of automobiles. I have been using it both in grease cups and on ball bearings of my automobile since last March and have run every day over all kinds of roads and have not had a warm bearing. For bearings where as much depends as on an engine in an automobile 'Albany' grease has no competitor."

THE ALLIS-CHALMERS CO. has issued a handsome catalog, 177 pages, 6 1/2 x 9 1/2 in., describing and illustrating the Reynolds-Corliss engines built exclusively by this company. The catalog contains views taken in the company's works, and also views in a few plants for which it has furnished engines. These include the Manhattan Railway Co., and the Metropolitan Street Railway Co., New York; New Orleans Street Railway Co., Brooklyn Heights Railroad Co., Fairhaven & Westville Railway Co., New Haven; Cass Ave. & Fairgrounds Railway Co., St. Louis; Detroit Street Railway Co., Chicago United Traction Co., Consolidated Traction Co., Jersey City; Metropolitan West Side Elevated Railroad Co., Chicago; Portland (Me.) Railway Co., Toledo Traction Co., and several other companies at home and abroad.

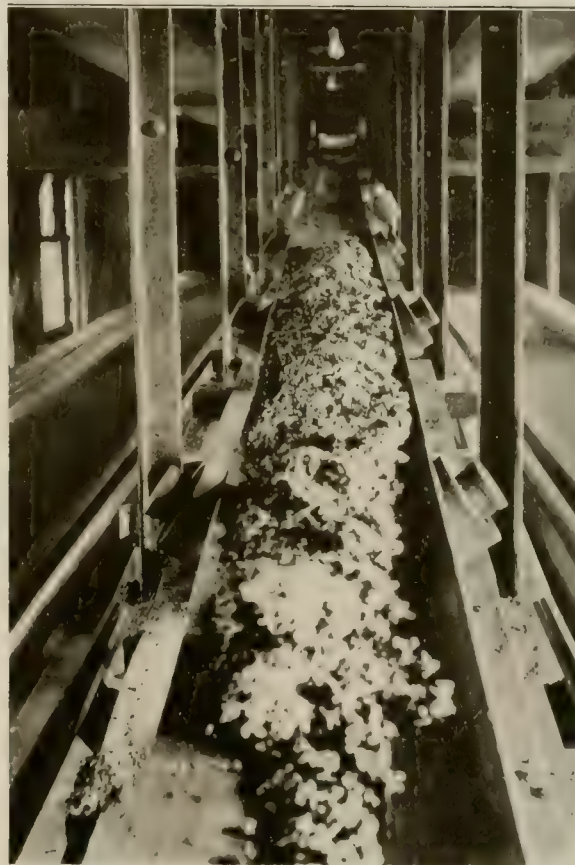
THE STAR BRASS WORKS, of Kalamazoo, Mich., maker of the well-known "Kalamazoo" trolley wheels and harps, calls attention to the new improved "Kalamazoo" trolley harp, which is presented as superior in every respect to those heretofore used. The springs are fully protected and there being no wear upon them they ought not to have to be replaced during the life of the harp. Roads that have tested this harp report that is the nearest to perfection of any they have used. The company also points to the performances of its "Kalamazoo" trolley wheels, some of the results of recent service tests by railway companies being as follows: A 6-in. wheel, still in service, has run 35,000 miles; a 4-in. wheel, with three bushings, 23,000 miles; a 4-in. wheel, with one bushing, 19,000 miles. In no case has there been injury to overhead wires.

E. P. ROBERTS & CO., of Cleveland, Ohio, consulting engineers, have opened a department of cement engineering and are now prepared to take entire charge of the designing and supervision of the construction and operation of cement plants. This firm has been in business for ten years and has large experience in electrical, mechanical and civil engineering, having had the consulting and supervision work for a great number of electric rail ways, electric lighting and power plants, manufacturing plants, etc. The cement department opens up a new field and the services of Mr. George S. Perkins, M. E., have been secured to look after the work. Mr. Perkins is a graduate of Stevens Institute of Technology, class of 1891, in the course of mechanical engineering and has had an extensive experience in the designing and constructing of cement plants.

THE TROLLEY SUPPLY CO., of Canton, O., advises us that for a device that has only been on the market about five months, the success of the Knutson trolley retriever, which it makes, has been unusually gratifying. Many lines have equipped all or part of their cars with it, and this is taken as convincing evidence that it is all that is claimed for it. Among the companies using the retriever are the Canton-Akron Street Railway Co., Stark Electric Railway Co., York Street Railway Co., Columbus, London & Springfield Railway Co., Indiana Union Traction Co., Indianapolis, & St. Louis Traction Co., Litchfield Traction Co., & Toledo & New York Traction Co., Youngstown & Akron Traction Co., Detroit United Ry., Rockford, Beloit & Janesville Traction Co., Grand Rapids, Holland & Lake Michigan Ry.

way Co., and the Western Ohio Railway Co. Shipments have also been made to France, Germany and South America, indicating a promising foreign business.

THE GREEN ENGINEERING CO., of Chicago, advises us that it has entered into a contract with the Allis-Chalmers Co., giving to the latter the agency for the Green traveling link grates in all foreign countries. Among recent contracts secured by the Green Engineering Co. are those with the following electric railway companies: Omaha & Council Bluffs Street Railway Co.; St. Joseph (Mo.) Railway, Light, Heat & Power Co.; East St. Louis & Subur-



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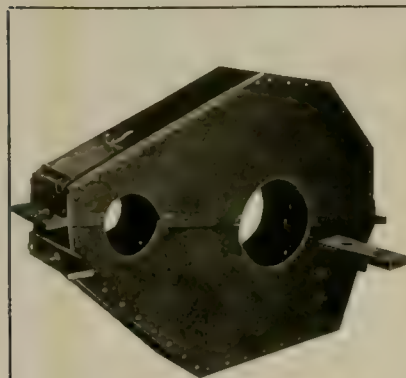
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Recent contracts for the supply of Street Railway & Light Co., Springfield, Mo.; Railway, Light & Power Co., El Paso, Texas; Union Co., Saginaw, Mich.; Traction Co., Galveston, Texas; Motor & Power Co., Columbus, Ohio; Railway & Light Co., Contract No. 1,000,000, Cincinnati, Ohio; the following street car road: Louisville & Nashville Railway Co., new shops; Chicago, Rock Island & Pacific Ry., new shops at East Moline, Ill.; Pennsylvania R. R., new shops. Besides these several contracts have been made with large manufacturing concerns. Among the largest installations of Green traveling link grates have been those for the Chicago Union Traction Co., Metropolitan Street Railway Co., of Kansas City, and the St. Louis Transit Co., aggregating about 50,000 h. p.

THE ROOT TRACK SCRAPER CO., of Kalamazoo, Mich., calls particular attention to three devices made by it which should be of especial interest to electric railway men at this time when preparations are going forward toward putting the rolling stock in shape for winter. One is a reversible scraper designed to be fastened on either end or at any point between the trucks of a double truck car. It raises, lowers and scrapes going either way, always throwing the snow to the right of the track. It is 9 ft. long and 21 in. from rail to top of spring. It is operated from one end of the car and needs no attention until the end of the line is reached. It cleans all of the snow from between the rails and 9 in. on the outside of both, clearing the snow thoroughly, over a space of 6 ft. 6 in. wide, level with the rail. This scraper is known as the "Detroit." The "Kalamazoo" is another scraper for which much is claimed. It is designed to clean all the snow from between the rails, and 9 in. on outside the same, throwing it each way from the center; it also cleans the top of the rail and groove. It can be run faster than a sweeper and is said to be more practical; it costs about 1-20 as much and there is no extra expense for labor, power and replacing worn-out brooms. It fully protects the motor from snow, the maker states. A device which the company guarantees is one for cleaning the third, or contact rail. It is a combination scraper and sleet cutter, or without the sleet-cutting wheel it is simply a scraper. For removing sleet it first breaks the ice and the spring back of the wheel scrapes the ice off of the rail. Any pressure can be put upon the springs, and no matter what the speed the ice is broken uniformly, it is stated, and is easily removed. A few of the roads



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THE ALLIS-CHALMERS CO. reports the following partial list of engine sales for July, 1903:

Chicago Beach Hotel, Chicago, one 16 x 36-in. heavy duty direct connected Reynolds Corliss; Knox Construction Co., Chicago, two 20 and 40 x 48-in. heavy duty cross compound direct connected Reynolds Corliss; Richmond Cedar Works, Richmond, Va., one 24 and 36 x 48-in. heavy duty cross compound Reynolds Corliss; Barrett Manufacturing Co., Beloit, Wis., one 20 and 40 x 48-in. heavy duty cross compound Reynolds Corliss; American Aristotype Co., Jamestown, N. Y., one 18 x 36-in. girder frame Reynolds Corliss; Stillwell-Bierce & Smith-Vaile Co., Dayton, O., one 16 x 42-in. girder frame Reynolds Corliss; Fourche River Lumber Co., Chicago, one 24 x 48-in. and one 20 x 42-in. heavy duty Reynolds Corliss; J. I. Case Plow Works, Racine, Wis., one Reynolds air pump and jet condenser; Consumers' Heat & Electric Co., Bloomington, Ill., one 20 and 32 x 36-in. heavy duty cross compound Reynolds Corliss; Union Sugar Co., San Francisco, Cal., one 18 x 36-in. girder frame Reynolds Corliss; Canton Oil Mill Co., Canton, Miss., one 16 x 42-in. girder frame Reynolds Corliss; Henry Du Pont, Wilmington, Del., one 20 x 42-in. girder frame Reynolds Corliss; Olds Motor Works, Lansing, Mich., one 16 x 42-in. girder frame Reynolds Corliss; Clayton Oil Mills, Clayton, N. C., one 18 x 42-in. girder frame Reynolds Corliss; Charles B. Pride, Appleton, Wis., one 18 x 36-in. heavy duty Reynolds Corliss substituted for 14 x 36-in. sold May 25, 1903; Columbus, Buckeye Lake & Newark Traction Co., Columbus, O., one 34 and 68 x 48-in. vertical cross compound condensing heavy duty Reynolds Corliss; Lock, Moore & Co., Ltd., Westlake, La., one 24 x 48-in. heavy duty Reynolds Corliss; Georgia Cordage Mills, Decatur, Ga., one 16 x 42-in. heavy duty Reynolds Corliss; Marquette Cement Manufacturing Co., La Salle, Ill., one 20 x 42-in. heavy duty Reynolds Corliss; Coe Brass Manufacturing Co., Torrington, Conn., one 22-44 x 42-in. and one 19-38 x 42-in. combined horizontal and vertical compound Reynolds Corliss and two air pumps and two jet condensers; Charles Waite, South Dakota, one 12 x 30-in. girder frame Reynolds Corliss, two 70 h. p. 54 x 16-in. tubular boilers and one No. 5 feed water heater; The Gauley Co., Camden-on-Gauley, W. Va., one 16 x 36-in. heavy duty Reynolds Corliss; Rock Hill Water, Light & Power Co., Scranton, Pa., one 20 x 42-in. girder frame Reynolds Corliss; Memphis Consolidated Gas & Electric Co., Memphis, Tenn., one 27-72 x 48-in. horizontal cross compound heavy duty direct coupled Reynolds Corliss; The Homestake Mining Co., Lead, So. Dak., one 18-32-34-24 x 42-in. combined horizontal-vertical triple expansion engine and three 320 h. p. Sederholm boilers; Lacey-Buek Iron Co., Birmingham, Ala., one 44 and 84 x 60-in. vertical standard furnace blowing engine; C. A. McDonald, Chicago, one 16 x 36-in. girder frame Reynolds Corliss, without crank, crankshaft, wheel, etc.; Arkansas City Milling Co., Arkansas City, Kan., one 22 x 42-in. heavy duty Reynolds Corliss; Manhattan Rubber Manufacturing Co., Passaic, N. J., one 24 and 40 x 42-in. heavy duty tandem compound Reynolds Corliss.

Recently an Aurora, Elgin & Chicago Railway Co. car ran 35 miles in 34 min. 39 sec., and on July 18th a Jackson & Battle Creek Traction Co. car made one mile in 30 seconds.

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DAILY STREET RAILWAY REVIEW

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No. 1

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Saratoga and its Environs.

The name Saratoga is derived from the old Indian name Se-rach-ta-gue — meaning the hillside country of the great river — and originally referred to a tract of land 15 miles in length and extending back about six miles from the Hudson, on both sides of the river. The much smaller tract embracing the present springs was called by the Indians Kay-ad-ros-se-ra — the lake country, this name being now retained for the large stream flowing through the country and emptying into the Hudson at Mechanicsville. When the mineral springs were first discovered by the white settlers, they unwittingly called them "The Spring near Saratoga," though situated several miles away from the real Se-rach-ta-gue. The famous resort of today is officially known as Saratoga Springs, but for brevity and convenience this is now commonly, though erroneously, shortened to Saratoga.

in number from time to time as the popularity of the place increased until the resort now boasts, among other superlative distinguishments, the largest and finest collection of commodious hostelries in the country.

The village of Saratoga Springs is located close to the eastern edge of New York State, near the gateway of the Adirondack region. It is 182 miles almost due north from New York city; 205 miles west of Boston; 311 miles east of Niagara, and 202 miles south of Montreal. It is on the main lines of the Delaware & Hudson R. R., the Adirondack R. R., and and the Boston & Maine R. R. It is easy of access through the excellent connections made at Albany and Troy, with all points East, South and West.

The mineral springs upon which the fame of Saratoga is based



SARATOGA RACE TRACK.

Although but a small village if classified according to its resident population, Saratoga Springs is justly renowned throughout the world, its fame being due primarily to the great number and peculiar quality of the mineral springs found in the immediate vicinity; and also to a very large extent to the fact that the springs early attracted the attention of several wealthy and prominent families of New York and Boston who year after year returned to the place for their summer outings and so started the movement that has given Saratoga Springs the appellation of the "most famous summer resort in America." The influx of health and pleasure-seeking visitors soon justified the building of commodious hotels which have been extended and increased

are found in a crescent shaped valley extending from Ballston Spa to Quaker Springs, a distance of about 17 miles. In the center of this valley is the village of Saratoga Springs near which are all of the more famous of the springs, about 35 in number. Not the least interesting feature of these is the fact that so limited an area can produce so wide a variety in the taste, chemical properties, and medicinal effects, of its spring waters. Each spring has its own distinctive qualities. There are wide variations, especially as regards the taste of the water which ranges from suggestions of rusty nails and old horse shoes to clear sparkling waters almost perfect in their purity. Each of the different springs has different curative effects and it is sug-

gested that before the visitor indiscriminately patronizes the various waters he consult some one of the responsible local medical authorities who will be able to prescribe the waters best suited for the particular case. To persons in good health a limited amount of the waters do no particular harm, but if it is desired to partake of the springs for their curative properties, it is best to ask the advice of someone thoroughly acquainted with the analysis of each water.

The springs are all natural flows and bubble up from the earth, some from the soil and others from apparently solid rock. Some of the waters are heavily charged with carbonic acid gas which forces the water to the surface under considerable pressure.

The history of the springs is interesting. For several centuries



SARATOGA LAKE FROM MOON'S LAKE HOUSE.

the Indians had known of the "medicine waters," and used the waters freely for the cure of many ailments. They regarded the springs as a gift of the Great Spirit for the healing of their nations. The first white man to visit the locality was a wounded French officer who was carried to High Rock Spring from Fort Carrillon by an Indian chief sometime previous to 1761. In the latter year Sir William Johnson visited the place and recorded the benefits he derived from the use of the waters. The first hotel was built in 1774 by one, John Arnold of Rhode Island,



CONGRESS PARK, SARATOGA.

and the beginning of Saratoga Springs as a pleasure and health resort dates from that year.

After the discovery of High Rock Spring the other springs were found, some by accident and some by careful scientific search. Practically all of the springs are now owned by stock companies or individuals, some are free to the public and at

others a small fee is charged for the privilege of drinking the water. The bottling and shipping of the various waters has come to be an extensive industry and the products of the springs are sold under trade marks or names all over the world for table and medicinal uses.

The more famous of the springs will be found within a few minutes walk of the center of the hotel district. Perhaps the best known and most largely patronized are the Congress Spring and



KID'S MOON'S LAKE HOUSE, AT CEDAR BLUFF.

the Columbian Spring, both located in Congress Spring Park, the entrance to which is just south of Congress Hall. The park is a beautiful reservation upon which a large amount of money has been spent in improvements. Entrance to the grounds is through a handsome pavilion and the park is laid out with charming walks, flower beds, deer reserve, band stands and other attractions. A small fee is charged at the gate, but once inside the visitors are free to partake of as much of the waters as they may desire, and are at liberty to enjoy all the features of the place without further charge. Old Red Spring, Saratoga "A" Spring, Empire Spring, The Star, High Rock, Seltzer, and the headquarters for the famous Saratoga Vichy, are all located within walking distance of the hotel district.

Almost as renowned as its waters is the air of Saratoga which throughout the year possesses a remarkable dryness—a blending of Adirondack breezes with the zephyrs from the nearby Green Mountains of Vermont. Saratoga has an altitude of over 300 ft. above sea level, and the air is characteristic for its buoyancy and freedom from all dampness.

Undoubtedly the hotels of Saratoga are remarkable in size, number and design, and the effect is one to be remembered as the visitor scans for the first time the fronts of the mammoth hostleries, the largest and finest of which are all concentrated within an area of half a dozen squares along Broadway, the main thoroughfare of the village. It is said that an influx of 40,000 newcomers in a single day causes but little confusion in the hotel lobbies, and does not tax unduly the capacity of the village for feeding and housing the visitors. The place is rapidly becoming a favorite convention city and its growing popularity for convention purposes is beginning to supplant more or less its fame as a strictly exclusive summer resort.

Three of the largest hotels, Congress Hall, the United States and the Grand Union, each cover an entire block. Each is built about three sides of an open court, where are to be found huge elms, shady walks, fountains and well-kept lawns. Several of the larger houses will each accommodate in excess of 1,000 guests.

The sources of amusement at Saratoga are many and varied. Especially is the village and surrounding country for its fine drives. Several hundred fine carriages will be found in the village for public hire and although the rates charged are not exorbitant on ordinary days, the prices asked increase rapidly on pleasant Saturday and Sunday afternoons. The carriage fares are not strictly regulated by ordinance and the price to be paid by the hour or for the afternoon is a matter for agreement between the driver and the parties when the carriage is engaged. Strangers will find it advantageous to have a complete under-

standing as to the price to be charged before the drive is commenced.

The chief and most popular drive is to Saratoga Lake, situated about four miles from the village. Starting from the hotel district the route is past Congress Spring Park and then along Union Avenue, the great fashionable drive, on which on a bright afternoon will be found a merry procession of automobiles, fine carriages, and stylish equipages of every description.

Leaving Congress Park perhaps the first object of interest will be Canfield's Place, notorious as the place where Society was wont to court Dame Fortune at games of chance. The famous red brick mansion is surrounded by beautiful grounds and flower beds—a miniature Monte Carlo.

A short distance farther on the right is the Saratoga Race Track, claimed to be the oldest and finest racing track in the North. Racing was established at Saratoga in 1864, and the "Saratoga Racing Season" now draws lovers of the sport from the country over, the rich stakes offered during the meet always bringing together many of the best thoroughbred horses on the American turf. The track, which was remodeled and rebuilt two years ago, is a mile and a quarter, with chutes for the mile and three-quarter mile distances. The grand stand accommodates 15,000 people, the betting ring being adjacent to it. A separate enclosure with accommodations for 1,200 horses is known as Horse Haven.

Just east of the racing park is Yaddo, the beautiful country estate of Mr. Spencer Trask. The drives through the grounds are open to the public through the courtesy of Mr. Trask.

Saratoga Lake is a mile or so beyond this point. The lake is an attractive body of water about seven miles in length and two in width. There are numerous hotels and road houses along the shores where fish and game dinners may be enjoyed. The largest of these places is Ben Riley's "Arrowhead." One of the landmarks that will be pointed out to the visitor is "Kid" McCoy's place across the lake, where the champion prize-fighter trained for several of his bouts.

A short distance down the lake shore is Kaydeross Park, which may also be reached from Saratoga by a branch line of the Hudson Valley Railway Co., by which corporation it is conducted as a pleasure park, with pavilion, restaurant, rustic theater, etc. From this point a steam yacht makes regular hourly trips to White Sulphur Spring at the south end of the lake.

Many other attractive drives and walks may be enjoyed by the visitor. The Saratoga Golf Club with its grounds is located on Church Street about a mile from Broadway. The Saratoga Polo Club grounds are just north of the golf links. The Speedway is a mile straightway speeding course rivaling New York's River

on Oct. 7, 1777, and there on Oct. 17, 1777, General Burgoyne surrendered to General Gates. The site of the battle is marked by a monument 200 ft. high. The place can be reached by steam railroad or carriage from Saratoga.

A few miles north of Saratoga is Mt. McGregor where Gen. U. S. Grant spent his last days. Under the supervision of the National G. A. R. it is kept in the same condition it was when Grant passed away. The place is best reached by driving.



CONGRESS HALL, SARATOGA.

Nearer the village is the Ostrich Breeding Farm on Ballston Avenue, reached by drive or by electric cars. A visit to this farm will be found interesting and instructive.

Near the center of the village is the House of Pansa, a reproduction of the building in Pompeii made famous in Bulwer-Lytton's "Last Days of Pompeii"; also the Indian encampment where baskets and other articles of Indian make can be purchased.

Saratoga's Convention Hall stands on the east side of South Broadway not far from Congress Spring Park. This building has been the scene of many a spirited convention of both great political parties. It was built at a cost of \$100,000 and seats 7,000 people.

There are no electric lines on any of the main streets of the village owing largely to the effective opposition of the Hack Drivers' Association. However, the cars of the Hudson Valley Railway Co. enter the village through some of the side streets within a few minutes walk of the large hotels and cars may be taken for any point on the Hudson Valley System.

Saratoga is also famous as the home of chips and trunks.



THE UPPER HUDSON AND LAKE GEORGE REGION.

Stretching away to the north from Saratoga lies a grand rolling country, whose history goes back to the earliest dawn of exploration. The Valley of the Hudson has been aptly termed "that splendid aisle which leads from the Adirondack Mountains to the sea." The region of the Upper Hudson has in later years been rendered accessible by the electric lines of the Hudson Valley Ry., and the steam roads of the Delaware & Hudson R. R., and the territory offers many a delightful slide trip or sojourn to those who may be visiting Saratoga Springs.

From Saratoga to Caldwell at the foot of Lake George is 30 miles and between the two villages will be found much to please and interest. The route has been a war path for many nations, British, American, French, and Indian have here waged conflict after conflict and scores of battle grounds, forts, sites of Indian massacres are strewn along the way. Of the towns passed, Fort Edward, Sandy Hill and Glens Falls will be found typical New York State villages, bustling with life and enterprise.

At Caldwell on Lake George the Hudson Valley Railway Co. owns Fort William Henry hotel, a spacious and delightful hostelry overlooking the lake and replete in all the necessities and luxuries of a first class hotel.

The Lake George region thus opened up is believed by many



PAVILION AT CONGRESS SPRINGS, SARATOGA.

sides Speedway. Woodlawn Park is a magnificent tract of nearly a thousand acres, the country seat of the late Judge Henry Hilton.

Within twelve miles of Saratoga occurred the incidents which marked the turning point in the Revolutionary War. Near Schuylerville around Bemis Heights was fought the battle of Saratoga

to stand unrivaled for natural beauties. Legends and traditions abound concerning nearly every nook. James Fenimore Cooper found here rich material for his best known tales, and to this day the localities immortalized in the "Last of the Mohicans" are pointed out as the scenes of actual occurrences.

Lake George varies in width from three-quarters of a mile to four miles. Completely shut in by the mountains which hang in bold cliffs over the water, or stretch into it in rocky promontories, the lake in its narrower parts seems but a river. Again it broadens out into magnificent stretches of water. Its hundreds of islands, most of which are the property of the State, furnish temporary homes for many summer visitors, who bring their tents and enjoy camp life. The beauty and charming delights of a trip through the lake, with its scores of stops at the various picturesque landings, will repay almost any effort necessary to make it.

About 10 miles from Glens Falls is Spier Falls where the Hudson River Power Co. is now completing a dam of immense proportions across the Upper Hudson, and where it is proposed to develop upwards of 20,000 h. p., which will be transmitted electrically at high tension on lines to Troy, Albany, Schenectady, and intervening towns and cities.

pending the completion of the Spier plant, the Mechanicsville station is supplying current for all the cars of the United Traction Co. in Albany and Troy, for the cars of the Schenectady Ry., and for a portion of the General Electric Works at Schenectady. Another of the water falls drives the plant of the Duncan Co. at Mechanicsville, the largest book paper mill in the world.

Still farther south toward Troy and Albany are the manufacturing cities of Waterford, Lansingburg and Cohoes.

Troy is a city of 75,000 inhabitants. This place is primarily the center for the manufacture of shirts, collars and cuffs, and it is calculated that Troy makes 85 per cent of the linen collars and cuffs produced in America. In this industry alone more than 20,000 persons are employed and \$9,000,000 is paid annually in wages. At Troy are also located large iron works, chain works for the making of ships chains, and establishments for the manufacture of steam valves.

The Rensselaer Polytechnic Institute is situated in Troy. This is the oldest and one of the leading schools of engineering in the world, having been founded in 1824.

Across the river from Troy is Watervliet, where is the widely known Watervliet Arsenal, established in 1813 by the United States Government for the manufacture and storage of heavy



THE STATE CAPITOL, ALBANY.

THE CITIES SOUTH OF SARATOGA SPRINGS.

Between Saratoga and Albany are numerous thriving cities with many mills and factories, attracted thither by the abundant water powers and good shipping facilities, and whose products include a wide variety of goods and staples.

Ballston, just south of Saratoga, is the shire town of Saratoga County and was one of the earliest fashionable watering resorts in the country. During the first half of the nineteenth century it was rich in mineral springs, but these have gradually failed, and it is now the center for many manufacturing interests for which water power is provided by Kayderosseras Creek. The principal plants are those of the Union Bag & Paper Co., the American Hide & Leather Co., the Glen Pulp Co., and the Island Paper Co. The Geysers Springs are between Ballston and Saratoga.

Mechanicsville, at the junction of the Saratoga Branch and the main line of the Hudson Valley Ry., is best known for its great water power developments. The largest of these is owned by the corporation which is building the great dam at Spier Falls, and

field, siege and seacoast guns, small arms, and shot and ammunition. Here was recently turned out a 16-in. breech-loading rifle, the largest gun ever made in the world. It was built to throw a projectile weighing 2,370 lb. 21 miles.

♦ ♦ ♦

ALBANY.

Albany is probably the oldest surviving European settlement in the thirteen original states. The settlement at Jamestown, Va., was made several years earlier, in 1607, but it has long since ceased to be a town, and is now merely a pile of ruins and tombstones. The city of Albany owes its birth to that staunch old explorer, Henry Hudson, who in September, 1609, went sailing up the Hudson River, confidently believing he had discovered the much-sought-for westward passage to India and China. Much to his disappointment, he found the river gradually growing narrow and shallow, and at last having reached the head of navigable waters, he landed on the west bank of the river, where the Capital City now stands.

There is much in the city of Albany to attract the interest of tourists. Chief, of course, is the Capitol, a fitting structure to represent the political center of the Empire State. On the first day of May, 1885, an act was passed authorizing the erection of a new Capitol building whenever the city of Albany should deed the land proposed as a site. On April 22, 1867, a preliminary appropriation of \$250,000 was made to be used in the construction of the building, but it was expressly stipulated that the building was not to cost, when completed, more than \$4,000,000. Before the structure was finished, however, many changes were made in the original plans, and when at last finished, the exact cost amounted to \$24,265,082.67. Excavation for the building was commenced in 1867, and the first stone was laid July 7, 1869. The Senate Chamber was first occupied March

to a depth of 9 ft. From the reservoir the water passes to the filter beds, where it filters through 4 ft. of clean white sand, and 3 ft. of gravel. The purified water passes into a storage reservoir, and thence through 8,000 ft. of 18-in. pipe to the well of the city pumping station, whence it is forced to the distributing reservoirs on nearby hills.

Near Albany on the banks of the Normans Kill is the vale of Tawasentha made famous by Longfellow's poem "Hiawatha." Across the river from Albany is Rensselaer, a busy city of factories and railroad shops. Visitors are interested in Fort Cralo near Albany, where "Yankee Doodle" is said to have been written. This place was afterwards the homestead of the Van Rensselaer family.

The population of Albany is officially 94,000 people.



VIEW OF ALBANY FROM ACROSS THE HUDSON RIVER.

10, 1881, but the building was not pronounced officially finished until two or three years ago, so that the structure was practically 35 years in building. It stands today, in point of size and magnificence, second to none save the National Capitol at Washington. The western staircase, with its magnificent carvings, is said to be the finest staircase existing. The corridors and various rooms of the building are filled with historical and Indian relics and curios, which are open for inspection to all visitors.

Albany, although essentially a political center, is rapidly developing important manufacturing and commercial interests, and its prominent buildings include, in addition to the City Hall, the Post Office and other State and City buildings, several fine buildings for banking institutions, and several office buildings, which,

SCHENECTADY.

Schenectady, a city of 50,000 inhabitants, including suburban districts, is about 17 miles northwest from Albany, with which it is connected by steam railroad and by two double-track electric lines, one running direct, and one by way of Troy. Schenectady is best known by reason of its two great industrial establishments, the General Electric Works and the Schenectady Locomotive Works, now owned by the American Locomotive Co.

The works of the General Electric Co. are situated about half a mile south of the business portion of the city, and the establishment covers an area of about 130 acres. At present, there are employed nearly 11,000 people, the great majority of whom are



HIGH SCHOOL. STATE HOUSE. CITY HALL.
ALBANY.



UNION STATION, ALBANY.

although but seven or eight stories high, are proudly termed by the citizens "sky scrapers."

The city has an exceptionally fine plant for the purification of its drinking water, which was completed at a cost of nearly \$2,000,000. The water is pumped up 18 ft. from the river by two centrifugal pumps, with a capacity of 16,000,000 gallons each per day, to a settling reservoir, which covers a surface of 5 acres

skilled mechanics. Here are made the almost infinite variety of electrical devices, machinery and apparatus which bear the General Electric name.

Schenectady is the site of Union College, which was chartered in 1795, and is, therefore, one of the oldest American colleges in existence. It is both an academic and a technical engineering institution.

PAPERS BEFORE THE AMERICAN RAILWAY MECHANICAL AND ELECTRICAL ASSOCIATION.

Read Sept. 1, 1903. — Afternoon session.

IMPROVEMENTS IN STREET CAR MOTORS.

By E. W. Olds, Superintendent of Rolling Stock, Milwaukee Electric Railway & Light Co., Milwaukee, Wis.

We live in a progressive age and have to look back but a few years to see that improvements in street car motors have been made at a very rapid rate. The growth of electric railways in this and other countries has certainly been wonderful. Many of us remember when the first street car motors were put into successful operation—the old Sprague No. 6 and T. H. F-20 being wonders of their day, the Sprague equipped with Sprague controllers, and T. H. with the so-called rheostat, coffee mill. With them, we were able to haul a fourteen or sixteen foot car with an eight or ten bench trailer at a speed of from five to twelve miles per hour. We remember the trouble caused by burning out of controllers, breaking of rheostat cables, also short circuiting and burning out of brush holders, armatures and fields, caused by water and the picking up of wires, etc.

To meet the demands of today, our service must be rapid, reliable and safe. Our manufacturers and designers have not been idle. We now have reliable equipments, all motors being constructed practically water-proof, with the gears entirely enclosed, and are well lubricated except where the gear cases are broken or out of order. The controllers are practically all series-parallel and are giving good satisfaction.



E. W. OLDS.

Some of our street railway companies have had, and are having special motors built according to their ideas and to meet their conditions, the manufacturers being not only willing but anxious to push the development of the machines to meet the railway companies' requirements. One of the weak points being covered by the manufacturers and railway companies in their special machines is the construction of the motor frame to make it more accessible for inspection and repairs. Nearly all of our motors, as now designed, are arranged to open at the bottom, doing practically all of the repair work in the pit. In repairing double truck equipments, it has been found more satisfactory to lift the car body from the truck, making it possible to do all of the repair work from the top. To do this, the top half of the motor frame should be designed to lift off, giving access to the armature, bearings, fields, brush holders, etc.

The dimensions of our gears have not been increased in proportion to the motors, as they show excessive wear, causing, very often, the swedging of the teeth. This should be remedied by making the gears with wider face. The quality of the steel should be better, that is, closer grained, and tough, thereby increasing the life of the gear with but little additional cost. The life of our present gears is from eighteen to twenty-four months and of pinions from twelve to eighteen months. This should be doubled. The advisability of using split, or solid axle gears, is an open question, each having its advantages and disadvantages. If split gears are used, the bolts should be made larger and pro-

vided with nut locks, double nuts and cotters, making it impossible for them to become loose and fall out.

The gear case should be so constructed that it would stand abuse as well as use. To make such a case, I believe it would be necessary to cast it as a part of the lower half of the motor frame, doing away with bolts and giving the gears absolute protection.

The armature bearings should be made longer and larger, with linings that may be easily removed and either re-babbitted or renewed. This would, we believe, make a saving of 50 per cent in our bearing expense. Their lubrication, also, is a very important matter. Until recently, nearly all of our motors have been designed to use grease. Some of our manufacturers have used both grease and oil, feeding the oil with a wick from below and grease from cups above the bearings. Bearings have been designed to use only oil, to be fed through wool waste or wicks placed in oil wells below the bearings, both of which have been found very satisfactory.

Upon comparing notes with other master mechanics, I find that a great many of them are using a cheap grade of babbitt. My experience is that the best is not good enough. We should have a metal that is hard, tough, and close grained. Our motors must necessarily run more or less in the dust, the soft or open grained metal will hold the small particles, thus causing excessive wear of the shafts. The average life of bearing linings on our city cars at present is about six months. It should be increased to not less than one year. On interurban cars, the average is about eight months, and should be increased to eighteen or twenty-four months.

The contact between commutators and carbon brushes should certainly be improved. This can be done by making the commutator bars longer and deeper, giving better contact with the brushes, and longer life. The best manufacturers do not produce a carbon brush that is always reliable, the brush being, very often, either too hard or too soft, which makes poor contact and causes the commutator to become rough and black, thereby causing the motors to become overheated, burning out the armatures and fields. A better connection should be made between the carbon brushes and brush holders. Motors have been constructed to use the so-called "pig-tail." Some users report that it is very satisfactory, and others that it is of no value. Without the "pig-tail," the current is practically all carried by the brush hammers and springs, often causing the springs to become overheated, destroying their tension and making poor contact between commutator and brush.

One of the weakest points of our motors is the insulation of the magnet wire used for fields and armature coils. There have been a great many experiments made to find a satisfactory substitute for the cotton covering, but nothing better has been found. After all the skill and thought that has been put upon our motors to make them perfect, mechanically and electrically, it seems too bad that we are obliged to use the same cotton covering we did years ago, as their electrical life depends, to a very great extent, upon our being able to produce an insulation that will not carbonize.

As previously mentioned, we are living in a rapid age, and to keep up with it we must give the people rapid transit, not only rapid, but reliable and safe, and at the same time as attractive as possible. To meet these conditions, our motors must be improved with the rest of the equipment. The high speed and quicker acceleration makes the strain greater and we must design our motors to meet the conditions, making them stand not only hard use, but abuse, ever keeping in mind that the cost of maintenance must be as low as possible.

The Milwaukee Electric Railway & Light Co. has had designed and manufactured, for its city and interurban service, motors embodying some of the special features previously suggested. The gear case is made more substantial and is well secured with bolts to the motor frame. The motor frame itself is constructed in two parts, the top half of which can be removed by loosening four bolts. The axle and armature bearings are constructed with oil wells, packed with wool waste and are lubricated with oil. For city use, the axle bearings are 5-in. and for interurban service 5½-in. Armature bearings are made larger and longer, the

commutator end increased about 30 per cent and the pinion end about 16 per cent. The commutator is made longer, increasing the contact surface 20 per cent, and the depth of bars is increased 30 per cent. The gear fit is made $\frac{1}{2}$ in. larger than the body of the axle. The face of the gears is increased about 15 per cent. The brush holders, their springs and hammers, are better insulated and made more durable. The construction and insulation of all electrical parts have been given careful consideration to bring them to as high a degree of perfection as possible.

SHOP KINKS.

By H. H. Adams, Superintendent of Shops, The United Railways & Electric Co., Baltimore, Md.

I do not know who it was that suggested the name for this paper, or what part of the shop was to have the "kinks," but I shall endeavor to submit a few ideas covering some of the things I have found useful in a repair shop. If any of them appear old, kindly remember the title of the paper, and think it is because they have been "kinked" so long that they have been unable to take on new life. But also remember they are still doing good service, and the idea, though old, may have a new feature which will be useful.



H. H. ADAMS.

In visiting the repair shops of different roads, I have found that each shop has its individual kinks, and I have also noticed that it is not necessarily the shops of the large roads which have the best kinks, or the best ideas, as I have frequently seen in the shops of some of the smaller roads unique devices for accomplishing various results, which are common to railway work. I have often thought that if it were possible to have more frequent interchange of ideas in this line alone, it would be a great advantage to all concerned, and in presenting the few ideas which are in this paper, it is with the hope that they will be of assistance to others, and may, in turn, bring forth ideas of a like nature from some one else.

Sand Blast.

The sand blast is a very old device and probably familiar to most of my hearers, but I desire to submit the arrangement installed in our repair shop, and describe the work done with it in connection with our glass work, particularly as applied to signs. Illustrated in Fig. 1 is the apparatus, which consists of a tank 14 in. by 48 in., with piping arranged as shown in Fig. 2. The small enclosure shown at the side of the sand blast is arranged so that the blasting may be done with as little disturbance from dust as possible. The operator stands at the front, placing his arms through the two holes, and directs the sand blast against the glass to be ground. There is also a vent leading out of the top of this enclosure, which runs to the outside of the building, and the small pipe leading into it from the main pipe is used to supply a small jet of air to blow the dust outside the building.

Our repair shop is supplied with compressed air at a pressure of 90 lb. and by means of a reducing valve, the working pressure

for the sand blast is reduced to 10 lb. The reducing valve is shown in Fig. 1 at the extreme top of the apparatus.

The method pursued in grinding or frosting glass is as follows: The glass to be ground or frosted is placed in the enclosed house or box. The air pressure is then turned on, care being taken to remove all moisture from the air by draining the pipes leading

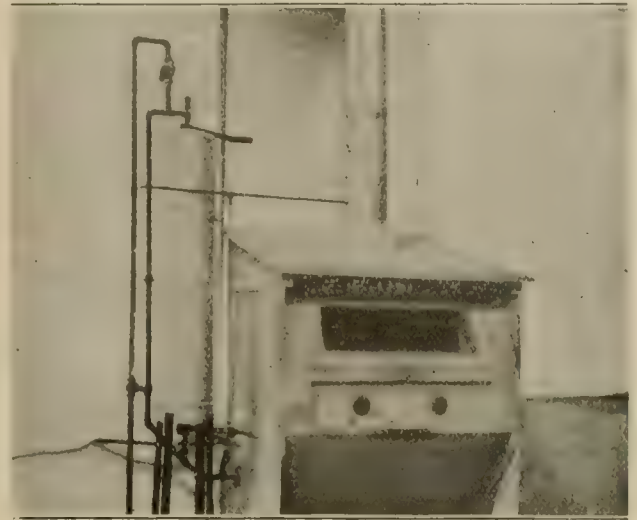


FIG. 1 SAND BLAST.

to the sand blast previous to starting operations. The sand valve is then opened, and the blast from the end of the nozzle directed against the glass, passing over the same gradually until the surface is ground. The time required to grind a glass 6x40 in., on one side only, is three minutes.

To illustrate the use this ground or frosted glass has been put to, Fig. 3 shows an illuminated sign, which consists of a glass ground on both sides, and the letters painted on one side in black. This is placed in the end of the deck of the car with the lettered side of the glass out, making a sign which is prominent in the day time, as well as being an excellent illuminated sign for the night.

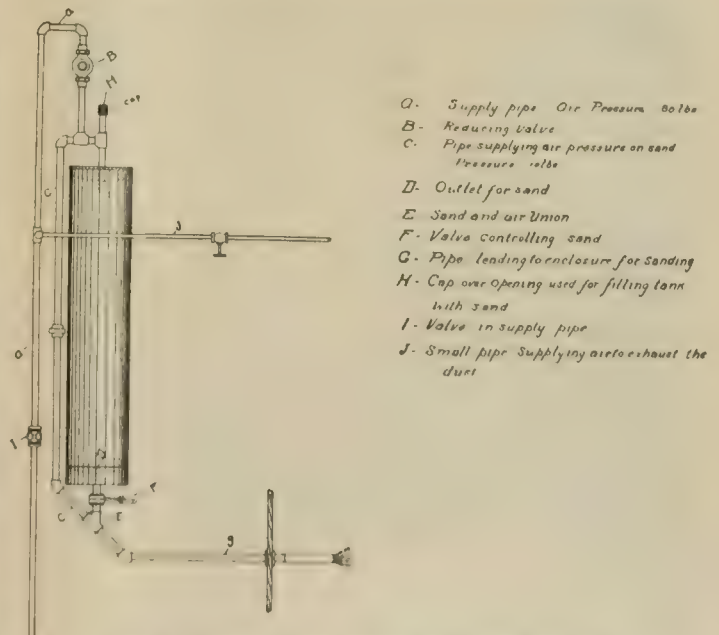


FIG. 2 DETAILS OF PIPING FOR SAND BLAST.

It is also possible to grind various designs by the use of patterns, which may be placed over the plain glass previous to the grinding. Fig. 4 illustrates what may be done in this connection. These glasses were ground for use in a United States mail car as ventilator glasses, and show how a plain glass may be

ground to resemble bevelled glass, this being accomplished by cutting the pattern at the corners on the proper angle, and leaving a small strip of the plain glass exposed to the blast.



FIG. 3 ILLUMINATED SIGN.

A further use for this apparatus is in making chipped glass, which is used so extensively in the cars of today. This is done as follows: A glass to be chipped is ground on one side only. This is then covered with hot glue, and allowed to dry. As it dries, the glue will chip the grinding from the surface of the glass, and will produce the effect desired. In this, as well as in



FIG. 4 ILLUMINATED SIGNS.

the simple grinding of the glass, various designs may be worked out by the use of patterns on the ground glass before the glue is applied. The patterns used are generally made of heavy paper, and fastened with paste to the surface of the glass. The sand used in this apparatus is a clean white sand, known as "Brunswick Sand."

A Device for Cutting Dashers for Headlights.

The apparatus illustrated in Fig. 5 is used for cutting the dashers for electric headlights. It consists of a circular plate $\frac{3}{4}$ in. thick and 12 in. in diameter, and a forging, which is arranged at each end to hold a standard pipe cutter. On each end of the forging there is bolted a handle, which is used to turn the cutters. The circular plate and the forging are connected with a spindle, which is threaded at each end, and has a collar in the center. The collar is $\frac{1}{2}$ in. thick and $2\frac{1}{2}$ in. in diameter. The diameter of the spindle which passes through the center of the circular plate is $\frac{5}{8}$ in., and the diameter of the other end of the spindle, which passes through a hole in the center of the forging, is $\frac{3}{4}$ in. On the side of the plate which is farthest away from the cutters is the feed arrangement, which consists of a U-shaped piece, threaded in the center to receive the $\frac{5}{8}$ -in. end of the spindle.

The method of operation is as follows: The center of the headlight hole in the dasher is determined, and an 11-16-in. hole drilled. The apparatus is then set up with the circular plate inside the dasher, and the forging with the cutters on the outside. Two men are required to operate it; one on the inside of the dasher to manipulate the feed, and the other on the outside to turn the cutters. With a device of this kind, a dasher of No. 12 soft steel can be cut for a 10-in. headlight in about eight minutes.

Unloading Cars.

The question of unloading cars from railroad flats is one which most roads have to contend with, and in the majority of cases it is done by some makeshift device, frequently at the expense of a long operation, and attended with more or less danger of accident to the workmen, or damage to the car.



FIG. 5 - DEVICE FOR CUTTING DASHERS FOR HEADLIGHTS.

A simple means for unloading cars and the method pursued in its operation of same, is illustrated in Fig. 6. This device consists of four upright posts 12x12 in., placed two on each side of the track, with sufficient clearance to pass all types of steam railroad cars. A 12-in. I-beam is framed into the top of each pair of posts, and the posts are tied together across the tracks



FIG. 6 - DEVICE FOR LIFTING CARS.

at the top by means of tie-rods, using pipe as spacers. The pipes are also fastened to the posts by flanges and lag screws. On each I-beam there are two 7,000 lb. chain hoists, which are suspended from rollers by means of a U-iron. The connection between the lower hook of the hoist and the truck consists of a flat bar, 1x4 in., bent into the form of a square hook to fit the side of the truck, with an eye at the upper end. This hook is made of a flat bar in order to allow it to be slipped into the

opening between the top of the toe-board and the bottom of the sill-plate.

A few words as to the time required for unloading cars with this arrangement will show its value. A shipment of 110 open cars on trucks was received by the United Railways & Electric Co. of Baltimore, all of which were unloaded by this device, and for a number of days the time required for unloading was taken. The average was 10 minutes to the car, with a gang of six men; this time including the placing of the car in the shop and the shifting of the railroad flat car outside of the yard. The whole cost of erecting this device did not exceed \$100.

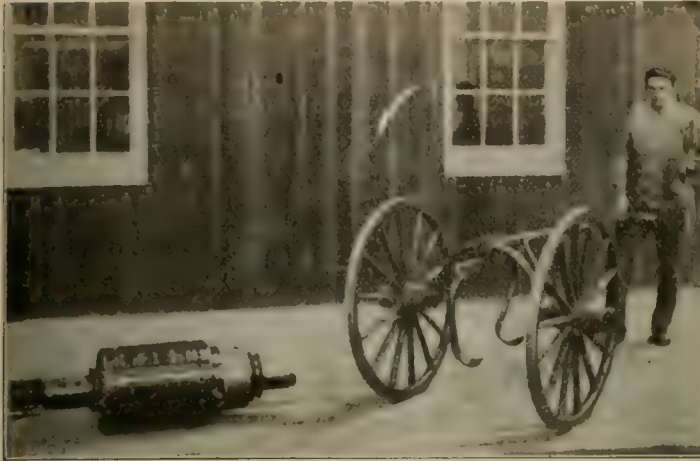


FIG. 7. ARMATURE CART.

Armature Cart.

An armature cart is illustrated in Fig. 7, which shows the cart without the armature. The armature is carried at a good height from the floor, and as the wheels of the cart are 36 in. in diameter, it is moved very easily from place to place.

A cart of this kind removes all necessity of rolling an armature on the floor, which is a practice that is dangerous in the cleanest of shops, as a metal chip too small to be readily distinguished is frequently picked up by the armature in rolling it over the floor. This chip may not be discovered until the armature has been placed in the motor ready for service, when it is very liable to make itself known in a disastrous way.

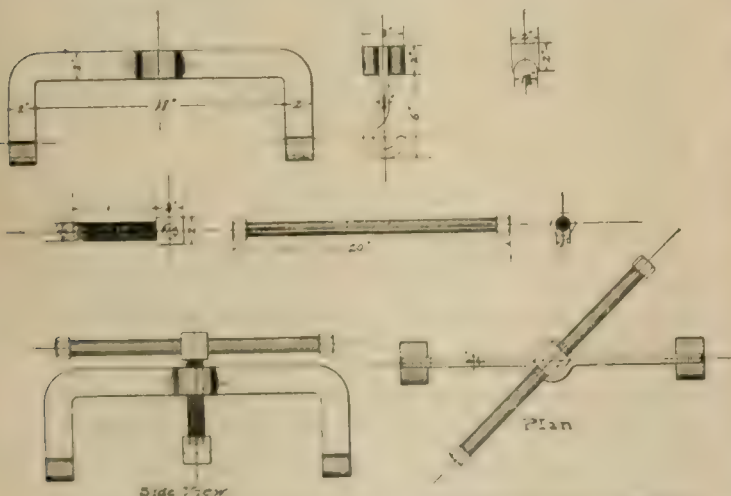


FIG. 8. DETAIL, SIDE ELEVATION AND PLAN OF JIM CROW.

As soon as the armature is removed from the motor, it is placed on one of these armature carts and carried just outside the building, where there is an attachment for cleaning the armature with compressed air. The armature may be readily revolved in the hooks on this cart without placing upon the ground, and in this way the compressed air is blown into all the openings in the armature, thus clearing out all the carbon dust. It is possible to reach in this manner.

Trolley Pole Straightener.

A small Jim Crow is a very useful device about a repair shop or carhouse. Fig. 8 gives the details of one, which may be used to straighten trolley poles, dash posts, etc. It is not too heavy to take on the roof of the car, and a trolley pole may be straightened without removing it from the stand.



FIG. 9. RE-INSULATING MACHINE.

Re-insulating Fields.

The question of re-insulating fields is one which has been before the electric railway repair men for some time. Some have adopted a scheme, and others have passed it by. I consider that there is a large amount of economy to be gained in the re-insulation of fields.

In using the re-insulating machine for this purpose, great care must be exercised not to stretch the wire excessively in putting it through the machine. The tension placed upon the wire in order to straighten it must be as light as possible. Fig. 9 illustrates a re-insulating machine, which we have made, and have in use at present.



FIG. 10. RE-INSULATING FIELDS.

Illustrated in Figs. 10 and 11 is another scheme for re-insulating fields, the wire of which is too heavy to be handled by a re-insulating machine. The method pursued in this case is to re-insulate the field by hand. The field which is burned out has its exterior cover removed, and if it is badly charred, it is taken outside the building and as much of the insulation and dust removed as can be blown out by 80 lb. of compressed air. The field is then placed on a long wooden bar, opened up, and stretched along the bar. The insulation which remains on the

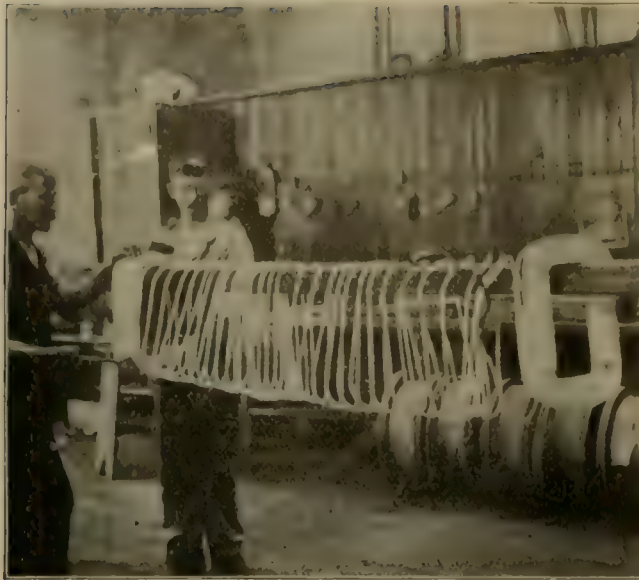


FIG. 11. REINSULATING FIELDS.

wire is cleaned off by hand with the use of scrapers. After being thoroughly cleaned, the new insulation, which consists of a re-insulating tape, is placed on the wire by hand. This being accomplished, the field is assembled, beginning with the inner turns, and following turn for turn to the outer ones, as shown in Fig. 11. The field is then re-covered and ready for service, and I consider that it is just as good as when new.

A field assembled after being re-insulated is shown in Fig. 11.



FIG. 12. TESTING ARMATURE FOR SHORT CIRCUITS.

The field shown in the illustration is the Westinghouse No. 56 field which is made up of No. 1 wire. There have been 281 fields successfully re-insulated from October, 1902, to July, 1903, which are at present in service and giving us no trouble.

Induction Tests for Short Circuits.

Fig. 12 illustrates the method pursued in testing armatures for short circuits. The apparatus used in this case consists of an old Baxter motor field suspended between two uprights, and balanced with a counterweight, so that it may be adjusted to conform to the various heights of the different armatures. This field is wound with No. 9 wire, and supplied with alternating current from a small alternator, which is belt driven. The



FIG. 13. DEVICES USED IN MAKING ARMATURE COILS.

armature is placed in the magnetic circuit of this field and revolved slowly, and a small tell-tale piece, consisting of a light piece of sheet metal, is held at the top of the armature, as shown in the illustration. If there are any short circuits they will easily be determined, as the tell-tale piece will set up a vibration, which can readily be felt by the hand. A device of this kind is one of the greatest money-savers possible to put in an armature repair shop, and it will save many an armature from being needlessly burned out, as the short circuits can be detected in the shop, instead of their developing after the armature has been placed in the motor.

Armature Coil Methods.

Fig. 13 illustrates two devices, which are used in connection with the making of armature coils. The one shown on the right hand side of the illustration consists of an ordinary vise, to which is attached cast iron jaws. The jaws are each heated by a gas burner. The use this device is put to is in drying the glue which is used in fastening the insulating cell of the coil. Also, as shown in the illustration, it is used in pressing two coils together, where the coils are to be assembled in this manner, as, for instance, the Westinghouse No. 56 coils, which consist of two coils of three wires, having two turns to a coil. This device drives out a large amount of moisture, and puts the coils in shape to be taped. Various lengths of jaws are used for the different types of coils.

The device on the left hand side of the illustration consists of a pair of rollers, these being used to flatten the leads of the coil, and by a very simple trick removes, at the same time, the insulation of these leads, instead of having to scrape it off by hand, as is usual. This is accomplished by the use of a little glue upon the rollers.

FIRST REGULAR ANNUAL MEETING

American Railway Mechanical and Electrical Association

Saratoga, N. Y.—Sept. 1—4, 1903.

TUESDAY, SEPT. 1, 1903.

President Thomas Farmer called the convention to order at 10:45 a. m., and introduced Mr. Joseph P. Brennan, attorney of the Village of Saratoga Springs, who made a brief welcoming address.

The president announced that the registration would be accepted in lieu of a roll-call, and that the minutes of the last meeting would be included in the report of the executive committee.

The secretary read a letter from Mr. H. H. Adams, of Baltimore, regretting that he could not be present to read his paper on "Shop Kinks," and suggesting that an open discussion be had on the methods used to determine when equipments should be overhauled.

The president then read his annual address, as follows:

PRESIDENT'S ADDRESS.

Gentlemen of the Association:—It gives me great pleasure to meet with you here at this the first annual meeting of the American Railway Mechanical and Electrical Association. As all present may not be familiar with the conception of this organization, I will briefly state that the matter had been talked over between a few of the master mechanics during the summer of 1902, and that during the convention of the American Street Railway Association, held at Detroit, in October of 1902, a number of the mechanical and electrical men who were present that year came together and effected a temporary organization. It was then decided to meet at Cleveland, Ohio, on Jan. 12, 1903, to perfect a permanent organization. The date was later changed to February 16th.

The meeting at Cleveland was attended by representatives of a number of roads from all sections of the country, and a spirit was manifested at this meeting that at once spoke for its future success. Since that time, owing in a great measure to the personal efforts of the executive committee, ably seconded by our worthy secretary, the membership has now reached a total of 85.

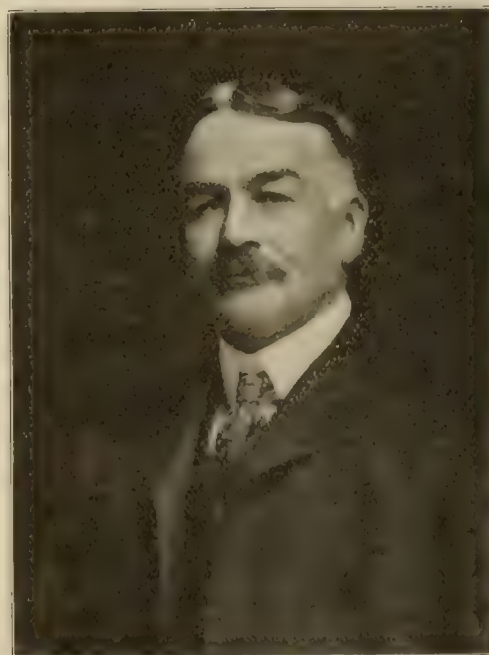
I earnestly hope that while we are here in Saratoga, with the opportunities that we will have to meet the different companies and their representatives who are not our members, that each and every one of you will use all possible endeavors to increase our membership to at least 150. We should all make an extra effort in this direction, and there is no doubt but what this result may be accomplished.

The objects of this Association are clearly set forth in our Constitution, Article 2, which says: "The object of this Association shall be the acquisition of experimental, statistical, scientific and practical knowledge relating to the construction, equipment and operation of street and interurban railways." Added to this are the advantages to be derived by all of us in the opportunities it affords for the interchange of ideas and the hearing of the members' papers, and to be able to freely discuss the same. The subjects of the papers which we will have the pleasure of hearing have been announced.

We should all take part in the discussions, as one of the principal objects of the papers to be presented is to provoke discussion, and with the men which I see before me there is no doubt but the papers will be most ably handled. It should be the duty of each member of this Association to freely impart to his fellows and information that he is possessed of regarding details, not only of matters relating to the electric car and regu-

lar shop practice, but of any special knowledge he may have regarding the work, for by so doing it will brighten us all up and make us, one and all, of more value to the companies we have the honor to represent. The representatives of the smaller roads can be of especial value in this respect, as, their facilities being more limited than those of the larger roads, the tendency of these men is always to be thinking of and working out new ideas which can be elaborated if necessary to meet the requirements of any sized road. We should all lend a helping hand if we wish to accomplish results laid out by our Association.

The American Street Railway Association has a Committee on Standards, appointed for the purpose of investigating and suggesting better methods and devices than are now current practice, and to secure uniformity in all matters relating to the



THOMAS FARMER,
President A. R. M. & E. A.

electric railway equipment. The work of this committee has been very ably handled and the results obtained, while not as far-reaching as they should be, can be seen in many ways. It should be the earnest effort of every member of this Association to give this committee every possible assistance to bring about the results hoped for in this direction. The fact of there being at present virtually no acceptance by the manufacturers of street railway material of any such standards leads to an enormous multiplicity of repair parts, not only electrical, but mechanical. The stock rooms of some of the larger roads have the appearance of a wholesale hardware store, and the amount of money invested in these stocks could be very materially reduced, as well as stock room attendance, by weeding out unnecessary parts and sizes. Too much stress cannot be laid upon this question of standardization. The steam roads are very far in advance of the electric roads in this respect, and it is for us, as the mechanical representatives, to try and get order out of the existing

clums. It will not only be better for the companies, but will lessen our own labors to a very appreciable extent.

Thanking you, gentlemen, for the honor you conferred upon me by electing me to the highest office within your gift, and again thanking you, one and all, for your co-operation in making this Association the success that it is, I will not trespass further on your time, but commend the business of the Association to your hands with the fullest confidence that the results will be most satisfactory and beneficial to every one here present. We will now proceed to the regular order of business.



Report of Executive Committee.

The executive committee made its report, briefly recapitulating the organization of the association at Cleveland, on Feb. 16, 1903, and the routine business transacted at its meeting held at Saratoga Springs, Aug. 31, 1903. The committee approved the report of the treasurer, it having been audited and found correct. The committee reported the receipt of an invitation from the Schenectady Railway Co. for the officers and delegates of the association to make use of its lines as guests of the company, it being announced that the convention badges would be honored on all lines of the company. The invitation was unanimously accepted and a vote of thanks for the courtesy carried.

Report of Secretary and Treasurer.

The secretary and treasurer presented his report. This showed the membership of the association to comprise: 21 active members, 27 associate members, 31 junior members, and 3 honorary members. The receipts from dues amounted to \$657. The expenses to Sept. 1, 1903, not including the salary of the secretary and the expenses incident to this convention, were: Printing and stationery, \$102.97; postage, \$50.09; miscellaneous, \$23.71; total, \$176.77. Balance on hand, \$480.23.

Report accepted.

The secretary then read the list of members of the association as follows:

Active Members.

Boston Elevated Railway Co.
Cleveland Electric Railway Co.
Cincinnati Traction Co.
Chicago City Railway Co.
Denver City Tramway Co.
Detroit United Ry.
Grand Rapids Railway Co.
International Railway Co.
Louisville (Ky.) Railway Co.
Milwaukee Electric Railway & Light Co.
Mobile (Ala.) Light & Railroad Co.
North Jersey Street Railway Co., Jersey City, N. J.
Rochester (N. Y.) Railway Co.
Rhode Island Co., The, Providence, R. I.
Scranton (Pa.) Railway Co.
St. Louis Transit Co.
Schenectady (N. Y.) Railway Co.
Toledo (O.) Railways & Light Co.
Union Traction Co. of Indiana, Anderson, Ind.
United Railways & Electric Co. of Baltimore, Baltimore, Md.
Washington (D. C.) Railway & Electric Co.

Honorary Members.

"Street Railway Review."
Street Railway Journal.
Western Electrician.

Associate Members.

Annable, W. W., M. M., Grand Rapids Ry. Co.
Adams, H. H., Supt. of Shops, United Rys. & Elec. Co., Baltimore.
Brown, C. A., M. M., Toledo Rys. & Lighting Co.
Baker, C. E., Supt. M. P. & Mach., Boston Elevated Ry. Co.
Ballard, H. M., Supt. Car Equipment Shops, Boston Elevated Ry. Co.
Bigelow, Chas. H., Ch. Mech. Draughtsman, Boston Elevated Ry. Co.

Bankat, John G., M. M., Schenectady Ry. Co.
Carver, D. F., Ch. Engr., Public Service Corporation, Jersey City, N. J.
Collins, W. S., Insp. of Motor Car Repairs, Boston Elevated Ry. Co.
Coring, John, Elec. Engr., Boston Elevated Ry. Co.
Dantforth, R. E., Asst. Gen. Mtn., Rochester Ry. Co.
Farmer, Thomas.
Green, Alfred, M. M., Rochester Ry. Co.
Heckler, Fred, M. M., Lake Shore Elec. Ry. Co., Toledo, O.
Herrick, Chas. T., M. M., Williamsport (Pa.) Passenger Ry. Co.
Hile, Chas. H., Supt. of Wires, Boston Elevated Ry. Co.
Libby, H. L., Supt. Car Shops, Boston Elevated Ry. Co.
Lundall, John, Gen. Foreman of Elevated Shops, Boston Elevated Ry. Co.
Miller, J., M. M., International Ry. Co., Buffalo Ry.
Mullen, T. J., M. M., Scranton (Pa.) Ry. Co.
Mundy, W. O., M. M., St. Louis Transit Co.
Mitchell, John L., Supt. Machine Shops, Boston Elevated Ry. Co.
Olds, E. W., Supt. Rolling Stock, Milwaukee Elevated Ry. & Light Co.
Postell, Wm., J. G. White & Co., New York.
Robinson, C. H., M. M., Bloomington (Ill.) & Normal Ry. Elec. & Heating Co.
Thorne, J. J., Ch. Elec., Bay Cities Consolidated Ry. Co., Bay City, Mich.

Junior Members.

W. G. Alexander, E. Brewster, G. F. Crozier, D. Canaway, M. J. Conway, A. L. Collins, J. M. Doody, J. E. Foster, P. Harrington, H. W. Hargrave, C. R. Hoyt, M. Hardy, F. B. Hardy, G. W. Jule, J. M. Lowe, J. D. Lynch, J. Massie, A. F. Marvin, D. S. McKay, G. McKenzie, A. J. Roberts, P. Scott, W. M. Snow, A. Thompson, J. F. White, P. Walsh, J. L. Webster, Foremen, Boston Elevated Railway Co.
Chas. E. Cross, Master Car Builder; Frank L. Miller, Master Car Painter; Fred Strail, Gen. Foreman; Geo. M. Wegman, Car House Foreman; Rochester Railway Co.
Lawrence P. Crecelius, Eleen.; Merle R. Griffith, Eleen.; C. L. Stone, Eleen.; St. Louis Transit Co.



The President: I think it would be well to have a discussion on the best way to increase our membership; we have done fairly well so far, but we must do better than we have.

Mr. E. W. Olds: In regard to increasing our membership, I will say that as you have noticed by the report which has just been read, nearly all of the members have joined the association through the instrumentality of the letters and circulars that have been sent out by our secretary; and when we see the showing they have made, we certainly feel they have done their duty; and it is now for us to see what can be done to further increase our membership. Our expenses, as you will notice, have been considerable, and to get out our reports and bear the other expenses which will fall upon us at this meeting and also to be ready for our next year's meeting, will require quite a good deal of money; and I think the only way for us to get at it is for each member to be a committee of one and get all others who are eligible to membership in the association interested in its work so that they will become members.

As we start out in our meeting, we have a goodly number here, really more than I expected to see this morning, starting one day in advance, and I certainly feel greatly encouraged. In our executive committee meeting last night we talked over the association affairs, and we feel that it is going to be a success. The same remark will apply to the success of this meeting as I stated in regard to the getting in of new members—it is up to us to make the meeting interesting and bring up the various points which will be of value to our members. There are a great many things that we can discuss. We all know as we pass around the country from time to time, the smallest shop, the smallest road, will give us ideas that are of a great deal of value. We do not always adopt exactly what we see, but we

get ideas which we apply to our conditions and are greatly benefited by them. If we do not do this we are liable to keep following the old beaten path, and the first thing we know we are side-tracked. Let us be up and doing; bring out our ideas. Another thing, as we pass around among each other, let us extend our hand and become better acquainted with each other. There are many here whom I have met, but I can recall but very few of the names of the gentlemen present; and that is no doubt the case with many others of our members. Let us all extend our hand of welcome and become better acquainted. I hope every one present will take hold and give our work a lift that we may realize the success we hope for the association. If every one will do his part there is no doubt about the success of our work.

Mr. W. O. Mundy: The object of our association is for the betterment of the railroads; and incidentally anything for the betterment of the road is for the betterment of the individual. It is only a few years since the engineer was considered to be the man who turned the throttle, and the master mechanic the fellow who shoved a file or scraped a bearing. We must establish our work as a profession, and not a trade. There is nothing that will establish that profession so much as to make ourselves felt. I believe that this association will help us more than anything else in reaching that end. It gives us a prestige we have never had before. To make the association successful, we must have the hearty co-operation of all men in this line of business. It is necessary for this association to be a financial success, as well as a success from the engineering standpoint. That means we must have an income which will keep the association in good financial condition; and what I really want to urge is, that instead of considering that because the road is a member of the association, there is no necessity for you being an associate or junior member, that we get over that idea. The yearly dues for associate members are \$5, and junior members \$3, a very small amount in either case. That includes the receipt of copies of the reports, and all discussions that go on at the meeting. A number of the roads around the country have said that they can get the transactions from the technical press. Suppose they can. If all the roads took that position, and all master mechanics took that position, that they did not care to become active, associate or junior members, there could be no association. If we want the association to be a success, we must as individuals and companies become members of it and help it along from the financial standpoint, and it is that point I want to urge; that each one consider the necessity of becoming an associate or junior member, and not a hanger-on, and going around to hear what the other fellows say and get the results without helping to pay for them.

Mr. Alfred Green, of Rochester: This is one of the most important times in the history of the profession of master mechanics and electricians. We are now starting out to make a beginning that is either going to raise us in the estimation of all men, or we are going to go below the level that we now hold; for there is no man, no set of men, no men in any profession, that can stand still. They must either go up or they certainly will go down. There is not in my opinion any set of men that has any more brains, any more ability, or any more power to adapt themselves to circumstances than have the master mechanics and chief electricians of this country. There is no reason why we should not have and hold the honor that our position will give us; but we must earn it, we must earn it honestly, we must earn it by hard work, careful thought, plenty of discussion, heart-to-heart-talks,—that is what is going to make our association a success. We have a nice start, too, but it is nothing to what it must be. We are now a branch-off from the American Street Railway Association. We must get to a point where the American Street Railway Association will be a branch-off from the Master Mechanics and Chief Electricians Association. There is no reason why we should not accomplish this. We ought to be the ones that they will come to hear discuss the papers that are the most important, or that take care of the most important details of any street railway system. There is, of course, in the general manager's office the financial part of the business, with which we have nothing to do. There is the department of the superintendent of trans-

portation, which we care nothing about. But neither one of them can be a success unless the master mechanic and the chief electrician make a success of their department, unless the latter is taken care of and brought to the point of success in careful business management which will give the best results with the least expenditure. The master mechanic's department can make a success of the other departments, no matter whether it be that of the general manager, the superintendent of transportation, or the superintendent of roadbed. Now, there is no reason why we should not come to that standing that belongs to us, and, as I have said before, what we want is hard work, plenty of it, good willing fellows, and not, as one man said to me this morning, "Why, Green, I couldn't say a word to save my life,"—now, we want to get that fellow out, and we will save his life anyway, and we want him just to say what he has to say in his good old-fashioned way, and it will help us all. I never saw a master mechanic yet that was an orator, and if I did, I would say it was time to kill him.

Mr. C. F. Baker, of Boston: We must put our shoulders to the wheel and push. Talking will not do it. I think every one of us can go home and take the men under us, the junior members, and get them interested, try to get some of the diamonds out of the pile, and polish them up a little, and get them to help polish us. They are the ones that are coming and that ought to come up, and we ought to help them. It will only cost them a little to come in, and I think they are the ones that we ought to get, as well as the street railways.

The following paper was then read:

CARE AND MAINTENANCE OF CAR BODIES.

By C. F. Baker, Superintendent of Shops and Machinery, Boston Elevated Railway Co., Boston, Mass.

The writer, in giving his views regarding the care and maintenance of car bodies, expects to meet with criticism, although it should be borne in mind that on the various roads in different sections of the country the conditions may vary considerably. In Boston, referring to the surface lines, we have comparatively few severe grades, but our crossings are numerous and many of the streets are so narrow and crooked that they form an important factor in governing the size of our cars; so really our first care



C. F. BAKER

is to see that we keep within certain prescribed dimensions in order that we may pass on curves, keep off the sidewalk corners, and be able to pass teams that may be standing on the street. Occasionally we are obliged to wait for a team to get out of the way, for with one wheel next the curb, the hub on the other side of the wagon will not clear our cars.

Our next care is the drawings and specifications. We furnish the car builders with both general and complete detail drawings, so that should we place an order for one hundred or more cars, dividing the same between two or more car builders, they would all look alike; and should the workmanship and material be equally good in all cases, the cars would be practically the same. By pursuing this method we believe the cost of maintenance is materially reduced, as we have less spare parts to keep in stock,

and a workman can do more routine work in a day than he could if working on first one design of car and then another.

Referring to our specifications, I would say these cover some twenty odd pages, and while to some of you this may seem voluminous, we often find that something has been omitted which should have been included.

We not only specify that all material and workmanship shall be first class in every respect, and that all lumber shall be cut from live timber, to be free from injurious checks, wanes, shakes or damaging knots, but we designate the kind of material for each part and how it shall be put together. For instance, all tenons must be coated with white lead thinned with varnish; the bottom framing shall have two coats of lead paint mixed with oil. As the vital parts inside the car are covered by ceiling, finish, etc., and the outside with paint and varnish, its strength and durability depend upon the fitness of the material used and the honesty of the builder. It is most difficult to judge from the appearance of a car whether or no it will be long or short lived, and whether it will spend most of its time on the rail or in the repair shop. Full painting instructions are also given. But the point I wish to make is, that care taken to protect all tenons, joints and bottom framing or foundation of the car, etc., will add to its life and help to keep down the cost of maintenance.

The next point I would call to your attention is the car body bolster, which, if not amply strong, especially where center bearing trucks are used, the car will go down at the sides, or apparently up in the middle; and where this is the case, there is more or less liability of trouble with the doors.

Assuming that the car has been properly designed, is built of the best material, and the workmanship throughout is first-class, care for same should begin in mounting it on trucks that will give it the best possible support and relieve it as much as possible from twisting strains, jar or vibration. Care should also be exercised in attaching the trucks, electrical equipment, and all other apparatus to the body of the car, as boring or cutting holes in the various parts not only tends to weaken them, but it is liable to furnish a path for moisture, which, if allowed to reach any portion of the work, is only equalled by fire or dynamite.

We have now reached the point where the car goes into service and is put into the hands of the car house foreman for inspection and care. On our road we have what the men term a "pit-list," which arranges for one-third of the cars in each house to go over the pits every day; or, in other words, each car is over the pits every third day for general inspection and care of the car body and its equipment. The car house foreman makes out a list of the cars to have attention each day and hands it to the men who are responsible for the different parts of the work, and they, at the end of the day's work, return the slips with all defects they have found reported thereon, in the meantime reporting to the foreman anything found out of the ordinary line of repairs. A car coming in from the street and reported for any trouble has immediate attention and is not held up for the three-day inspection. We hold our foremen responsible, and insist that they give their personal attention and supervision to all defects or irregularities reported by their, or other inspectors. A man selected to inspect the car bodies is one who has served through the various departments of pit-work and is considered capable of doing any of the work required of the car house men. I would say, however, that we do no extensive repairing or painting in our car houses, the work consisting of inspection of motors, trucks, controllers changing wheels and axles, armatures, brake shoes, and the renewal of all parts subject to wear. The car houses are, however, supplied with a forge and some minor tools, and we have quite an extensive stock room in each house for supplying the spare parts of the various equipment, so that the work falling upon the car house foreman and his assistant in connection with the care and maintenance of car bodies is limited largely to that of inspection and renewals; although it is their duty to inspect and adjust the tie rods, bolts, trusses and struts, keeping the cars in perfect alignment; doors, windows, ventilators, hand straps, rods, brackets, bells, register and bell cords should have thorough inspection and attention. Doors, rolls, pins, etc., should be oiled, and if a little bayberry tallow were occasionally applied to the sashes and posts, it would save trouble and possibly broken glass. They are cautioned to pay particular attention to all parts that

might cause accident to passengers; for instance, loose register backs, signal bells, ventilator sashes, which might become loosened and fall; grab handles, rails, trap door lifts, or screws that may project. On open cars, the seat backs and arms should have attention, also the half round iron on the steps and running board should not be allowed to project above the edge. Floor slats, where used, should be thoroughly inspected and none allowed to project above the level; trap door lifts should be kept in proper shape so they will be available for use when necessary; all dirt should be cleaned from under the trap doors, so they will fit down closely and not project. The dirt which collects in the crevices will hold moisture, which is very detrimental to both wood and iron.

Under the head of care of car bodies might be included the cleaning, which, in some cases, comes under the Department of Transportation. It is a very important question, and one on which a great deal has been written. In 1900 the subject was one for topical discussion at the meeting of the American Railway Master Mechanics' Association, and the questions of washing at terminals, dry wiping, and using various cleaning oils and compounds were considered, and the report was published in July, 1900.

On the New York Central the success met with in dry wiping was quite gratifying, and I understand that road has done away with washing cars at terminals, except during damp weather. They claim the varnish stands better and the equipment looks better. Mr. Pfleger, of the Pullman company, stated that they had cleaned cars by dry wiping also by using water, and at the end of twelve months very little difference was noticeable in the appearance of the car as to which method was used. Mr. Morris, of the Chesapeake & Ohio, said that for light-colored cars they used a cleaner of evaporating oil combined with linseed oil to neutralize the alkali in the quantity of soap deemed necessary for the composition. This cleaner was used about once a week on light-colored cars, while on the darker cars the dry cleaning could be used longer without the introduction of liquid cleaner.

Regarding our method of washing cars, we attempt to wash them once a week in dry weather, and every day during wet or muddy weather. We use a little alkali or soft oil soap for cleaning the sinker panels or parts that are painted white. Our instructions are to use cold water and as little alkali or soap as possible, and only when necessary. The cars are swept and dusted once every day, and the glass cleaned with "Bon Ami" every third day.

The elevated cars we do not attempt to clean, more than the glass and the inside of the car, for in their constantly going through the subway they become covered with a coating of grime or oxide, caused from the iron dust arising from the excessive wear of the brake shoes, etc., which is impossible to remove without taking the varnish.

The practice of cleaning cars with petroleum is in vogue in England, it is claimed, with very good results. I understand this is being done by some of our steam roads, and would like to learn if any here are following that practice.

As car cleaning is a subject of interest to us all, in the discussions I trust will follow, I hope to hear expressions from the other roads represented here.

When our cars go into the paint shop for the annual overhauling, touching up, or repainting, they are dismantled or stripped of all cushions, seat backs, doors, hand rails, and all metal or composition parts are removed and sent to the various departments for refinishing, polishing and lacquering, and the cushions and backs are thoroughly cleaned. The mechanics then take hold and do all the wood and iron work necessary to put the cars in proper repair and ready for the painters. If the painting is properly done, we may be sure of many years of service.

The painter should work hand in hand with the builder from the beginning to the finish of the car, to the effect that all parts of contact and all exposed parts are thoroughly coated with best lead and oil as the building progresses in order to insure against decay. The painter should have one paramount idea in view—that of durability—as I believe the time is past when it is wise, or even possible, to tie a car up in the shops long enough, or to expend that amount of money necessary to attain the perfection of surface called for on a private carriage or coach. It

is not the object of modern street railways to maintain, at a considerable expense, a painting department for the exclusive purpose of embellishing its equipment to the highest degree, nor is it the intent that all the energy of the painting department should be concentrated in the development of extreme display; but it is expected that the company shall receive adequate returns for the money invested, by giving its rolling stock all the protection possible under the existing conditions. The important points to be obtained are durability, cleanliness, and wholesome appearance at a minimum cost.

To obtain this standard, nothing but the best material should be selected. The painter who specifies and insists upon having nothing else is the most economical man. With the best of body varnish that money can buy, together with choice pigments and vehicles, assembled and applied under the supervision of the head of the department in a judicious manner, after the method I am about to describe, we will, I am sure, have cars of continuously neat and dignified appearance, which should be commended by all who criticize from a reasonable standpoint, and at a comparatively low cost.

Our procedure is what is known as the knifing process. After due care has been given to the steel and iron work, all rust, scales and imperfections eradicated, the woodwork as smooth as the cabin-maker and sander can make it, all parts thoroughly dry, all crevices, nail and screw holes well dusted, we proceed to prime with pure lead and a liberal supply of linseed oil, care being taken that not the minutest part of the car is slighted and that the priming is well rubbed in. Having seen to it that the car is well primed, a very important part of the work has been accomplished. It is then we putty all nail holes and indentures, care being taken to fill all places to more than the level of the work, as after this is dry and hard it must be sandpapered to a smooth surface.

We now continue the work on a lead basis; we mix what is known as a knifing coat. This is compounded from a portion of keg lead, dry lead, japan and turpentine, mixed quite thick and applied in liberal quantities and allowed to partially dry or set, as it is termed among painters. Then with a broad putty knife it is gone over by men who have become proficient in the work until the coating has become perfectly smoothed, all brush marks obliterated, and uneven places leveled up; when dry, this is gone over with fine sandpaper and is ready for the ground color which is to follow. Again a light sandpapering and the car is ready for the body color, of which two coats are applied. It is our practice to add a small portion of body varnish to the body color, as it gives a little more binding and elasticity, which is of much importance. The car is then ornamented and two coats of body varnish applied, forty-eight hours between coats. The exterior of the car is now finished, and the knifing process has been substituted for the rough stuff and block pumice stone; and if the work has been properly done, all requirements have been met at a much reduced cost and in less time.

The time consumed to finish a car from the wood by this process would be about two weeks; while by the rough stuff method I would say not less than double that time. If, after a newly painted car has been placed in service six months, it is then taken in and one coat of body varnish applied, I know of no better investment or guarantee for its future condition, providing it has its yearly renovating. Thus we may expect many years of good service before having to repaint.

Regarding roofs, I would add that it is our practice to cover with No. 8 duck, care being taken to paint the top side of the roof boards with a mixture composed of linseed oil, lead and whiting, the canvas to be laid while the paint is wet. We then paint with two coats of lead and oil, excluding the use of sizing. By the addition of one coat of paint every two years, we are sure of a tight roof for many years. In fact, I can go back for twenty years and trace roofs that are in a good state of preservation today.

Mr. Green: Mr. Baker says after a newly painted car has been placed in service for six months it is taken in and given one coat of body varnish. I would like to ask how many coats of finishing varnish that car gets before it goes out, and if he gives

it the extra coat after the six months, does he add that as an extra coat, or what does he do before the car goes out?

Mr. Baker: We have reference there to a new car. We have Mr. Libby with us, who was formerly our master painter, now superintendent of our car shops, who could give you the details of all this much better than I.

Mr. Libby: As Mr. Baker said, he referred to the new car on which two coats had been applied. We deem it advisable to have the car in service at least six months, when we give it a third coat. Some builders advocate putting on three coats when the car is built. We think it better to have that time elapse between the second and third coats. That applies to either a new car or a car burned off.

Mr. Mundy: In applying that varnish in two coats, do you put on two coats of rubbing, or one coat of rubbing and one coat of finishing varnish?

Mr. Libby: We use no rubbing varnish on the exterior except on the sashes and doors.

Mr. Mundy: If you put the third coat on after six months do you give it one coat of varnish every year when you renovate?

Mr. Libby: One coat. Our repair work on interior is simply a question of touching up the heel board, the toe board, and possibly the window sills. Other than that we expect to get ten or twelve years out of a new car, with a rubbing up of a preparation of oil and rotten stone. We have not tried the patented processes as yet. We mix our own preparation.

Mr. Green: It is a nice thing, if it can be done, to bring your car in after it has run for six months, because the varnish on the car, the first two coats, has had a chance to harden. Then, when you bring it in before the weather has had any effect on the varnish, and give it an extra coat, you have something there which is a great help to the body. I do not know how many roads there are that could afford to do that.

Mr. Mullen: What is the object in omitting the rubbing varnish? It has been my understanding that it was of special benefit to the body varnish as a binder. It is in use on our road and on several others.

Mr. Libby: I would say in answer to that question, that we believe a rubbing varnish is of a brittle nature; in other words, it is our purpose to start from the beginning and make the surface of the car as elastic as possible. As Mr. Baker said, if we introduce a rubbing varnish into the cover, body cover, Japan cover, and we thin that with turpentine and apply it, it does not have the proper degree of elasticity. Starting from the lead, we have in view securing a flexible or elastic surface. It will stand more vibration, and we believe that we get better results. Rubbing varnish is a varnish that was used very largely to facilitate the possibility of getting a good, smooth surface, and must necessarily dry hard and brittle in order to be rubbed with pumice stone and curled hair, and was used, as I understand, largely for the purpose of being able to produce that fine surface. We do not make any attempt to produce such a surface. We do get a softer and more elastic finish if we omit the use of rubbing varnish.

Mr. Olds: That has been our experience regarding the painting of cars, whether new or old—leave the rubbing varnish in the manufacturer's cellar. We do not have any use for it. We use two coats of finishing varnish. It is very pleasing to note in Mr. Baker's paper the method they pursue in painting their cars. As nearly all of you know, the rough stuffs and primers that are brought to our attention are a curse as a whole. There may be some of them that are good, but I have yet to find them. The lead surface will give us an elastic coat that will give us years of service. I can show you cars that have been painted for about eight years, on which the body is not cracked; it is solid and sound. The car has been varnished quite a good many times, and a few times the varnish has been taken off—it got too old and became yellow. There are a number of varnish removers, but we have had as good results from using ammonia. If it is used properly, and with reasonable care, it will not injure your paint. If the ammonia is removed thoroughly and the car cleaned off, your car can be brought up then with small expense, not to the fine finish that we used to get upon a coach, but a good, durable and elastic finish.

Some ten years ago we were getting out some cars that were needed for a special summer service. The car builder said that

it was impossible for him to finish the cars for us, but I did not believe this. We went through very nearly the same process that Mr. Baker has described, but instead of using the knife coat, we simply lentiled, and did not wait for the knife coat. In fact, the cars were finished in four days and put into service—and the cars were not repainted for over four years, being simply touched up and varnished. There was very little body on the cars, but it was good.

As to the finishing of the inside of the car, we have many mechanics who are not as clean as they should be, who injure the inside of our cars, causing the wearing off of the varnish at the doors, window sills and various other points. We find we have to clean them and quite often re-finish them. Then, as Mr. Libby has stated, the principal part of the work is the rubbing of the inside with some varnish renovator, or some preparation of oil, to bring out its life.

Mr. Green: I ask Mr. Baker in regard to the washing of the cars—what do you use? What help have you? I understand there are some roads that employ women for washing the cars.

Mr. John Lindall, Boston Elevated Ry.: We use men in our car house and pay them \$1.50 a day, and they work seven days a week. We figure one car cleaner for every seven cars. Our method is to wash the cars every day that it is wet, or keep washing them until they are cleaned up after a storm, and then clean the inside of the cars. There is something which interests me very much just now, on account of the recent disaster in the Paris tunnel, and that is the fire-proofing of cars. I think that might be taken up in connection with this paper. We try to make the elevated cars as newly fire-proof as possible, and have the motor end of the car underneath covered with asbestos and galvanized iron. On account of some trouble we have had on account of fire ignited through the light switches, etc., we have put asbestos mats under the switches and stripped the insulation off the wire back six or eight inches and put on asbestos stockings. We are also contemplating extending that to the light sockets on new equipment. I believe there has been some discussion among the underwriters in regard to putting the wiring in the cars in conduits. I should very much like to hear that proposition discussed at this meeting.

Mr. Green: I rather think that the electrical interests in the state of New York have to meet more exacting requirements from the fire underwriters than in any other place in the country. In regard to the use of asbestos for preventing fire, I will say that when we use the old style rheostat, and when we had the old, short, contact boards and such things we tried that asbestos plan, and found it one of the most dangerous things we ever used. We got the asbestos cardboard and fastened it to the floor of the car, covered it with sheet iron and fastened the rheostat to that. We found the asbestos would not only hold moisture, and take up all that came along, but when it got hot, and the iron got hot and heated the asbestos the asbestos held the heat long enough to set fire to the car on several occasions. It is, in my opinion, a most dangerous thing to use where you have any amount of heat.

In regard to the wiring of cars it is certainly for the railway companies to improve in our mode of wiring, especially where the climate is such as we have in Rochester, where we have about six months in the year slush and mud and where we use salt in the switches and you cannot keep the salt away from the wires. The moisture seems to work through every crevice in the car where you have the cables. In that case it is very necessary that the car wires eventually shall be put into a conduit, not for the benefit of the underwriters as much as for the benefit of the railway companies themselves. We are now getting away from the use of the old style rheostat so that we have something from which the heat can radiate and keep the rheostat cool. I do not think we will ever be able to get up any kind of an apparatus whereby you can teach your motormen not to run on any part of the rheostat. They will run on it and get it so hot that they will simply burn it up. You ask the motorman why he did it and he will tell you that the car was no good when he took it out. There is nothing, however, that could persuade me to use asbestos under any consideration.

The President: Mr. Green spoke of the covering of the cables. We have had trouble in Detroit with our snow plow cables. We use salt on the tracks and after every storm. We have

eight ordinary snow plows, five or six of the snow plows come in with the cables burned out. We took some 12-in., inside diameter, lead pipe and made junction points at the proper place with small lead pipe leading into the larger lead pipe and put all the cables into those pipes. We have not had a snow plow come in for cable repairs in four years. The lead pipe is expensive, but it is an absolute protection.

As to asbestos, I would state that all the cars in Detroit are lentiled with a stove in the centre of the car. They set in a box which is lined with asbestos inside and iron outside. We have had a great many fires in the interior of cars caused by the non-protection of the asbestos. Lately we have used merely sheet iron inside and out, with a good big air space and that air space is well ventilated, both top and bottom; a good circulation of air through the box is better than any insulating material.

I would ask Mr. Libby if he has tried wiping the outside of cars with linseed oil to brighten up the varnish?

Mr. Libby: We never did that. If we should attempt that it would have to be done in the car house. We have been studying on this washing question quite a little, and we have not come to any definite conclusion. We are now using a very weak solution of linseed oil soap. On white work, the lower panels around windows and under the bonnets, etc., we have to give them a very hard rubbing, sometimes, to get them clean, but our main dependence is upon the use of clear water.

The President: Do you have trouble with the soap getting in the corners and accumulating dust?

Mr. Libby: We have the soap thoroughly diluted and give it to the men in diluted form, so that it will easily rinse out of all crevices.

The President: We had trouble in Detroit with the soap lodging in corners and crevices—we are using it yet, but in much less quantities. The men would not wash the soapy water off and it would accumulate in a corner and form a sort of fillet which would get full of dust. It got so bad there was an order issued to discontinue the use of soap on all the cars. The cars got to looking so badly that we went back to soap.

The President: Do you not have trouble with the car floors rotting from the excessive amount of washing which you give them?

Mr. Libby: No, we have not experienced any great trouble with that. We paint them only once a year, when the car is shopped.

The President: We have one suburban line in Detroit on which we find the car floors are all rotting out; just on that one line, and it is not a line any older than some on which the car floors are perfectly good. I personally went to see the method which was used for washing the cars, and it is the excessive amount of water that they used and they did not try to dry the cars out after they were washed. The result was that we had eight cars on one line there on which the floors had to be replaced. You can take a knife and stick it right through the floor; nothing left; it is all brown wood. I didn't know whether you took care of that with paint or not.

Mr. Libby: Do you hose them out inside?

The President: Yes, take a hose and swash it all around.

Mr. Libby: We do not use that amount of water on the interior.

The President: You spoke about the roof paint. Do you ever use any ochre in your paint on the roofs?

Mr. Libby: No, the management prefers white.

The President: Are your car roofs painted white?

Mr. Libby: They are supposed to be white, but we have gradually been introducing a little lamp black, a little at a time. They are not white today, but the management prefer a white roof by all means.

The President: If the management did not prefer a white roof, do you think ochre equally as good, if not better, than lead.

Mr. Libby: I should change the tint. No, I should prefer the base to be white lead.

The President: Well, a mixture of white lead and ochre.

Mr. Libby: Yes.

The President: Now, Mr. Baker, you say on open cars the seat backs and arms should have attention, and that the half

round iron on the steps and running boards should not be allowed to project above the edge. What do you do when that iron does project above the edge, as it does in a whole lot of places? Do you put on a new running board?

Mr. Baker: Yes. The projecting iron is a very slippery and dangerous thing.

The President: Oh, it is the most dangerous thing on a car. When it gets in that condition you take the running board right off?

Mr. Baker: Put on a new one, using the old iron.

Mr. Olds: I might say in reference to that that in a number of cases we have lowered the iron about $\frac{1}{4}$ in., and have been quite successful in that way. The running board originally was 14-in., so that we were able to lower the iron and get the same result. It is very important that nothing should project above the board.

The President: I was going to make a suggestion after hearing what Mr. Baker had to say about putting on the new running board—why wouldn't it be a good plan to make an oval hole when you put that on? Then you have got it right on the start, so that when it does wear you can slack up on your screws and drop it down at no expense whatever. Why would not that be a pretty good thing?

Mr. Olds: I am afraid we would have trouble from that at times. The iron will get a hard blow. That will drop it down. It will then wear off the board and we will be unable to drop it again.

The President: You could bring it back, Mr. Olds.

Mr. Olds: Yes, but as a car comes out of the car house my experience is that some of those things are overlooked. We have to issue orders calling that car in, and they kick. We are short of cars, our company is very short of cars, and to get the car in for the necessary painting and overhauling is like pulling teeth. During the past winter we have been obliged to neglect our cars for that reason. In Boston they use a double equipment, as a great many others of you do. With us, our equipment runs the whole year round, practically, and in that way we are obliged to bring the cars in from service, and during the last year we have been unable to bring them in as we would like.

The President: Mr. Baker, you spoke about the trap door lift being kept in proper shape. What do you consider the best form of trap door lift?

Mr. Baker: I think we have had the best success with the T lift. The only thing is to keep them down and keep the dirt out from under them. They will get rusty anyway and should be renewed at times and kept clean and in workable condition. I have seen a trap door lift before now become magnetized and stand up.

The President: I am almost through, then I am going to give them all a chance. Now, Mr. Libby, in building up on your first painting you use less oil in each coat, do you not, on your putty coats?

Mr. Libby: Yes, that is the idea exactly. We put a good lot of oil on the first and then gradually reduce the amount of oil on the other coats. It is our object to fill the grain or pores of the wood to a level surface, and only to a level surface; in other words, to apply as little paint on the car as possible. This knife process is to scrape or smooth down just as close as we can get to the wood. It is our object to get as much of the paint off as possible and press into the grain and pores of the wood. After having sand papered that coat we then give it just one coat of ground color, which depends upon what the body color of the car is going to be, and then two coats of color and two coats with varnish.

The President: Are those both varnish coats, or is only your last coat a varnish coat?

Mr. Libby: Neither one of them is what you might call a varnish coat.

The President: You say you mix varnish with it?

Mr. Libby: Well, only a slight amount, not enough to give it a gloss whatever.

The President: That is what we do.

Mr. Libby: And we ornament practically on the flat color and add two coats of body varnish about 48 hours between the coats, rubbing the first coat slightly.

The President: Mr. Lindall, you said you allowed one man

to seven cars. What do you mean by that? Do you mean that one man can wash seven cars in a day?

Mr. Lindall: Yes, wash and clean them.

The President: That beats the record out in this country.

Mr. Baker: I might say that we have in our car houses seven cars to the man, for sweeping and maintenance. We have tried eight cars to the man, but we did not get our work done quite satisfactorily. Possibly we do too much work; that is, are too particular, and clean our cars too often. As I stated, we wash the cars once a week, except in wet weather; and as Mr. Lindall went on to say, in bad weather we wash them every day, or keep at them until we get through. It is a question, really, of doing all the work we can with our men. If we cannot wash the cars every day they have to go two days or three days. In our inspection and our other work, as I said before, we have tried to do that every third day. Some roads have criticized us, I believe, because we had too many men in our car houses for that work, but if we find other roads that can keep their equipment in good shape with less inspection and less work, we would like to know how they do it. We are anxious to get down our cost as low as we can and keep our equipment in proper shape.

Mr. Green: I think you would find it harder if you ran about 80 per cent. of your total equipment every day in the year.

Mr. Baker: We run 80 per cent. not of both equipments, but of either equipment. We would have over 3,000 cars if we were running both equipments.

Mr. H. J. Lake, Muncie, Hartford & Ft. Wayne: This matter of car cleaning has been a great bone of contention between myself and the management. I am quite interested in it. I would like to inquire about the size of the cars. Of course the city cars vary a great deal from our interurban cars. I suppose that the seven cars that Mr. Baker turns over to one man to clean are small city cars, are they not, and perhaps open cars at that?

Mr. Lindall: Twenty-five foot.

Mr. Lake: My management is very particular about car cleaning, wants them very clean inside and out. The territory that we go through is composed of an oil and gas country. The oil and gas, of course, come from the ground, but I find a great deal circulating about through the air, and the cars also accumulate a great deal in passing. About the best I can do on a 46-ft. car is to allow one man to a car per day. I change my cars off. I only run cars every other day, a run of a little better than 20 hours, making from 350 to 390 miles a day. In order to keep these cars up in any kind of presentable condition I have to clean them every day, windows and all. When they come in they are coated with a kind of yellow sediment that looks very much like brick dust mixed with water. Just what it is, we have not been able to find out, but we think it comes from the oil, it is also very greasy. Now, Mr. Farmer and Mr. Libby spoke about soap. I would like to inquire what kind of soap they use. You all know that any kind of soap used on varnish is very detrimental, as well as on paint; and a thing of that kind we must experiment with, and the one we experiment with first, if it does any damage, is very costly.

Mr. Libby: We use what is known as a linseed oil soap. There are two or three different makes, and we have had good success with them all. We are using what is known as the "Columbia" cleaning compound, which is a very mild form of alkali soap, in fact so mild that I have applied it full strength and allowed it to remain over night on a newly varnished sign, washed it off in the morning, and found there were no bad results, full strength, right out of the can.

Mr. Lake: I have tried the same soap. The Farris linseed oil soap is another that we have had good success with. We, however, have a very hard water, that we have to use some kind of soap with in order to get this grease off the cars. Another trouble we have is that we take our water from the Mississinewa River which is lined with paper mills, I guess, from one end to the other; and those paper mills have a very bad practice of dumping their refuse into the river. Of course, we have to take our share of it with the rest. You were speaking about cleaning your cars. That water is a very good car cleaner. Both for grease, paint and varnish.

Mr. Lewis, Schenectady Ry.: With reference to cleaning cars, we clean six cars a day with one man, on an average. Our

equipment is a mixture of interurban and urban, ranging from 25 ft. bodies up to 52 ft. Probably our interurban cars have to be cleaned more frequently on account of the higher speed and greater accumulation of dust upon the body and the windows of the car, but our average is six cars a day.

Mr. Mundy: Referring to the point brought up by Mr. Lake, we are using a soap very similar to that Mr. Libby speaks of, and do not find any serious results on varnish. If Mr. Lake got some other kind of water he might get better results with the soap. I think that has a great deal to do with it.

Mr. Lake: Our cars have been in operation now for a little better than six months. We received four new cars less than two months ago that have not been in operation yet, and you can see very little difference in the paint. I would say that I have preserved my varnish and paint to very nearly a new lustre, but I have been very careful. My best results have come from using what is called "Knocksall" linseed oil soap, dissolved thoroughly in water and not allowing the men to use it without being dissolved, and then using only a small portion of that in the water.

Mr. Mundy: Referring again to the paint question, I am hardly in a position to say very much on that because at the present time the St. Louis Transit Co. cannot pride itself on its cars; we are practically a combination of a lot of roads that left the cars in about the most artistic shape in which you could possibly find them, and we have been short of cars, and for that reason unable to get around and cover them to the best advantage, but we have been doing the best we could, and have been following out some lines in painting that are slightly different from those commonly used. One thing in which we make an absolute saving is that we do not decorate. We have got down to the point where we put the color on the car and then do nothing but stripe it. We have not the name of the St. Louis Transit Co. on it except in one corner we have the initials "St. L. T. Co." and the number appears in the middle of the panel, on the side, and on each dash, but the car is free from decoration of any kind. We are getting quite a number of new cars for the World's Fair, and in doing that we have even gone further; we have taken the inside of the car and made the woodwork absolutely plain. We have not put a line of beading in the whole car surface. For instance, the pilaster on the window is simply a plain face with a corner taken off, about $\frac{1}{4}$ -in. radius. The cars are finished that way all through, so that when it comes to cleaning in the future we will have it right down to a minimum, with no place for dust that we can possibly avoid, and no decoration to maintain and rub up.

Mr. W. D. Wright: We do not use very much soap; we believe in plenty of water, good water, no paper-mill water. I do not know that I can give you any statement as to the number of cars assigned to each cleaner. Many of our car cleaners have other duties, shifting cars, etc. We keep our equipment looking pretty well. We have the idea, just mentioned, of eliminating much of the decoration and fancy work on the cars. I believe that idea will gain strength; it is good common sense. It will save expense and we will get just as many nickels in a day. It will be better all around.

Speaking of the trouble from fires, through our electric circuits, we have had some trouble in that line. We had one quite serious fire that I am satisfied was started by a heater wire in a side seat car; the car was all right not many minutes before the fire started. I think it was started by a small rubber covered wire connected with the heater becoming strained to the breaking point and finally, from some little jar, it gave way and as the heater circuit, which should not have been on, was on at that time a fire resulted. When the series circuit was opened the rubber covered wire would not stand it, and I am satisfied the fire started in that way. One of the first things we did to guard against fire was to stop the use of a solid conductor, especially in the smaller sizes, and for our lighting and heater circuits we use nothing but stranded wire which will not become nicked and break off inside the insulation sometimes. Inside, under the seats, we go still further and in our heater wiring use a slow-burning cover, the same as is used in houses, and get the rubber out of the way. We use nothing but stranded wire.

In order to avoid trouble from the cables due to water under the car, we adopted a plan of putting our cables as much as possible above board, even in the cross-seat cars, having a conduit for them along the side and making all taps to the cables above the floor. That seems to be the weak point of the car cables underneath the floor; and we make all taps above the floor and bring the wires from the floor through porcelain or clay tubes, not cleated to the inside of the car body; and we use a porcelain knob that will hold two wires, designed to take different sized wires. We put two wires on one knob. The idea was to give an air space around the wire which would be better than any tube you could put on. The wheels can throw water on these knobs, but they will dry off sooner, and they also prevent the lodging of mud which holds the moisture, and which affects the woodwork all the time. Eliminate all these points if possible. Sometimes for resistance, we bring a whole bunch of resistance wires, six or seven, in a separate cable; these are in the centre of the car and not subject to the water from the wheels, and you can protect them better. When we come to the centre line of the car the resistance leads are in position where they can be cleated safely in carrying the wire around the resistance boxes. In the first place we lower the leads and get them down over the car floor, and in carrying lead wires to the resistance box we never carry a wire with a rubber covering on it from one box to another or between boxes. We cut off the insulation and leave a part of the wire bare; bend it so that it can have an air space. If it is necessary to insulate it, we put on a piece of porcelain or clay tube. Of course, the trouble is that we have got to go out of the car body somewhere. In the case of a box car, the car which gives the most trouble from water, we have been using a 2-in. pipe where we go out at the corner of the car, using a 45° ell, and use that pipe to go from above the floor down to a point where you would branch off and run under the platform to the controller.

It pays to follow out these little details. If a thing gives trouble, get at it and see if you cannot cure the trouble; we are very free from troubles due to our wiring. The insurance people are taking the matter up, and a member of the New England Insurance Exchange, with whom I am well acquainted, was down to see us to get our ideas on the matter of car wiring. I could see what they were aiming at—to get car wiring on the same basis as house wiring, that is to have it in metal conduits, leading all the wires to the centre of the car and having branch ducts to bring out the leads. That is all good in a way and in the right direction; but I told the gentleman I could not see, from our experience in the present way of handling wires, but what we were free enough from troubles due to the wiring to feel practically safe. I do not believe in using asbestos unless you keep it where it is absolutely dry.

Mr. H. E. Farrington: The matter of car cleaning on our road is in the hands of the superintendent of the transportation department, and therefore I have nothing to do with it. I do not believe in using a strong alkali, or a very strong solution of soap, upon the outside of a car. My experience has been that if the cleaning is handled by men who understand how to do it properly, no bad results will follow; but if it is handled by the ordinary run of car cleaners we have, unless they are watched very carefully, we are apt to have bad results. We are governed in our car building by the same conditions that govern the Boston Elevated Road, as we run into Boston and our cars are practically the same as theirs, except some few which we have on the long lines out of town, where we have some larger cars, using the same straight side car with cross-seats. Our methods of painting differ from those described by Mr. Libby. For some years we followed the same method as the Boston Elevated; but our people thought we should have a little better luster and higher polish, and we went back to the old method of carriage painting. We gave up the knifing, but filled and rubbed down. The only object of the filling is to put it there for the purpose of producing a good finish, and I believe, as the committee does, that better results can be obtained by using an oil lead primer, using your second coat, then knifing—better results can be obtained in this way than is possible by a coat of any rough stuff that may be used—

it insures long life and more durability. I have never followed the practice of putting varnish into a flat color. I tried that several years ago, but we had more or less chipping or flaking off of the color. Then, after the color was reduced to a consistency for use, my men applied a very small amount of raw linseed oil, not enough to produce what we call an egg-shell gloss, or keep it from drying, but you can make the color more elastic than would be possible to get by using the varnish. I have seen cars painted with the knifing process that have been out in service from eight to ten years, before coming back into the shop for any apparent cracks. I do not believe rubbing varnish is intended to do any more than rough stuff for producing a fine finish and getting down to a surface; being heavily freighted with drying qualities it is not elastic, and if there comes a hot day it will not expand and contract with the outside varnish, and the result is you get cracks. If you carry the same elastic coating through from foundation to finish, you will find that the ground work will stand for a number of years without showing any cracking or peeling, and stand up and do good work. I think for car work that method is the best of any I have ever seen.

As to the method of inside varnishing—the finishing of the inside of the car—I believe if we use inside lead color, not a rubbing varnish wholly, but mixing it possibly with one-half rubbing, or two-thirds rubbing and one-third finishing, it will dry sufficiently hard to give better results. With an occasional cleaning and rubbing with oil, it will stand for several years and make a good appearance without any expense to the company. I follow that method, and the only varnish we have on the inside of the car is on the doors and windows and similar places.

Mr. William Pestell: I am interested in the matter of fireproof car wiring very much at the present time, and would ask how many cars you have wired with the lead covering on the cables?

The President: Eight. They have been in service four years and have been very satisfactory.

Mr. Ballard: On the Boston Elevated we have experimented a little with lead cables; we have only four cars running with that cable. We took our motor leads and encased them with 1½ in. lead pipe, the pipe coming up under the seat and carrying it directly over the motors. The cables are not encased in lead—only the leads. The cables are encased in linen hose and fastened up under the seat. The taps are made in the cable. For a great many years we had much trouble with the leads parting at the brush-holder or other points and taking fire and setting fire to the car underneath the seat. There is a fireproof wire brought out made by two concerns, the Okonite Co. and Washburn & Moen Co., which we use entirely on our leads, field leads, bumper leads and the taps that run to the resistance boxes. We never had a case where the fire would run more than three inches on the wire. It is impossible to burn it with a torch. There is a coating outside of it which is practically waterproof, and it is impossible to set it on fire, and we have not had a case where we have had a wire take fire and carry the wire under the seat of the car or carry it under the seat for any distance whatever; it is impossible to do it. I prevailed upon our company to get some fireproof covering for wire; we tried many thousand feet of it before we succeeded in getting the right kind, but we now have a fireproof wire that is the best thing to use on all leads to the resistance box and the motor.

The President: Where we take the taps off, we wipe the points the same as a plumber would so as to make them nice and smooth. We never have had a cable down since they have been put up according to these plans. These cables are on the snow plows, the only cars we have tried them on.

Mr. E. W. Olds: Our method of car construction is a little different from some others. We have two sills running through the full length of our cars that are placed six inches apart, and the space between these sills is separated by a small cast iron bar. Our cables are run in between them. With four motor equipments, the leads are taken out from that hose through the sill, dropped directly to the motor, which is inside hung, on the other side of the body holder. By so doing they are

absolutely protected from the water; and the lead being very short is not injured by the swinging of the trucks. We have been using this method for about seven years, and have found it very successful. In fact, the only short circuits we have had in any of our cables have been caused by very hot resistances, or in a few cases at the trap door where the cleaners have allowed the mud and dirt to accumulate which in very hot weather causes a short circuit of the wiring in the hose. At the ends of the car we used two center platform leads coming up directly under the sill, the cables being passed in between these in the same way. Our knee plate has an oblong hole large enough to allow the two cables to pass through that hole, pass through the lead at the left, nearly under where the motor man stands, directly to the controller, and we have found that very successful.

There is one thing in regard to car cleaning and the use of different soaps. There are many oil soaps and other kinds of soap. I have found that no matter what soap you use you need to take extra care and caution with the car cleaners to keep them from using too much. It does not really matter much what the soap is, in my opinion, if you use a small quantity. We must have a little alkali in the soap in order to cleanse. If we take almost any soap and have it so diluted there will be but very little of the strong alkali, we would do but very little injury to our painting.

Mr. Ballard: I ask the members if in car wiring they have used any method of keeping the wires separated where they go into the controller underneath the car platform, whether they put them in one post or two posts. We have had a great deal of trouble with moisture getting in from the platform and getting into the cables, and the cables being short-circuited a foot or two from the controller on either platform. In our last lot of cars we have taken the wires out of the holes entirely and run them separately, and they do not care if the water gets near them.

Mr. Pestell: When we put the water guard on, we are pretty careful to get it tight, and underneath the car, at the right hand of the bumper sill, we put a canvas around the cable where it comes out, nailing it on in good shape and keep it painted, and that keeps the water away from the cable. The place we find they burn is where the bend comes in the cable underneath the sill. We protect that so as to keep the dust out of the controller and keep the water from getting on the cables at that point.

Mr. Mundy: We have had some trouble in the grounding of cables, but most of it occurred in summer cars on which the car company put the cable in. We were using at that time rubber lined hose. They cut the hose level with the top of the floor, so that the water got into the hose and ran down it. We found if we ripped the hose open for about three feet, re-taped it, providing an opening so that the water could get out after it got in, the wires dried themselves, and we stopped the short circuit. On our ordinary work we run the hose three inches above the floor and set the controller on a wooden block so that the hose keeps the water from getting in. We find it better to split the hose and re-tape it so that any water which gets in will work out of the hose, owing to the split.

On motion, the meeting adjourned until 2:30 p. m.

AFTERNOON SESSION.

President Farmer called the meeting to order at 2:45 p. m.

Mr. Green: Mr. President, I would like to bring up the question of the time of the meeting of our next convention. Of course, our meetings will always be held at the same time as those of the A. S. R. A., but it seems to me that it would be a great deal better for us if we could get together two days in advance of that association. My reason for proposing that is, that I feel that if we do that we are going to get a great many more master mechanics at our meetings, because it will give them an opportunity to come and attend the convention and get the full benefit of the papers and discussions of both associa-

toons. I think it will be better for us in every sense of the word, and when it comes to the exhibitors I think if they understand that the master mechanics are going to get together two days in advance of the other association it will give the manufacturers a better opportunity also to show us what they have. In order to bring it before the meeting in proper form, I would make a motion that hereafter we meet two days in advance of the American Street Railway Association.

Mr. Baker: I second that motion, Mr. President, and I would offer the further amendment that we have three sessions a day, morning, afternoon and evening; that we do not come here on a junket—if we do, let us have our junket after we get through with business, having three sessions on each of the first two days.

The President put the question on the motion to have the meeting of this association two days in advance of the meeting of the American Street Railway Association, at the same place, and that there shall be three sessions a day instead of two, and it was determined in the affirmative.

Mr. Pestell: I move that the New England Street Railway Bulletin be elected an honorary member of this association. It is the official organ of the New England Street Railway Club, representing all of the street railways in the New England States.

Mr. Mundy: Mr. President, being highly in accord with the idea of having all the technical papers with us who desire to become members, I heartily second that motion.

The President: That will come before the Executive Committee.

Mr. Baker: In regard to Mr. Pestell's motion to have Mr. Lane made an honorary member, I see no reason why we cannot have him as an associate member, as some of the other papers have requested, and paid their \$5.

Mr. Pestell: I did not know that that could be done, according to the constitution; that is all. If that can be done I guess there will be no trouble about it.

Mr. Baker: If not we can amend our constitution and by-laws so that that can be done, and possibly in some other particulars so that we can get in some other men that have been in railroading and are going out of it, as Mr. Pestell may be at the present time. I do not think we want to debar such men from our association.

Mr. Mundy: I think if we do follow that suggestion, Mr. President, we will have to be somewhat careful, on the line we were discussing at our meeting in Cleveland, and the taking in outside men connected with the operation of the roads, and excluding the supplymen; because if you take in outside men and do not put on a limiting feature it will leave it open to the supplymen and would be liable to run into an advertising medium, which we do not want.

Mr. Baker: Regarding the supplymen, I am connected with two railroad clubs in Boston, the New England Street Railway Club and the New England Railway Club, both very successful clubs, and when we have been a little short of funds the supplymen have been the fellows that went down in their pockets and helped us out, and they are not active members in one sense of the word, that is, they do not hold office, but we allow mechanical engineers and supplymen to become members, that is, supplymen in our line of business, and I do not really see any objection at the present time to even allowing a supplyman in.

Mr. Farrington: I would say, Mr. President, that the New England Club would appreciate it very much. That club takes in nearly all of the superintendents and active men of the mechanical departments of the railways throughout New England. The paper is published monthly and reaches those men, and many of them will be unable to join this association, I presume. In that way they would be benefited by this resolution, and for the club I can say they would appreciate it very much if they could be numbered with the other periodicals of that kind.

Mr. Green: We are really getting into a discussion that belongs to the Executive Committee. If we are going into this question we must remember that we have a proposed set of by-laws and a constitution that have not yet been accepted as a whole. It seems to me to dispose of the question in proper

form we ought to have the by-laws and constitution acted upon; then we will know what we are working from. As far as I am concerned, I never would vote for a supplyman to belong to this association. I never would vote for a consulting engineer to belong to this association. I never would vote for any of the papers to become associate members. On that question I stand pat. There is nothing like telling just what you think. We want to keep this association just as free from anything of that description as we possibly can. If we throw it open we must go into our own companies further and take in our superintendents of roadbed. The position of superintendent of roadbed is held a great many times by the superintendent of transportation. You say you do not want the superintendent of transportation. He is not a master mechanic, yet there are men connected with the mechanical department that have charge of the roadbed. You simply must draw your line and stay there or you will find that at every meeting there will be somebody or something that will want to break over your rules and come in; and of course the railroad boys all have great big hearts in them, every one of them,—I never saw one that wasn't a good, jolly fellow—and the trouble is they will run away with you sometime, so you ought to kind of hold it down a trifle.

The proposed constitution and by-laws was then taken up and discussed in part and further action thereon deferred until a later meeting, at which the subject would be taken up anew.

The President then called upon Mr. E. W. Olds, who read his paper on "Improvements in Street Car Motors."

Mr. Olds: Before reading the paper I will say that the preparation of this paper has been quite a task to me. It is the first time I have ever attempted to prepare a paper of this kind, and I hope that the paper may be of at least this much benefit to us—that it will bring about a discussion in which we shall free our minds upon the subject of the paper and by so doing get some benefit from the paper.

[For Mr. Olds' Paper see page 556.]

Discussion on Mr. Olds' Paper.

The President: You have heard the paper by Mr. Olds. It is now open for discussion.

Mr. Green: Do you use split boxes?

Mr. Olds: We did use them until about a year ago, exclusively. We now use some of the solid boxes.

Mr. Green: Why do you use a solid box?

Mr. Olds: The general construction of the bearing, and of the oil well, is such, on account of getting the long bearing we are obliged to let the bar extend, so to speak, somewhat into the end of the armature so that the bearing is all lifted out together, and as all pinions are now put on with a taper fit, we have not the same objection to the solid bearing that we had years ago.

Mr. Pestell: How much larger are the bolts and gears?

Mr. Olds: About $\frac{1}{8}$ in.

Mr. Pestell: Do you use outside or inside hung motors principally?

Mr. Olds: Inside.

Mr. Pestell: Have you any carriage or outside hung motors?

Mr. Olds: Yes.

Mr. Pestell: Have you made any changes in regard to bringing the leads out on either side, so as to bring the leads into the center of the truck.

Mr. Olds: When we ordered the motors for the cars, we had the leads changed and brought out on the axle side. We have but twenty cars with the outside hung motors, and these have the leads coming out on the axle side. They are G. E. 1,000 motors and were built in that way for us.

Mr. Pestell: We have many trucks with the motors hung outside and the lead troubles have been reduced fifty per cent by bringing the leads on the opposite side. It occurred to me, in ordering new motors, it would be well to have holes drilled, and then plugged, so that you could use the motors either way.

Mr. Mundy: We have gone into the matter of motors and are having some new ones built. I talked this matter over with Mr. Olds, and we placed an order. We had the privilege of pretty nearly deciding what we wanted. We carried his ideas perhaps a little further than he has done. Our motors are all

outside hung and the leads brought out on the axle side. We have not only increased the bolts in the gear, but have the motors arranged so that we can use a solid gear for small motors, as small as 40-h. p. As far as bringing the leads out is concerned, the company decided they would put in bushings on both sides and plug the side which was not to be used. These motors are Westinghouse. We have had some motors from the General Electric Co. with the leads coming out on the axle side, and in that case we simply drill one side.

Mr. Wright: In our double truck cars we bring the leads from the top of the motor—that leaves the car bolster as it should be. The lead goes into the motor on the outside and we bring it into a piece of canvas which lies on the top of the motor. It makes no difference in the life of the lead.

Mr. Olds: In that type of truck, with outside hung motor, how do you get the brake rigging on?

Mr. Wright: We lay it down right on top of the lid of the motor. Our types of motor have a lug on the side for side-bearing suspension, and we bring them around through there. I believe that is the place to support the lead to the bolster.

Mr. Mundy: Just a word on the subject of lids. Our cars are set low, and they barely clear the wheels and the brake-rod, inside hung with straight rod, rubs sometimes on top of the motor. It is a nice thing to carry off the motor lids and leave them on the street. This is true with the cam arrangement of lid. I have been hunting for something in the way of an improved motor lid and have not struck it yet.

Mr. Green: We had the same trouble and we made a long stirrup and fastened it on the cross sill so as to give the brake rod plenty of room to adjust itself to the swing of the car. It travels in the stirrup. Otherwise it would take the lid off the motor.

Mr. Olds: Regarding the twenty cars equipped with the outside hung motors, we made a little stirrup or guard that carried the rod so that it was always above the motor, just clears it. We have no trouble with the leads, as they come out on the axle side of the motor. This is the G. E. 1,000 motor and it is no trouble to make this change yourself, for that matter.

Mr. Wright: You can make a little sling to be attached to the motor, which is set over the top of the grease cup.

Mr. Mundy: I had reference to the cam type.

Mr. Lake: I had some experience with the fastenings of the motor lids on work cars; we were using them frequently. Our passenger equipment does not trouble us. I made a hinge hasp, a sort of loose staple, drilled through the lid, made the hasp so it came down on the side of the casing with a thumb button turned through the loop in the hasp, and dropped it down. It answers better than the gear rigging.

The President: Mr. Mundy, do I understand that you are using solid gears down to 40-h. p.?

Mr. Mundy: We have just gone into them.

The President: I have used solid gears for over a year.

Mr. Annable: We have used solid gears at Grand Rapids for eight years, on all sizes of motors, from 25-h. p. up. The only split gears in use are those on new equipment.

The President: We get all gears bored to a standard fit. Take a gear and press it on to an axle, about 25 tons to 30 tons pressure, that gear goes on to the gear fit. After the gear is worn out and is pressed off the axle, it occurred to me that the next one that went on, bored to the same size as the first one, would not be as tight a fit. That thing could continue indefinitely. Suppose you wore out a half dozen? Each one would be looser than its predecessor. Is it your practice to turn the gear fit very smooth or do you leave it rough?

Mr. Annable: All the axles we have used it on have been cold rolled finished axles; all we did was to cut the keyway and reduce the journal and the manufacturer bored it. The only dimensions given the manufacturer was the size of axle.

The President: Have you experienced trouble in having the gears become looser after pressing on one or two on the same axle?

Mr. Annable: We have not, for the reason that the first axles the gears were used on were on cars of lighter equipment and lighter trucks. The result was there are new axles placed under them to take care of other equipment. We put on new axles.

Where we ran along on that type of axle we have not had any trouble in that direction. We put them on with a hydrostatic press instead of clamping them. This has reference to the split gears. We get much better fit then by bolting. While these split gears will become loosened from the stretching of the bolts, of course, we would not meet with that trouble in the solid gear. After one gear has been removed the next one would be a stronger fit, put on with a hydrostatic press, than if we put on a split gear. We have close enough fit so that in increasing our key we hold them, and in increasing the fit we do not throw the gear out of center any more than in the other case.

The President: I have only had a year's experience with solid gears, but it has been in my mind that as you keep on pressing on new gears, you will get a loose slim fit.

Mr. Lake: I believe the Union Traction Company of Indiana is using solid gears. I know it is at the present time, and it has used solid gears on Westinghouse 125 ever since the road started. I have been in their shops and talked with Mr. Anderson, and the last time I was down there he had two or three motors on the floor. He said he liked the solid gear very much; if anything better than he did the split gear. They only used two motors, equipped on one end of the car.

The President: In the use of the solid gear on some of our axles, the hub goes right against the hub of the wheel. Most of us have 100-ton presses, and we have found that we do not dare to press them off, the gear and wheel together, with a 100-ton press. We have had to split the gear, drill holes into it and split it, before we dared to shove them off together. If we try to shove them off together with a 100-ton press we would break the press. For this reason a short time ago I advised the purchase of a 200-ton press, so as to be able to shove them both at once. There is no way of getting presses in between them.

Mr. Mundy: I do it with a split gear, shove out the split gears. I have not anticipated any trouble with the solid gear, because I have large holes in the web of the gear and run columns through there and shove the wheel off.

The President: We could not get anything that would stand the strain. Our wheel has very heavy arms, which makes the distance between the arms small, and so we cannot use that method.

Mr. Mundy: We use a piece of iron shaped like a horse-shoe, for slipping between the wheel and the gear—the columns went into little pockets and made a bird-cage through the gear, and shoved the gear off and left the wheel on. That is a system which we use with split gears.

The President: The trouble with split gears is this—we put on a nut which does not fit. They ought to make a nut wrench fit the whole length of the bolt, but they do not do that.

Mr. Wright: We use "Crown" nuts altogether. We have no trouble with the nuts working loose or the bolt breaking off.

Mr. Mundy: We have been using $\frac{7}{8}$ -in. bolts on all of the small gears and using crown nuts. The bolts seem to become crystallized and break off, and get in between the gear and the pinion, and you know what happens. That is one thing we prevented by using the solid gear. I may be mistaken with regard to the fit of the gear, but I do not expect any great amount of trouble, because for a number of years we have been following the practice of placing our wheels on axles in a manner slightly different from the usual method. I do not let my wheel-fitter fit a wheel to the axle. The axle is turned to a gage and the wheel turned to a gage, and he does not know what axle the wheel is going on. We carry that standard right through. We will press on and off eight or ten wheels before the fit is loose enough to give any trouble.

In a discussion on armatures Mr. Wright described the method used by his company for taping coils stating that he used 8-oz. tape rolling it and making a heavy tape in that manner. As a last coating lamp black and oil is used to make it waterproof. On some armature coils asbestos insulation is used. The wire is covered with an asbestos cover.

Mr. Baker: Do I understand that that is the commercial asbestos, or do you use a special asbestos?

Mr. Wright: We use the special, made by the E. & W. Fuse Co. It is just about ready to go on the market. We have had to work pretty hard to get what we wanted, and they have

worked hard to keep it down in size. That has been the great trouble, to get an asbestos that would be fine enough and still be strong enough to work, but they are getting it in good shape and I think they have something that is of value to us.

Mr. Annable: In connection with the splicing of the end of cables, there is something that I didn't get to this morning. I have brought over a sample and I will leave it here so that you can see it. It will explain much better than I could the way in which we connect our leads with our cables. It is something we have had in use for five or six years. It makes a mechanical joint, to begin with.

(Samples of the splices referred to were left on the table by Mr. Annable.)

Mr. Mundy: I really was very much disappointed last night to find that Mr. Adams, of Baltimore, was not going to be here, because I, for one, wanted to express to him my great appreciation for some little schemes that he has gotten up and to tell him that he actually got me out of trouble this year. It is on this field question alone, the insulation question—we were in a very tight position—we were getting ready for the dedication of the World's Fair and owing to the trouble with circuit facilities, it was almost impossible to get field wire for the motors, No. 1 wire for the 56 motors. Mr. Adams, as is shown in his paper, has a way of putting on tape by hand, and when you really get on to that it saves lots and lots of money. I was able not only to get out of the trouble, because I was able to put my motors into service by using the old fields over, a thing I had not been able to do before, but it is an excellent insulation scheme. I speak of it just because we are speaking of the field question.

Mr. Baker: Regarding the axle bearings, armature bearings, I take it for granted that Mr. Olds used babbitt. In specifying our motors we have the shells made of cast-iron, and the lining about $\frac{1}{4}$ in. thick of composition. We have our own brass foundry and make those linings, and we find that on the average they wear something over a year, and in some cases on test they run much longer, and we do not have the trouble about bands, etc., with those that we have had where we have tried the babbitt as recommended by the motor builder, the General Electric Co. and the Westinghouse Company.

Mr. Mundy: Mr. Baker, what is the experience as far as cutting the axle is concerned, with the use of a composition bearing? Do you not find that the axle does become moist?

Mr. Baker: No; I think we have less trouble with our axle bearings. The babbitt is apt to be cut if it gets burnt. If you take and burn babbitt, it is about as apt to cut as anything you can find except cast-iron with cast-iron, get the cat-heads on, which is something similar to babbitt and seal. Mr. Ballard is here. He can tell us more about it. He has the armature bearings to look after, that is, the armature shafts.

Mr. Ballard: We have very few cut bearings. We have one occasionally. When they do cut they do not cut badly. The cut is just in little grooves instead of cutting the same as if they were babbitt. When they do cut with babbitt, they cut the whole width of the bearing as a general thing, but with metal we find it only cuts in grooves.

Mr. Mundy: What method do you have of getting those bearings into shape afterward? Do you turn them down and shrink a sleeve on, or put a new shaft in, or what do you do?

Mr. Ballard: With the W. P. we put the sleeve on, a new sleeve, when it is necessary. When they get worn to a certain size, if they are too small, we will say 1-64-in., we turn that shaft down and we have a special bearing for that shaft. On our old motors we have three sizes of bearings on our shafts, 132-in. decrease in each size. When they get below that we renew the shaft.

Mr. Mundy: I know there are a number of roads using the shells with shrinking sleeves on. Is there anybody here that has experience in that line?

Mr. Pestell: We have adopted the practice of shrinking on sleeves when the shafts were below a certain size, using a sleeve rough-turned on the outside and true on the inside; simply a matter of turning the armature shaft to a proper fit, cleaning up the sleeve, putting it on, and turning it off; practically an inexpensive process.

Mr. Mundy: Where do you get that stuff?

Mr. Pestell: From the Shelby Tube Company and the E. W. Russell Co., they are furnished with a finished interior. We use a sleeve on the shaft about $\frac{1}{4}$ in. thick, turned down at the bottom about 1-16 in.

The President: Where your taper leaves your armature bearing?

Mr. Pestell: We only turn a fit to that part, do not turn beyond the taper.

The President: There are many armature shafts up in Detroit that have no shoulder left at all, on the old steel motors. The taper runs right straight out to the armature, the bearing side.

Mr. Pestell: Even if they were so and you cut your sleeve right up so that it left a shoulder, you wouldn't lose enough of the fit of the pinion to do any harm. I should not consider that anything. As I remember it, there would not be more than about 3-16 in. of your fit gone. The last end of your fit, you wouldn't bring it up.

The President: When you press these sleeves on do you increase the size of the armature shaft over the original size?

Mr. Pestell: No, bring it back to the original size.

The President: Then, under that condition, if it is $\frac{1}{4}$ in. thick I should think that you would turn away down into that paper.

Mr. Pestell: Well, it doesn't turn down very far. On our motors it does not affect it to speak of at all. I know the motor you mean. It would make more difference there; but I do not think it would make enough to have it bother the fit of them.

Mr. Mundy: Do you find it necessary to either pin or key the shell at all?

Mr. Pestell: No, sir, the shrinking is sufficient. You have to do it pretty quick or you lose your fit. It fits too soon.

Mr. Green: We have put on a great many sleeves to bring our armatures back to size, but our greatest trouble comes on the commutator end, and we get this tape from the Shelby Steel Tube Co., of Shelby, O., and we can get it of any thickness we want. What I wanted to ask Mr. Baker especially was, what are they doing in Boston in regard to lubrication? Are they using oil or grease? I will tell you why I ask that question. We have gone to the oil entirely in Rochester. I do not know what results we are going to have when we come to cold spells—it may tell a different story,—but we find that with the oil lubrication we are getting most excellent results. It seems to be a different thing entirely with your armature shafts and axles, your outside bearings, your truck bearings, on all the motors, G. E. 800, 67, G. E. 1010 Westinghouse 3. We oil with a feed cup we get from Columbus. We are experimenting with a cup of our own and one from the Standard Oil Co. We are getting elegant results. In greasing your outside bearings, your grease gets to the back part of the box and collects dirt and dust from the street, and it hangs to that grease and just forms a perfect emery wheel on the axle, and cuts it, and that dirt keeps working, back into the grease if you do not watch it very closely. With the oil we find our brasses are giving us better results, and on our busiest days, where we run the 80-mile round trip to Sodus Point and back we never think of having a hot journal or hot brasses of any description. Our axle bearings are all babbitt.

Mr. Mundy: Do you mean oil on the outside bearings, too?

Mr. Green: No, but then we lubricate with oil.

Mr. Pestell: What is the comparative cost of lubrication as between oil and grease?

Mr. Green: Up to date we have not been able to go into it deep enough to be able to tell; but this much I can say to the present time, that the improvement in the shafts and bearings all around and the cutting down of the number of boxes that we have had to babbitt, from the time we have started in with oil,—the babbitting alone has dropped down more than one-half,—and on our busiest days, with our long trips to Charlotte and Summerville, and the cars going out in the morning with no inspectors to take care of those things, you can smell sulphur for ten miles, and what you save on those busy days alone will pay the increased cost of the oil, if there be any, without taking into consideration the benefit you get to your bearings.

Mr. Mundy: Is it necessary for a man to turn on these oil cups when he goes out, or is it self-lubricating?

Mr. Green: There is the great trouble. Your grease cup

always feeds. They are experimenting now with a double cup, one feeding down into a lower cup, with a ball set over the opening which vibrates with the action of the brake or the car, allowing the oil to feed, and the moment the car comes to a stand still the ball drops over the hole and stops the flow of oil. If that is a success it is going to be a great thing.

Mr. Mullen: We have been using the cup that Mr. Green refers to for about a year and a half and are very much pleased with it. We save about one-third in the cost of our lubricants besides prolonging the life of our bearings fifty per cent. That is the cup that is right down here at the door on exhibition, as you go out. It is all right, and is a beautiful thing.

Mr. Baker: Mr. Green asked me if we used oil or grease. We use both. We use oil on car journals almost exclusively. On some of our motors we are using grease or solidified oil, and we are having very good success with that. On our elevated Mr. Lindall, who is here, tried that device that has been spoken of, and in some places he had some trouble with it. I think he is using oil altogether. I think oil is better in a great many cases, except where we have the grease cups and have not got the oil wells that you can feed up through. It may be that in our trial of the cup described they sent us a poor tool, or that we did not know how to use it. On a great many cars we cannot get it on our journals on account of our running boards, on the open cars, and our success with it was not satisfactory.

Mr. Mullen: Have you tried the same cup on your motor bearings?

Mr. Baker: I could not say. I do not think we did.

Mr. Mullen: We use it on both.

Mr. Wright: In regard to oil versus grease, I will say we have not used grease for six years for lubrication. I believe in oil as a lubricant. I know well enough from experience that we are up against quite a problem in trying to feed from a motor bearing, but we have done it the best we could.

Mr. Mundy: On the question of gear casing, we have had a great deal of trouble with gear casings breaking, also the supporting bolts that hold those casings, breaking and dropping in the street. I guess everybody here has had that experience, and the difficulty of getting a gear casing out from under a car when it was broken. It means a tie up of anywhere from 45 minutes to an hour; and in trying to overcome that we have been getting our new motors according to a design which is somewhat radical. They are going on double trucks and we expect to do all repair work by running the truck out underneath the car and working from overhead. The trucks that we are using are the Dupont double trucks, in which the truck goes underneath the axle; the axle lifts up. So we have had this motor designed so that the gear case is supported on top of the motor, and you cannot take the bottom half of the gear case off without lifting the pair of wheels out, so we are not depending on a bolt in any manner for holding it up. The lugs run out underneath. Whether that is going to prove a remedy for this dropping of gear cases in the street, I do not know. We have tried on other motors everything we could think of, tried all kinds of bolts, all kinds of nuts, and still the bolts will break and the gear cases drop down in the street. I would like to know whether anybody else has had any experience in this line.

Mr. Annable: That works out very nicely when we are going after new machines and can have them built to receive those improvements, but what are we going to do when we have a lot of them giving us that trouble and still have to use them? I will tell you what I have been doing since 1894 on the old type of machines. G. E. 800, we are using a wood gear case, 7/8 in. faced inside, though I prefer sweamore with a 12 inch gear steel face screwed on. I use an 1884 screw for holding the 12 cage and adding the same support or anchor that was originally designed for the machine. That means we have reduced the weight to a point where there is not any self destruction; and as for the life of the gear case, to say nothing about its breaking loose from the motor. It has doubled the life of the gear case, we have found you can safely say five or six times.

The President: I have just designed a gear case and we have some of them in use in Detroit. It is just an angle in the form of the case; four of those cases to a gear case, two rights and two lefts; then for the slides I use 5 1/2 in. wood, and for the out

side, the periphery, of the case I use wood 1/2 thick. The reason I made it so thin was that if a bolt breaks, instead of getting in there and springing your armature shaft it will go through the gear case and not hurt anything.

Mr. Mundy: How do you hold that bolt?

The President: I put the thin pieces in first, in between the two ends, and then I put the side pieces in next, and the side pieces hold the outside pieces in. You see, it cannot get out. Then in between these angles I put in distance pieces and rivet the whole thing up together. The outside angles pieces, the large pieces, are cast with lugs on to hold on to the motor case. I have patterns out now for 12 A, 38 B, Steel 34 and Westinghouse 76. I think the patterns are nearly out for all the different motors we have and it looks pretty good. It looked so good to me that I started to get a patent out on it, and I found some other fellow had patented it away back in 1893.

Mr. Mullen: We have designed a gear case something after the pattern described by Mr. Annable, made of 7/8 maple and covered with No. 14 galvanized iron covering, but we have a little different method of anchoring the gear case than formerly. We use an angle on the side of the gear case and fasten it on to the lower bolts on the axle cap, which gives the strain right in the heavy part of the gear case, or in the widest portion, almost directly under the axle, and it takes practically all of the strain off the gear case; and then on the front end we anchor it in the old place provided for the purpose on that style of motor; and I can safely say we have decreased the cost of our gear case expense for the last two years at least 30 per cent.

The President: In making it out of wood you get rid of the excessive weight. The gear case on a 12 A weighs 126 lb. This gear case I got up weighs 58 lb.

Mr. Mullen: You do not have that jumping effect to loosen bolts that you do with a heavy gear case.

The President: This structure is elastic.

Mr. Annable: You just about take off 100 lb. with this class gear case that I make. They weigh about 32 lb.

Mr. Olds: I would like to describe a method we have been using now for about two years. We made up our mind that most of our gear cases were broken by coming in contact with something on the street. It breaks the top half. The lower half very often is not injured at all. We cut off the lower half, about 3 1/2 to 4 in., got out a new set of patterns cast in malleable iron, the upper part; then made a sheet iron bottom of No. 20 iron. The lower edge of this lower half of the gear case had a flange cast on it and bolt holes. In just the ordinary folding machine we make a folded joint. There is another ring made of 3-16x1 in. stock. That slips over; then there are bolts through. I have yet the first case to renew after I have put that on, which is about two years ago. We have to renew the bottom parts very often. The other day the car foreman happened to be near the door when a car came up rattling, and he said, "Jack, what is the trouble with that car?" He went out to investigate, and reported "The boys say there is something in the gear case, stripped pinion or something of that kind." They pushed the car through the cross-over to shove it into the barn and were getting out another car to put in its place. He said, "You will find the trouble is that they have gone over something on the street and part of the sheet iron is up in the gear," which upon examination was found to be the case; and, as stated before, we have found this style of gear case to be a success. Once in a while we have one of them drop on account of the bolts becoming loose or broken, but we do not get the old broken lugs at all.

Mr. Pestell: We have adopted a little scheme in Worcester to prevent the gear case from falling when a bolt does break. We put a little angle right under the bolt, right on the end of the gear case, let the bolt go right down through it. The bolt breaks off usually right down near the nut, near the thread, and this angle is still retained on there and holds the gear case up. It has saved us a great deal of trouble on the street. We put one of these on both ends of the gear case.

Mr. Green: We have a condition to meet at Rochester that I think is different from what any one else here has. We have 88 miles of track between the curb and the sidewalk, so that we have to chop the side of the trees to get the cars through. We

start to plow snow every year about the middle of November and we will plow snow up until the latter part of March. On this side track we have to use a nose plow, and they will not let us throw any more than they can possibly help, and in between the trees and the walk they won't let us throw it out into the street any more than they can possibly help. The consequence is, using the nose plow, the plow keeps churning and leaves a certain amount in the center, and then the frost heaves all the cross walks that are in that track, and the consequence is that if we do not watch it we have to take in a great many cross walks and relay them again in the spring. They take our gear cases right square off, so that we cannot get anything strong enough in the form of a gear case just on account of that piece of track, 38 miles of it.

In the absence of Mr. H. H. Adams, superintendent of shops, United Railways & Electric Co., Baltimore, his paper on "Shop Kinks" was read by the president. The paper was read and discussed by sections.

(For Mr. Adams' Paper see page 557.)

Discussion on Mr. Adams' Paper.

The President: With regard to the glass question, I would like to ask if it is necessary to have two sand glasses to make the glue do its work. In our case, at home, we take plain glass and put the glue on, and it will lift it every time if the glue is good.

Mr. Green: We do not use any sand glass.

Mr. Bigelow: A friend of mine connected with the Boston & Maine described to me a simple arrangement they had in which they had a box, the top covered with plush and about a 2-in. hole through it, and a sand pipe discharging directly underneath this hole, a lead pipe about 1½ in. in diameter, and they moved the glass around on top of this plush as the writer describes. If they wanted it to come up to the edge of the glass they would put another piece of glass or cloth against it. They had no trouble with dust blowing. There was a reservoir for the sand at the side of this box and the sand dropped into the pipe from that, the same as the writer describes, with a 45 degree fitting, and then the sand dropped to the bottom of the box. The box was beveled.

The President: That question as to the re-insulating of machines, if any of you have had any experience, I should like to hear from you.

Mr. Mundy: This re-insulating, although we did not get started at it until April, and have not had a chance yet to determine how long it will last, we see no reason why it should not last just as long as the cotton insulation, because if anything the tape is better than the cotton for holding, and I find that unless the difference between the price of scrap copper and insulated copper is more than 8½ cents, it pays me to re-insulate. In the majority of cases the copper we have been getting makes a difference of about 5 cents, so that we are just so much to the good; those fields running about 70 some odd pounds, it does not take very long for a few cents to make quite a difference in the field. You would naturally think the field would occupy considerably more space than it does when new, but after the men get a little used to it they can get it into almost exactly the same space. The wire goes back right into the former positions and gives a very steady field indeed.

Mr. Wright: You use about a ¾-in. tape?

Mr. Mundy: We use a ¾ tape, and have the tape cut into lengths to take one side of the loop; go around the loop, starting from the top and going down to the bottom. We work it to have two men to clean. The first thing is to spread it out, then go over it with a knife and clean up the insulation. After it is cleaned either those same two men or another two take it out, take the two sides right along together; then it takes two men to put it on. The actual labor of re-insulating and putting on is probably twice that of winding with cotton.

Mr. Green: We have had re-insulated wire now for seven years, and we have re-insulated wire which we use on a Westinghouse 3 and all other sizes for the different fields. We have one of the Detroit machines that we use and an old machine that was bought second hand, rigged up with a head to wind

fields. We have a boy for that, whom we pay \$1.38 a day for nine hours' work. All our men get free transportation. In regard to cost, I am very sorry that I have not the exact figures with me, as I could give it to you in detail, since every field is wound under a job order number, so I will not make any guess at it, but if any one wishes to get the full data in regard to the cost of re-insulating fields, I will give it to him. Every field is numbered as it goes out and the day and date recorded, and the copper hardens after a time. If there were no way of softening that copper, of course you would not be able to re-insulate that field more than twice before it would be perfectly worthless; so we take the field right out into the yard, build a fire and burn the insulation off and let it stay there, of course, until it is cold. That softens the copper. We do not put any tension on when we re-wind, only the tension of the machine. We use the insulated tape with the gum on one side; it is a thin tape. On every layer we also use the St. Louis compound. We have tried everything. And of course you cannot use that St. Louis compound only just where it is going to stay just where you put it, because if you bend it you break the body. After taking the tape off, take and give it two coats all around the outside where it has been on the former and outside of the field, and put it in the oven for two hours and let it bake and become thoroughly dried out. It comes out in a solid mass somewhat similar to what our friend says about shellac and whitening. Then we use the plain tape for insulating. We use the varnished paper, Empire cloth, next to the copper, and then we take the plain tape without any gum or anything of that kind and insulate the field. Then we take the whole thing and put it into a pan of compound, whatever we may be using for that purpose. We have tanks of different kinds and get them hot, drying them quickly, getting the fields quite hot and putting them into the tank while hot and we secure excellent results in that way. The Westinghouse 49 field we have never re-insulated, but that is the same size as the No. 67, and we simply use that wire.

The President: When you form a field, after it is wound have you had any trouble with the insulation being destroyed, when you form it in the wheel press?

Mr. Green: We do not form a field.

The President: In forming fields we wind with new wire, but do not use insulated wire.

Mr. Mundy: That is the reason we have not been able to re-insulate No. 56 fields.

The President: We used new wire as we found in forming them up it would destroy the tape.

Mr. Olds: Mr. Mundy gave his method of re-insulating the field, which is practically the same as Mr. Adams's. I have seen the work done in Mr. Adams's shop, so that I simply got his method, which is practically the same at the start as that of Mr. Mundy, except that the cleaning of the old insulation from the wire and the winding of the tape is all done by girls and women. He told me he found them better workers, and that they did the work neater, and after they were broken into the work they would stay by it, whereas a man would wish to advance himself to something higher. I saw some fields that he had when I was at the works last fall, that had been put in shape that certainly looked as neat as anything I had ever seen in that line.

Mr. Mundy: By using six men we can get eight fields per day on the basis on which we work. To overcome the possibility of a man being careless in getting the tape on — of course we have to put them somewhat in the press to bring them down tight — I transform all fields and if the man has been careless and there is a tendency to break down the transformer breaks down. If it does, I then open the field and re-insulate the place that gives the trouble. I do that with all fields that have not the brass spools upon them.

I agree with Mr. Adams that this matter of transforming, to get at defects in the armature room, is a big money-saver. The least carelessness of any kind on the part of the coilmakers or the armature winders is detected at once and saves the expense of putting an imperfect armature into the motor. I will

not state the name of the company I got them from, but not long ago we found some difficulty in getting cotton covered wire of the right size for one of our motors. We ordered by telegraph from a manufacturing concern 25 sets of armature coils. I got them and started to place them in service, but I found six or seven coils in which the wires had been crossed and put in the press so hard you could not tell the difference, hardly. I do not know whether they put this kind of coil into their own armatures, or send them out to people who buy repair parts. We adopted a transformer test. We have a home-made machine, made up of an old Sprague motor, simply taking the commutator off, replaced it by a couple of copper rings, and brought out the leads at opposite sides. It runs at 1,300 revolutions and gives me 25 cycles, alternating current. For a really satisfactory test it is claimed the current should be of a high frequency, up to 125, if possible. I find the 25 cycle transformer gives me everything we want, and it is not an expensive apparatus to fix up. Any road that has not taken it up, if they will look into this matter, it will pay them.

Mr. Pestell: We use a method for testing all windings of the armatures, etc. We use a milli-voltmeter, and a current from the lamp circuit through the armature. It is handy and does not require moving around, and can be used at any armature stand. If it is a repair job and the armature comes in, it is simply a matter of putting the current through the armature with a wooden yoke, putting the current through the same points as the brushes, and then running the connections of the milli-voltmeter to the commutator. Many short circuits in the armature can be located quickly and the bad coil taken out and replaced, and also new work can be checked up in that way in a short time and at very little expense.

Mr. W. W. Annable: I ask if the scheme can be worked by putting in a shunt the same resistance as the milli-voltmeter?

Mr. Pestell: We use no shunt; but enough current from the armature to get a sufficient deflection, 75 or 150 milli-volts, through a normal coil. If there is a short circuit we do not get as much deflection.

Mr. Baker: In addition to the test mentioned, we put our armatures into a frame and run from 20 to 30 minutes with a load on the armature before they go out. We have a report of every armature that comes in that has not been out thirty days in actual service. There is no doubt that some of them are damaged between the time they leave the armature room and the time they are placed on the cars.

Mr. Ballard: We take two motor frames and put them together end for end. We have them mounted on old pieces of railroad iron and move them forward and back. We use one motor as a generator and the other as a motor, and run the current to 40 amperes to get them to the highest point they will run at. We run them from twenty to thirty minutes, first as a motor and then as a generator. In testing for short circuits we use a step-up transformer.

Mr. Mundy: May I ask what voltage you use for testing a newly wound armature, and also what voltage you use for testing an armature brought in for repairs?

Mr. Ballard: On new work we run up to 2,000; as high as they can step up. On old work we calculate to run from 800 to 1,000. If the armature will stand 800 volts we will let it go out.

Mr. Baker: Mr. Lindall can give us a few shop kinks in regard to steel tired wheels. We had to take our wheels out and grind them about every two weeks.

Mr. John Lindall: Owing to our severe conditions, curves, etc., in Boston, we wear out the steel tired wheels very rapidly. The road has been running now something like two years and we have replaced something over 200 pairs of tires in that time. The way we do it is we have a gas heater. After the wheel is taken out, we heat up the old tire until it drops off. Then with a large lathe we bore out a new tire to a shrinkage fit, allowing about 0.031 of an inch in a 33 in. tire. We heat it with a gas heater. The heater is arranged so we can drop the wheel into it, and we can take off a tire in six months with the heater. It takes ten minutes to heat a new tire so that we can drop the wheel in it. In this way it costs us about \$2 a wheel for changing the tires.

Mr. Bigelow: I saw an interesting kink in a shop for winding coils for heaters, which I think Mr. Ballard can explain.

Mr. Ballard: What Mr. Bigelow refers to is in preparing heater coils, either American or Consolidated heaters. In repairing these heaters it is necessary to wind long coils of wire and in place of winding them on a mandrel the wire is fed through a fine hole into the interior of a die containing several screw threads which is revolved in a lathe, and the coil of wire is fed out as long as desired.

Mr. John Lindall: There is a way which has come to my notice of moving motor trucks. There is a large lift which takes the truck from underneath the car on the upper floor and takes them to the machine shops. We have to move the trucks from the lift or elevator twenty-five or thirty feet. At one time we had ropes and tackle and pulled the trucks around the shops in that manner, but one day one of the men said "Why don't you make the trucks run themselves?" We took one of the car rheostats and put in on the wall and connected a line to it and ran a flexible lead out to the truck; and in moving the truck we simply take the lead to the track and start the connections and the truck walks off, as it were. We have saved a great deal by doing away with the pushing and pulling of the trucks.

Mr. Pestell: We are using a little scheme for re-grinding engineer's air-brake valves that may be of some interest, using a small motor with a little fine wheel on it mounted to the post of a lathe and mounting the valve seat in the lathe, revolving the valve seat, and then running this motor right across the face of it and finishing it up in two or three minutes. We have a hardened steel head for grinding the disk, a small hole to take the stud on the face of the disk, and put in ground glass and oil between the two faces, and face off the disk in a very short time, after which it is simply a matter of grinding the tube together.

Mr. Bigelow: An arrangement which we adopted in one of our stations may be of interest. We wish to make some columns to support a heavy weight. We took some 9-in. girder rails and riveted to each side of the web a 5-in. T rail to make a strong column. In this way we can use up some of the old iron. It makes a solid and substantial column, riveting the flat part of a T-rail against the web of a 9-in. girder rail.

The President then appointed the following gentlemen as a Committee on Nominations, the election of officers to occur at the last session of the convention: Messrs. Olds, Green, Baker, Mundy and Mullen.

On motion adjourned until evening, when the matter of amending the by-laws was to be discussed in executive session.

THOMAS FARMER.

Mr. Thomas Farmer, president of the American Railway Mechanical and Electrical Association, was born in Boston, Mass., in 1853, and was educated in the public schools in that city, graduating from the High School in 1869. That year the family removed to Grand Rapids, where the son entered a machine shop as an apprentice. He worked in different shops until 1874, when he was appointed superintendent of the Grand Rapids water works system, which position he held for five years, and which he resigned to go into the machinery and foundry business as a manager. Later he entered the employ of the Somersworth Foundry & Machine Co., at Dover, N. H., and built a plant for that company at Bloomington, Ill., for the manufacture of radiators.

At the end of two years Mr. Farmer went to Detroit and constructed the plant of the Detroit Radiator Co., after which, for eight years, he acted as the company's superintendent and purchasing agent. He was next engaged to build a plant for the Russel Wheel & Foundry Co., being appointed superintendent. In 1894 he resigned to enter the employ of the Detroit Citizens' Railway Co., as constructing engineer. He was next appointed superintendent of motive power, Detroit United Ry., which position he resigned July 27th last.

B. B. Jenkins, general manager, and George Stevenson, secretary, are in attendance at the convention representing the Railway Sander Co., of Toronto, Ltd.

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5TH YEAR / Wednesday, Sept. 2, 1903. SERIAL No. VOL. XIII
 No 1 / No 8 A

REGISTRATIONS.

The registration bureau for the American Street Railway Association is located in the "Stock Exchange" room of the Grand Union Hotel, adjoining the main lobby.

The Accountants' Association register is in the same room.

Members and visitors to the American Railway Mechanical and Electrical Association are requested to leave their railroad certificates at the registration desk of the American Street Railway Association adjoining the lobby of the Grand Union Hotel. Certificates will be ready to be returned to owners on Friday.

THE AMERICAN RAILWAY MECHANICAL & ELECTRICAL ASSOCIATION.

If the results foreshadowed in the first annual meeting of the mechanical and electrical men are fulfilled this new-comer into the field will have established a new standard in technical society work. The character of the papers presented at the first session, and the volume and character of the discussions following each paper, reflect the fullest degree of credit upon all who are in any way responsible for the association and its program. If further justification for the organization of such an association is needed it is found in the large attendance on the first day and in the practical enthusiasm displayed. It is seldom a meeting of this nature is productive of so large a mass of valuable data and information as was presented at yesterday's session, a full verbatim report of which will be found in to-day's issue of the "Daily Street Railway Review."

In executive committee session and in general session the American Railway Mechanical & Electrical Association has extended a cordial and urgent invitation to every electric railway company, and to every individual connected with the mechanical or electrical departments of electric railways to join the association and participate in its benefits and co-operate in the advancing of its objects. Secretary Mower, President Farmer, or any member of the society will be glad to furnish application blanks for membership, or to answer any questions

concerning the aims and work of the association. Up to yesterday afternoon over 40 delegates and visitors had registered for this convention, and many more are expected on to-day's trains.

CLEANING CARS.

Appropos of the paper and discussion at yesterday's session of the American Railway Mechanical & Electrical Association, on the topic of car cleaning attention is especially directed to an article in the last issue of the "Street Railway Review" (page 174) written by Mr. C. R. Bellamy, general manager of the Liverpool Corporation Tramways, Liverpool, England, in which is described in detail the method of cleaning cars with oil referred to in Mr. Baker's paper on "Care and Maintenance of Car Bodies." Owing to the demand for this particular issue the edition is almost exhausted but a limited supply will be found at the "Street Railway Review" booth on the main veranda near the entrance to the meeting room of the American Street Railway Association.

AN ARGUMENT AGAINST RECEIVER SYSTEM FOR COLLECTING CONDUCTORS' RECEIPTS.

An incident that has been characterized as an emphatic argument against the "Receiver System" as compared with the "Bag System" occurred in Chicago, Sunday, August 30th, when three masked robbers at 3 o'clock in the morning entered the receiver's office of the Chicago City Ry., at Sixty-first and State Sts., killed two men, wounded a third, and escaped with \$3,000 in cash which had been turned in by the conductors and which was being counted by the clerks. Although the two clerks in charge, aided by other employes, attempted to resist, the robbers accomplished their object and escaped in a rig held in readiness at the front door.

C. N. DUFFY GOES TO NEW YORK.

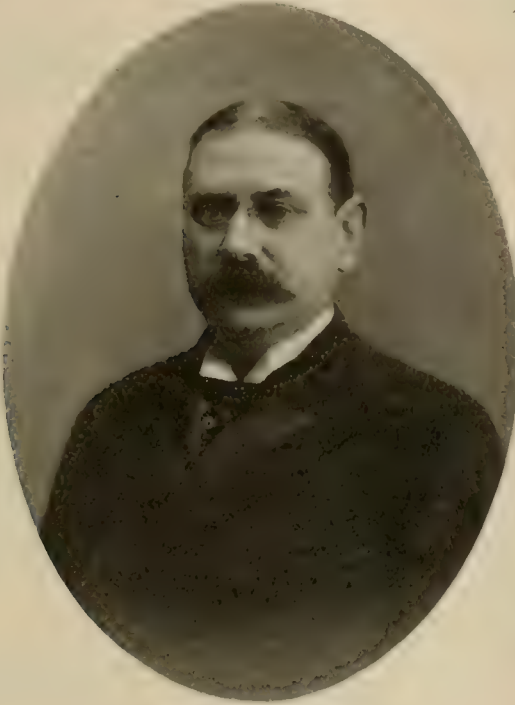
As announced in the "Street Railway Review" for August 20th Mr. C. N. Duffy, secretary and auditor of the Chicago City Railway Co., tendered his resignation to take effect Aug. 31, 1903, to become comptroller of the Interurban Street Railway Co., of New York, and its allied companies, the Metropolitan Street Railway Co. and the Metropolitan Securities Co., assuming his new duties immediately after the A. S. R. A. convention. In May, 1886, Mr. Duffy entered the street railway business as secretary and treasurer of the Union Railroad Co., of St. Louis, which afterwards became one of the seven constituent companies of the National Railway Co., of Illinois, a corporation controlled by Chicago capitalists, of which Mr. D. G. Hamilton was president. Mr. Robert McCulloch, vice-president and general manager and Mr. Duffy secretary. Mr. Duffy remained with the St. Louis roads until Sept. 1, 1899, leaving St. Louis to become auditor of the Chicago City Railway Co.

He was one of the organizers of the Street Railway Accountants' Association, serving on the committee that framed the constitution and by-laws. At the organization meeting he presented a paper on "Suggestions for a Standard System of Street Railway Accounting," which resulted in the appointment of a permanent committee to carry out the work of formulating a "Standard Classification of Accounts," of which committee he was and remained chairman. The work accomplished by the committee is well understood. At Niagara Falls in 1897, in the absence of the president, H. L. Wilson, Mr. Duffy, as vice-president, presided at the first regular annual meeting of the Accountants' Association; at Kansas City in 1900, he presided being then president of the association.

Mr. Frederick M. Waterbury, who is chairman of the Information Committee, is a busy man these days. He is ready to give a "polite and courteous answer" to any question that any convention visitor may care to ask. Mr. Waterbury will also print signs or circulars for exhibitors at reasonable prices. His office is in the rear of the Town Hall, Broadway, Saratoga.

WILLIAM CARYL ELY.

Mr. W. Caryl Ely, president of the International Railway Co. of Buffalo, who as first vice-president of the American Street Railway Association will in the absence of Mr. Hutchins preside at the convention, was born in Middlefield, Otsego Co., N. Y., in 1856. His family is of New England origin, and is intimately identified with the history of Otsego County. Mr. Ely in early life began the study of law and in 1882 was admitted to the bar at Ithaca. In 1885 he removed to Niagara Falls and continued in the practice of the law, independently at first, and later as a member of the firm of Ely, Dudley & Cohn, which firm was dissolved in 1899 upon Mr. Ely's election to the presidency of the Buffalo Ry. and allied companies.



WILLIAM CARYL ELY.
First Vice President A. S. R. A.

Notwithstanding Mr. Ely's career at the bar, it is most natural now to speak of him in connection with the vast undertakings in the electric field which have characterized the Niagara Region. He was one of the original promoters and incorporators of the great Niagara Falls Power Co., and was instrumental in securing the enactment of its charter. He was the chief promoter of the Buffalo & Niagara Falls Electric Ry., and was its first president. He was also actively engaged in the construction of the Buffalo & Lockport and Lockport & Olean Railways, and was the president of both companies.

In 1898 Mr. Ely conceived the plan of combining into one system all of the electric railways in Buffalo, Niagara Falls, Tonawanda, Lockport and vicinity, together with the Niagara Falls Park & River Ry., on the Canadian side of the Niagara River, and the Steel Arch Bridge, at Niagara Falls, and Suspension Bridge, at Lewiston and Queenston. This plan was successfully carried out. All of the operating companies, with one exception, have been consolidated into the International Railway Co., all the capital stock of which is owned and held by the International Traction Co., the holding company. Mr. Ely is president of both companies. Messrs. J. P. Morgan & Co. were the underwriters and are the bankers of the International Traction Co. This company owns and operates 352 miles of urban and interurban electric railways; also two great bridges across the Niagara River.

Mr. Ely was one of the original promoters, a director, chairman of transportation committee and a member of the executive committee of the Pan-American Exposition. He is a director and has been the counsel of numerous banking and manufacturing corporations, including the Niagara Falls Power

Co., Manufacturers' and Traders' National Bank of Buffalo, Carter-Crume Co., Niagara Silver Co., and Wm. A. Rogers, Limited.

In politics Mr. Ely has always been warmly attached to the fundamental principles of the Democratic party, as all his ancestors have been for a century.

**HENRY J. DAVIES.**

Mr. Henry J. Davies, president of the Street Railway Accountants' Association, began business as a court and convention reporter in Cleveland, O., and continued in that work for 12 years, leaving it in the fall of 1889 to become private secretary to Hon. Tom L. Johnson. On Jan. 1, 1890, he was elected secretary and



HENRY J. DAVIES.

treasurer of the Brooklyn and the South Side railroad companies of Cleveland, which Mr. Johnson controlled.

When these companies united with others in 1893 to form the Cleveland Electric Railway Co., Mr. Davies was appointed assistant secretary and claim adjuster, and later assistant treasurer. He voluntarily left the company in 1899, when Mr. Horace E. Andrews, president, and Mr. John J. Stanley, general manager, retired from the management, and was immediately elected secretary of the National Carbon Co., which position he held until last March. On the retirement of Mr. H. A. Everett and his associates and the reelection of Messrs. Andrews and Stanley, Mr. Davies was elected secretary of the Cleveland Electric Railway Co.

He is also secretary of the Iroquois Portland Cement Co., and a director of that company, of the Factory Mutual Insurance Co., of Ohio, the Lakewood Savings & Banking Co., and several other corporations. Mr. Davies has always been active in the Accountants' Association and in 1899, after severing his connection with the Cleveland Electric Railway Co., the association elected him an honorary member. At the first meeting of the association after his return to the street railway business he was chosen president.



Among the representatives of the John Stephenson Co. in attendance at the convention is E. J. Lawless, general sales agent.



F. A. Estep, president and treasurer of the R. D. Nuttall Co., of Pittsburg, will be present at the convention, although the company did not expect to make an exhibit.

PROGRAMS

AMERICAN STREET RAILWAY ASSOCIATION.

WEDNESDAY, SEPT. 2, 1903.

Morning: Registration of Delegates.

Afternoon: First Session at 1:00 p. m.

Roll Call.

Address of Welcome, Hon. Edgar T. Brackett.

President's Address.

Report of Secretary and Treasurer.

Appointment of Committees.

Evening, 8 p. m.: Excursion to Saratoga Lake and Casino as guests of the Hudson Valley Railway Co.

THURSDAY, SEPT. 3, 1903.

Morning: Second Session at 10 a. m.

Afternoon, 1:00 p. m.: Excursion to Schenectady as guests of the General Electric Co. Lunch will be served on the train or at the company's works.

FRIDAY, SEPT. 4, 1903.

Morning: Third Session at 10 a. m.

Afternoon, 1:00 p. m.: Excursion to Lake George as guests of the Hudson Valley Railway Co., returning at 6:00 p. m.

Evening, 8:00 p. m. Annual Banquet and installation of officers-elect.

The papers to be presented before the association are as follows:

"Steam Turbines," W. L. R. Emmett, General Electric Co.

"Electric Welded Joints," Worcester Consolidated Street Railway Co., by William Pestell, superintendent of motive power and chief engineer.

"The Evils of Maintenance and Champerty in Personal Injury Cases," Detroit United Ry., by Michael Brennan, attorney.

"Train Orders and Train Signals on Interurban Roads," International Railway Co., of Buffalo, by C. A. Coons, superintendent of transportation.

"Freight and Express on Electric Railways," Birmingham Railway, Light & Power Co., by J. B. McClary, manager railway department.

"The Manufacture and Distribution of Alternating Currents for City Systems," Chicago City Ry., by Richard McCulloch, assistant general manager.

"Comparative Merits of Single and Double Truck Cars for City Service," Milwaukee Electric Railway & Light Co.

"The Right of Way," Interurban Street Railway Co., by H. H. Vreeland, president.

STREET RAILWAY ACCOUNTANTS' ASSOCIATION.

WEDNESDAY, SEPT. 2, 1903, 10 A. M.

Annual Address of the President.

Annual Report of the Executive Committee.

Annual Report of the Secretary and Treasurer.

Paper: "Freight and Express Accounts," by Irwin Fullerton, general auditor, Detroit United Railway, Detroit, Mich.

Appointment of Convention Committee on Nominations.

Appointment of Convention Committee on Resolutions.

Replies to questions.

THURSDAY, SEPT. 3, 1903, 10 A. M.

Paper: "Car Maintenance Records," by S. C. Stivers, New Jersey & Hudson River Railway Co., Edgewater, N. J.

Paper or address by a representative of the United States Census Bureau.

Report of the Committee on a Standard Form of Report for Electric Railways, Chairman, William F. Ham, comptroller Washington Railway & Electric Co., Washington, D. C.

Replies to questions.

FRIDAY, SEPT. 4, 1903, 10 A. M.

Paper: "Advantages and Disadvantages of Bag or Envelope System and of the Cashier System of Receiving Conductors' Deposits," by F. B. Henry, auditor St. Louis Transit Co., St. Louis, Mo.

Comparison of the Municipal Tramways Association of Great Britain proposed "Standard Classification and Form of Report" with the American Standard, by C. N. Duffy, secretary Chicago City Railway Co., Chicago, Ill., chairman Committee on Standard Classification.

Replies to questions.

Report of Committee on Resolutions.

Report of Committee on Nominations.

Election and Installation of Officers.

Adjournment.

MECHANICAL AND ELECTRICAL ASSOCIATION.

WEDNESDAY, SEPTEMBER 2d, 10:00 a. m.

Presentation and Discussion of Technical Papers.

THURSDAY, SEPTEMBER 3d, 10:00 a. m.

Presentation and Discussion of Technical Papers.

FRIDAY, SEPTEMBER 4th, 10:00 a. m.

Presentation and Discussion of Technical Papers.

Report of Committee on Nominations.

Election of Officers.

The papers before this association include the following:

"Type M Control," W. O. Mundy, master mechanic, St. Louis Transit Co.

"Use and Abuse of Controlling Mechanism," D. F. Carver, chief engineer, Public Service Corporation of New Jersey, Newark, N. J.

"Car Shop Practices," Alfred Green, master mechanic, Rochester Railway Co., Rochester, N. Y.

Messrs. C. C. Lewis, chief engineer of the Schenectady Railway Co., and Herschel A. Benedict, electrical and mechanical engineer of the United Traction Co., of Albany, represent this association upon the local committee.

PLANS OF ENTERTAINMENT COMMITTEE.

The entertainment committee, of which Mr. A. B. Colvin, president of the Hudson Valley Railway Co., is chairman, has planned several enjoyable diversions, among them being excursions to places of especial interest.

On the first day (Wednesday) the delegates and ladies will be taken to Kaydeross Park in a train drawn by the Hudson Valley company's electric locomotive.

On Friday at 1 p. m. the train and locomotive will again be pressed into service to take the delegates and ladies to the Fort William Henry Hotel, Lake George, and possibly to Warrensburg. Returning the excursionists will reach Saratoga at 6 o'clock, in time for the banquet.

The convention banquet will be one of the most elaborate ever held at Saratoga. Mr. Colvin, who had charge of the arrangements, has secured speakers of note for the post-prandial program and a literary feast is promised.

The Electric Railway Equipment Co., of Philadelphia, has no exhibit, but callers at its booth will be entertained by the officers of the company: A. S. Vane, president; M. Herman Brill, vice-president, and W. H. Heulings, Jr., secretary and treasurer.

Something new.—The Ohio Brass Co. is furnishing portraits on a button. Ask the man.

MUSIC AT THE HEADQUARTER'S HOTEL.

During each day of the convention Victor Herbert and his orchestra will give two concerts in the main reception hall of the Grand Union, one at 10:30 a. m., and one at 8:30 p. m.

The programs for today's concerts are as follows:

Morning Concert.

- 1 March "Defendant" Henneberg.
- 2 Overture "Fingals Cave" Mendelssohn.
- 3 (a) Edleurement (Valse Lente) Ganne.
do Chanson Joyeuse Wachs.
- 4 Waltz "Wein, Weib und Gesang" Strauss.
- 5 Selection from "Mikado" Sullivan.
- 6 Egyptian Dance from "Djamileh" Bizet.
- 7 (a) Yesterthoughts Herbert.
do Punchinello Herbert.
- 8 Czardas "The Gypsy" Burek.
- 9 Suite " Sylvia "
do Les Chasseresses, do Intermezzo et Valse Lente, } Delibes.
do Pizzicato, do Cortège de Bacchus. }

Evening Concert.

- 1 Marche Joyeuse Chabrier.
- 2 Overture "Cockaigne" Elgar.
- 3 Suite "Casse Noisette"
do Danse Arabe, Tschalkowsky.
do Danse des Mirlitons,
do Danse Chinoise,
4 Waltz "The Blue Danube" Strauss.
- 5 Prelude "Lohengrin" Wagner.
- 6 (a) Fleurette, Herbert.
do Under the Elms (Souvenir de Saratoga). }
- 7 La Jota Aragonesa Saint-Saens.
- 8 Norwegian Dances Grieg.
- 9 Rhapsody No. 2 Liszt.



FENDER TESTS TODAY.

The Eclipse Car Fender Co. makes the following announcement:

"There will be practical tests and demonstrations of the efficiency of the Eclipse life guard today at 12:05 noon and at 5:05 p. m. Not a man or a dummy but a number of men will stand in front of an electric car moving at various speeds from 5 to 18 miles per hour and allow the Eclipse life guard with which the car is equipped to strike them and pick them up. The place is on Hamilton St., near the Hudson Valley Electric Railway Station, just half a block south of the Grand Union Hotel. All visitors to the convention are invited to be present and witness any or all of these tests."



SCHEDULES FROM ALBANY AND TROY TO SCHENECTADY.

The Schenectady Railway Co., which has extended the coverage of its various lines and divisions to the wearers of convention badges, announces the following schedules on the Albany-Schenectady line, and the Troy-Schenectady line:

Cars leave Albany, No. 24 State St., for Schenectady, at 7:45 a. m., and every 30 minutes thereafter until 9:45 a. m.; then every 15 minutes until 9:45 p. m., then every 30 minutes until 12:45 a. m. The "Schenectady-Albany Limited" leaves on the car on leave from 10 a. m. to 9 p. m., making no stops after leaving the city limits. Cars leave Troy from the Union Depot for Schenectady at 7:15 a. m., and every 30 minutes thereafter until 12 m.; then every 15 minutes until 9:45 p. m.; then every 30 minutes until 12:45 a. m.

A. B. COLVIN.

Hon. A. B. Colvin, president of the Hudson Valley Railway Co., besides giving his personal attention to the financial and to some of the operating departments of the road, is actively interested in a number of other enterprises of moment and he holds many offices of trust in commercial and financial institutions both in his native city of Glens Falls and elsewhere. He is president of the Glens Falls Trust Co., of the Empire Real Estate & Theater Co., of the Glens Falls & Lake George Plank Road Co., and of the Harris Safety Co., of New York. He established and developed a large printing and publishing house with headquarters at Glens Falls; he was an organizer and



A. B. COLVIN.

first vice-president of the Commercial Union Telegraph Co., now included in the Postal Telegraph Cable Co.; an organizer of the United Press Association, and one of the organizers of the People's National Bank of Sandy Hill, N. Y. Mr. Colvin has also been prominent politically, and he filled for two terms, dating from Jan. 1, 1894, the office of treasurer of the state of New York. He was a delegate to the first national republican convention which nominated William McKinley for President, and for a number of years represented his county in republican state conventions. He is a vice-president of the New York State Street Railway Association. In addition to his street railway connections at Glens Falls Mr. Colvin is vice-president and a large stockholder of the Niagara, St. Catharines & Toronto Railway Co., of St. Catharines, Ont. Mr. Colvin was born in 1858. He makes his headquarters at Glens Falls, N. Y.



LOCAL COMMITTEES.

ENTERTAINMENT COMMITTEE

Hon. A. B. Colvin, Chairman; President Hudson Valley Railway Co., and Vice-President Niagara, St. Catharine & Toronto Railway Co., Glens Falls, N. Y.

Hon. John W. Herbert, President Niagara, St. Catharine & Toronto Railway Co., Vice-President Hudson Valley Railway Co., New York.

Edgar S. Fassett, General Supt. United Traction Co., Albany, N. Y.

W. M. McFarland, Acting Vice-President Westinghouse Electric & Manufacturing Co., Pittsburg, Pa.

G. Tracy Rogers, Pres. Binghamton Railway Co., Binghamton, N. Y.

Hon. George E. Green, V.-Pres. Binghamton R'y Co., Binghamton, N. Y.

Hon. J. Leslie Hees, Pres. Ponda, Johnstown & Gloversville R'y Co., Ponda, N. Y.

Herbert H. Woodland, Pres. Interurban St. R'y Co., New York, N. Y.

Edward G. Comette, Vice-Pres. Syracuse Rapid Transit R'y Co., Syracuse, N. Y.

L. J. Nicholl, Vice Pres., Rochester Ry. Co., Rochester, N. Y.
 James O. Carr, Sec'y, Schenectady RY Co., Schenectady, N. Y.
 Thomas R. Kneil, Supt. of Schools, Saratoga Springs, N. Y.

RECEPTION COMMITTEE.

Hon. A. P. Knapp, President Village of Saratoga Springs
 Hon. Edgar T. Brackett, State Senator
 W. M. Probasco, Westinghouse Electric Co.
 J. R. Lovejoy, General Electric Co.
 C. B. Thomas, President Business Men's Association.
 Carlton H. Lewis, Police Commissioner.
 H. L. Waterbury, Chairman Board of Directors, Business Men's Association.
 Jonathan Marshall, Colecord
 D. C. Moriarta, Chairman Street and Water Commission.
 Dr. Amos C. Rich.

LADIES' RECEPTION COMMITTEE.

Mrs. A. P. Knapp, Chairman.
 Mrs. A. B. Colvin, Mrs. E. A. Burd,
 Mrs. W. M. Probasco, Mrs. F. R. Kneil,
 Mrs. J. R. Lovejoy, Mrs. J. M. Colecord,
 Mrs. D. M. McFarland, Mrs. H. F. Thomas,
 Mrs. D. C. Moriarta, Mrs. H. H. Vreeland,
 Mrs. C. B. Thomas, Mrs. Amos C. Rich.

EXHIBITS COMMITTEE.

F. M. Cozzens, Chairman.
 M. E. Varney, W. B. Eddy,
 W. S. Robertson, Elmer E. Durkee

INFORMATION COMMITTEE.

F. M. Waterbury, Chairman.
 W. L. Thompson, F. J. Rossegunie,
 F. A. Burd.

PROVIDENCE FENDERS

The exhibit of the Consolidated Car Fender Co. occupies 1000 sq. ft. of floor space in the main court and the company lays special emphasis on the fact that this exhibit, as usual, is the largest and finest car fender exhibit shown. The Consolidated Fender Co. feels justified in referring to the Providence Fender as "the old reliable," and the statement is made with pardonable satisfaction that the Providence device was placed on the market eight years ago, and, although since that time many fenders and life guards have been brought out, these much heralded so called life-saving devices have come and have gone, but the Providence fender goes on in the same old way, saving life and limb under all conditions, day in and day out, in stormy weather and in fair. Since its inception, the Consolidated Fender Co. has sold an aggregate of about 15,000 fender equipments to over 227 electric railway companies.

The exhibit this year comprises the following:

Model "A" Fender, designed for use on open or moderately high cars.

Model "B" Fender, for closed or low cars.

Model "C" Fender, especially adapted for city cars, either high or low. Has good carrying capacity and is the latest improved type for all-round service.

Model "D" Fender for large suburban and interurban cars. This type is built extra heavy and is claimed to be strong enough to pick up a horse or cow without injury to fender or to animal struck.

All Providence fenders are interchangeable from one end of the car to the other and from one car to another of the same general type. Fenders can be transferred from end to end in a few seconds' time and without the use of tools of any kind.

The exhibit also includes samples of the Campbell snow broom; the Miller car step lifter, and fender parts.

The Consolidated Car Fender Co. is represented by Col. A. C. Woodworth, Geo. H. Hollingsworth, and E. C. Hall.

FORMER CONVENTIONS.

A list of the cities where the American Street Railway Association conventions have been held and of the presiding officers is as follows:

| | | |
|------------------|---------------------|------|
| Boston | Moody Merrill | 1882 |
| Chicago | H. H. Littell | 1883 |
| New York | William H. Hazzard | 1884 |
| St. Louis | *Calvin S. Richards | 1885 |
| Cincinnati | Julius S. Walsh | 1886 |
| Philadelphia | *Thomas W. Ackley | 1887 |
| Washington | Charles B. Holmes | 1888 |
| Minneapolis | George B. Kerper | 1889 |
| Buffalo | Thomas Lowry | 1890 |
| Pittsburg | Henry M. Watson | 1891 |
| Cleveland | John G. Holmes | 1892 |
| Milwaukee | D. F. Longstreet | 1893 |
| Atlanta | Henry C. Payne | 1894 |
| Montreal | Joel Hurt | 1895 |
| St. Louis | H. M. Littell | 1896 |
| Niagara Falls | Robert McCulloch | 1897 |
| Boston | Albion E. Lang | 1898 |
| Chicago | C. S. Sergeant | 1899 |
| Kansas City | J. M. Roach | 1900 |
| New York | Walton H. Holmes | 1901 |
| Detroit | H. H. Vreeland | 1902 |
| Saratoga Springs | Jere C. Hutchins | 1903 |

Deceased.

A list of the cities where the Street Railway Accountants' Association has held meetings and the presiding officers is as follows:

| | | |
|------------------|-----------------------------|------|
| Cleveland | *Morris W. Hall, Chairman | 1897 |
| Niagara Falls | C. N. Duffy, Vice-President | 1897 |
| Boston | H. L. Wilson, President | 1898 |
| Chicago | J. E. Calderwood, President | 1899 |
| Kansas City | C. N. Duffy, President | 1900 |
| New York | W. F. Ham, President | 1901 |
| Detroit | H. C. Mackay, President | 1902 |
| Saratoga Springs | Henry J. Davies, President | 1903 |

Deceased.

"CONSOLIDATED" CAR HEATERS.

The Consolidated Car Heating Co., of Albany, has prepared an interesting exhibit which is well worth inspection. There is shown a panel to which are attached the company's standard designs of panel and cross-seat heaters, together with its various types of regulating switches and cut-outs for electric heaters in service. There is also exhibited the special heater which the company is building for the Interborough Rapid Transit Co., New York, in connection with the railway company's order for 12,680 heaters.

Another feature of the exhibit is two special heaters designed during the past year—one a single coil heater, the other double coil, having the connections so arranged that the terminals are brought out at one end of the casing. These heaters are especially designed for use under cross seats. They are very readily installed, there being none of the usual difficulty in bringing lead wires around the heater. Still another part of this exhibit comprises a special truss plank heater in position on a model section of car, showing the space available for this type with the ordinary cross seats as furnished by various companies.

The company is represented at the convention by Francis C. Green, general manager; Mr. Hawley and Mr. Keys, of the New York office, and Mr. Hequembourg, of Chicago.

F. B. Billheimer is conserving the interest of the Kinnear Manufacturing Co. at the convention. This company makes the well-known Kinnear steel rolling doors and shutters.

THE WESTERN SPECIAL.

Nearly 100 electric railway men and street railway supply-men arrived last evening on a special train over the Wabash and West Shore roads, which left Chicago at 5 p. m., on Monday. St. Louis and Detroit cars were added to the train at Detroit. Among the passengers on this train were the following:

F. W. McAssey, auditor Rockford & Interurban Railway Co., Rockford, Ill.

W. K. Morley, vice-president and general manager Grand Rapids, Grand Haven & Muskegon Ry.

L. E. Myers, general manager Peoria & Pekin Terminal Ry., and Vineyard Park and Topeka Railway Companies.

James F. Morrison, superintendent and master mechanic South Side Elevated Railroad Co., Chicago.

Homer McNutt, San Diego Electric Railway Co., San Diego, Cal.

Richard McCulloch, assistant general manager Chicago City Ry.

C. N. Duffy, comptroller Interurban Street Railway Co., New York.

Harvey B. Fleming, superintendent of track and electrical department Chicago City Ry.

John H. Camlin, secretary and treasurer Freeport Electric Railway Co., Rockford, Ill.

J. A. Trawick, manager Little Rock (Ark.) Railway & Electric Co.

R. W. Bailey, superintendent of overhead construction East St. Louis & Suburban Railway Co.

W. A. Bennett, engineer of maintenance of way East St. Louis & Suburban Railway Co.

John T. Huntington, general manager Elgin, Aurora & South end Traction Co.

Joseph Kuen, master mechanic East St. Louis & Suburban Railway Co.

F. R. Henry, auditor St. Louis Transit Co.

E. J. Pratt, superintendent of motive power Southwestern Missouri Electric Railway Co.

H. M. Siegfried, general manager Atchison Railway, Light & Power Co.

Michael O'Brien, master mechanic Chicago City Ry.

T. M. Ellis, general manager Rockford & Interurban Railway Co., Rockford & Belvidere Railway Co., and Rockford Railway, Light & Power Co.

Andrew Christ, jr., auditing department Chicago City Ry.

W. A. Smith, general manager Omaha Street Railway Co.

Wall Nutt, general superintendent Rockford, Beloit & Jamesville Railroad Co.

J. Z. Murphy, master mechanic Union Traction Co., Chicago.

John Grant, general manager St. Louis Transit Co.

H. M. Sloan, general manager Calumet Electric Railway Co., Chicago.

J. J. King, superintendent San Antonio Street Railway Co.

Thomas Bailey, Chicago General Railway Co.

Peter Smith, of Peter Smith Heater Co., Detroit.

J. M. Gallagher, manager Chicago branch Mayer & Englund Co.

Fred A. Poor, western representative Weber Railway Joint Manufacturing Co.

Arthur S. Partridge, of St. Louis.

E. F. Wickwire, of Ohio Brass Co., Mansfield, O.

E. F. Kirtpatrick, manager McRoy Clay Works, Brazil, Ind.

Harold R. Wilson, Chicago representative Stanley Electric Manufacturing Co.

R. B. Kent, manager Atlas Railway Supply Co.

W. R. Garton, president and treasurer W. R. Garton Co., Chicago.

H. B. Abbott, western manager Street Railway Journal.

Arthur Benzel, of St. Louis office of National Lead Co.

M. A. Berg, of Porter & Berg, Chicago.

Geo. W. Linnell, of Watts & Linnell, St. Louis.

John E. Eldred, Jr., representing N. A. Christensen, Milwaukee.

Wallace Franklin, manager Detroit office of Westinghouse, Cramoh, Kerr & Co.

Charles A. Ballard, treasurer Magnetic Equipment Co., Chicago.

A. T. Kalas, of railway Appliances Co., Chicago.

W. R. Bonham, of Bukeye Electric Co., and Jandus Electric Co.

Thomas O. McGill, of Chicago office of American Brake Shoe & Foundry Co.

Roland L. Morley, son of W. K. Morley.

R. D. Belknap, assistant sales agent Pennsylvania Steel Co.

John W. Cooke, general western passenger agent West Shore Railroad Co.

George Frederick Rooke, Peoria, Ill.

S. P. McGough, of Chicago office of Continuous Rail Joint Co.

D. J. Evans, Chicago, representing Lorain Steel Co.

H. C. Holloway, assistant engineer Weber Railway Joint Manufacturing Co.

Edgar S. Netherent, chief engineer Paige Iron Works, Chicago.

H. F. Tate, western manager National Conduit & Cable Co.

James W. Lyons, representing the Allis-Chalmers Co.

George S. Bigelow, of railway department Chicago Varnish Co.

Walter B. Templeton, president Templeton, Kendy & Co., Ltd., Chicago.

H. T. Bigelow, Chicago, representing Hale & Kilburn Manufacturing Co.

William H. Stare, superintendent Railway Journal & Lubricating Co., Chicago.

Frederick B. Pierson, Detroit, resident manager National Lead Co.

H. E. Overstreet, general manager Climax Supply Co., Chicago, and son.

George Weston, vice-president Chicago Engineering & Constructing Co., and Mrs. Weston.

C. B. Easty, Detroit.

W. J. Cooke, vice-president McGuire Manufacturing Co., Chicago.

Ernest H. Noyes, manager Chicago office Pittsburg Reduction Co.

N. C. Keeran, city passenger and ticket agent Wabash R. R., Chicago.

Elliott Lairat Keeran, Chicago.

J. V. E. Titus, vice-president and secretary Garton Daniels Co.

J. G. McMichael, president and treasurer Atlas Railway & Supply Co., and Mrs. McMichael and Miss Rogers, of Chicago.

E. J. Pietzcker, Standard Underground Cable Co., Pittsburg.

Miss Annie P. Wiley, New York.

Anthony H. Metzelaar, Battle Creek, Mich.

W. Worth Beard and Mrs. Beard, St. Louis.

George B. Foster, Chicago, representing Bullock Electric Manufacturing Co. and Wagner Electric Manufacturing Co.

Godfrey H. Atkin, manager Chicago office Electric Storage Battery Co.

J. H. Parshall, western agent Ball & Wood Co., Chicago.

Charles K. Knickerbocker, Griffin Wheel Co., Chicago.

William D. Ray, Westinghouse Traction Brake Co., New York.

Mr. J. G. White, of J. G. White & Co., London and New York, is attending the convention.

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The National Carbon Co., of Cleveland, O., is exhibiting its various styles of carbon brushes, under direction of N. C. Cofa-bush, sales manager, assisted by R. K. Mickey.

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The Dearborn Drug & Chemical Works, of Chicago, is represented by Robert T. Carr, vice-president and general manager; William B. McVicker, second vice-president and eastern manager; and Grant W. Spear, of the Chicago office. The company's exhibit space will be utilized mainly for reception purposes, and everybody will be cordially welcome.

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The Railway Appliances Co., of Chicago, is making a general display of railway devices, including Stanwood car steps, car replacers, etc. The company is represented at the convention by Frederick Brotherhood from the New York office; Anthony Kalas from the Chicago office, and E. H. Symington, who has charge of the journal box department.

THE ST. LOUIS NO. 47 TRACK.

The St. Louis Car Co's exhibit includes one of its No. 47 trucks, which is illustrated herewith together with five of its style seats and an arc headlight, both of which latter were described and illustrated in the "Street Railway Review" for August. The No. 47 truck made by this company is in use on many electric roads, including the St. Louis & Suburban Railway Co., Little Rock Traction & Electric Co., Detroit United Ry., Louisville Railway Co., Beaumont Traction Co., and the Cincinnati, Milford & Loveland Traction Co.



THE ST. LOUIS NO. 47 TRUCK.

The truck has a short wheel base (1 ft. 6 in.), which is designed to make the rounding of curves easier to save power and reduce the wear of both wheel and track.

The design permits the car body to be hung low, thus facilitating the loading and unloading of passengers. It is of the swing bolster type, with elliptic springs on each end. The bolster is hung from rigid truck frames, which are supported on spiral springs over the journal boxes, and has end springs to cushion the end play. The frames are of cast steel, machine fitted to the angle iron end frames; being machine fitted, no trouble is caused by loosening of bolts, a point not to be overlooked when considering the vibration a truck in city service has to undergo. The frames once together, stay together and will not rattle to pieces.



STERLING-MEAKER CO'S EXHIBIT.

The Sterling-Meaker Co's exhibit is a very comprehensive one, comprising practically all the articles which the company manufactures. These include the Sterling safety brake, the Sterling sand box, the Sterling fender, the Sterling registers (including



THE STERLING NO. 5 ROUND CASE.

Nos. 1, 3, 5, 6, 7 and the portable, the Sterling trolley base, the Sterling seat back buffer, the Sterling register fittings, the Sterling brazing torch, the Earl trolley retriever, the Trojan trolley

catcher, conductors' punches, register cord, hand hold straps, sliding pliers, trolley tape, etc.

The company has recently embodied its No. 5 register in a round case, as shown in the accompanying illustration, and now supplies this register in either round or square form, as desired. Attention is also called to the No. 6, its latest and best double register.

The newest register made by the Sterling-Meaker Co. is the No. 7. This is a single, round register, and is thought to be equal if not superior to any other single register except the No. 5. The Sterling trolley base was described and illustrated in the "Street Railway Review" for May, 1903.



EXHAUST HEAD OF UNUSUAL SIZE.

We present herewith an illustration of a 36-in. exhaust head made by the Sterling Blower & Pipe Manufacturing Co. for the Springfield (Mass.) Street Railway Co's. new power house, and which was recently delivered at Springfield. This exhaust head is 7 ft. 6 in. in height and 6 ft. 8 in. in diameter; it is made of heavy, galvanized sheet steel plates, riveted and soldered.



36 IN. EXHAUST HEAD.

The Sterling company is also building two of these 36-in. exhaust heads for the new power house of the Rhode Island Suburban Railway Co., of Providence, R. I. The address of the Sterling Blower & Pipe Manufacturing Co. is 3590 Huyshope Ave., Hartford, Conn.



The Hale & Kilburn Manufacturing Co. has a novel exhibit of up-to-date car seats and material which will be found on the main corridor adjoining the hotel dining room; its exhibit space covers 250 sq. ft. The representatives of the company who are in attendance are H. T. Bigelow, of Chicago, and A. F. Old and S. A. Walker, of New York City.



Eugene Munsell & Co., and the Mica Insulator Co., of Chicago, are represented at the convention by Charles E. Coleman, of the Chicago office. Charles W. Jefferson, manager of the Schenectady branch, is also in attendance.



Thomas F. Carey, 53 State St., Boston, dealer in railroad equipment and supplies, was among the early arrivals at Saratoga. Mr. Carey has no exhibit of his own, but the following companies which he represents as general sales agent for the snow plow department have their own exhibits: John Stephenson Co., Bemis Car Truck Co., Wason Manufacturing Co.

FUEL OIL AND OIL FURNACES.

Among the many problems that have to be solved by the operating official none is more exacting than the maintenance of equipment, and in this no subordinate part of the repair plant is more important than the blacksmith shop. Oil furnaces have figured prominently in transforming the ill-kept blacksmith shop of yesterday into the well-ordered shop of today. With the introduction of forging machines, power hammers, bulldozers, etc., much that was formerly hand work came to be done on machines and it was found that with coal or coke fires the material could not be heated fast enough to permit the machines to be run to their capacity. Oil furnaces were then introduced for this class of work, resulting in an increased output, sometimes as great as 300 per cent.

Fuel oil has long been recognized as possessing many advantages over coal. It contains more energy than an equal weight of any other material that exists in large quantities. Containing

perfect combustion, as evidenced by the satisfactory performance of a number of its welding heat furnaces now in use for welding tubes, small forgings, etc., in which the material has to be handled very rapidly and in a perfectly heated furnace. It is further claimed for the Ferguson furnaces that they are economical in the consumption of fuel; material is brought to the required temperature in a perfectly heated furnace and in condition to be handled to the best advantage; no material is lost by faulty heat treatment; no machines are kept idle waiting for heated material; no time is lost bringing coal or coke to the fires, cleaning the fire or removing ashes; the time of the men is wholly given to their work; the furnaces are designed to do a certain class of work and do it well—to heat the material and not the shop or men; in other words, to make a condition as nearly ideal as possible.

During the past three years Ferguson oil furnaces have been installed in the shops of 50 railroads and are said to have formed the furnace equipment of all the modern railroad shops built in the past two years. Two of the Ferguson furnaces are installed in the new shops of the Chicago City Ry.



THE FERGUSON OIL FURNACE.

no ashes, every portion can be burned to produce heat. Fuel oil contains from 19,000 to 22,000 B. t. u., and all that is necessary is to supply this fuel with air in such proportion as will result in bringing together the right proportion of the gases at the right time to obtain perfect combustion. If this is accomplished, we have a fuel that, whereas its theoretical efficiency over coal is only 45 per cent, yet it has a calorific value more than 60 per cent greater than bituminous coal. Oil contains little or no sulphur or phosphorus to attack the metal heated, nor with perfect combustion is the metal injured in any way by being heated. Especially for such work as welding, the perfect combustion and absolutely clean fire made possible by the use of a liquid fuel should recommend it.

Among the many types of oil-burning devices which have been placed on the market during the past few years there is one system of oil furnaces, the "Ferguson," that has many new features, chief of which is that the oil is not atomized, but is simply brought into combination with a quantity of oxygen, or fan blast. Partial combustion takes place and the hydrocarbons burn on their way up a vertical combustion chamber, and on reaching the top combine with a further supply of air, when perfect combustion should result. The oil and air supplies are independent and under the control of the operator, so they can be regulated to a nicety. The maker of the Ferguson oil furnaces, the Railway Materials Co. of Chicago, claims to obtain

THE WATSON AUTOMATIC FENDER.

W. T. Watson, of Newark, N. J., maker of the Watson automatic fender and wheel guard, which were described and illustrated in the "Street Railway Review" for August, personally supervises his interesting exhibit, which consists of a full-sized fender fitted to a car platform built for the purpose, and showing all details and manner of operation. The automatic wheel guard is also exhibited. A special catalog has been compiled by Mr. Watson, to be distributed at the convention. Mr. Watson advises us that he has received a number of inquiries about his products both in this country and in Europe, and that he now has considerable European business in sight.



THE VAN DORN & DUTTON CO.

The Van Dorn & Dutton Co. and the Van Dorn-Elliott Electric Co., of Cleveland, exhibit together as usual, the former making a display of its well-known track cleaners, which are standard on over 300 electric roads, and also showing a line of open hearth steel gears and hammered steel pinions. The electric company's exhibit includes commutators, and armature and field coils, which are widely known for their excellence.

BALL-BEARING TROLLEY BASE.

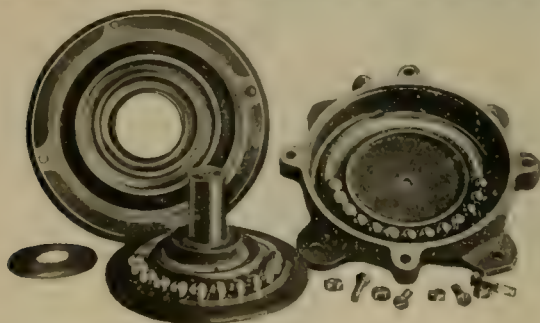
The ball-bearing trolley base which is made by the Detroit Trolley & Manufacturing Co., and which is shown in the accompanying illustrations, is on exhibition at space No. 39, under direction of W. S. McDonald, secretary of the company, who will be pleased to answer all questions pertaining to the device. This base is made of a special run of hardened cast iron, with two sets of grooves to afford raceways for 1 in. solid steel balls. It is designed to give the maximum amount of horizontal flex-



SECTION OF BASE.

ibility, so as to enable the trolley wheel to follow easily any variations in the alignment of the trolley wire. By the use of ball bearings friction is reduced to a minimum, both on the trolley pole and on the wire.

The company claims for this device an assured saving in wear of overhead construction, saving in wear of trolley wheels, sav-



PARTS OF BALL-BEARING TROLLEY BASE.

ing in poles and saving in enforced stopping by reason of the wheel leaving the wire, it being further claimed that with this base the wheel cannot leave the wire. It is made of the best materials and is believed to be practically indestructible. It is in practical operation on over 300 roads.

In consequence of the growth of its business the company has found it necessary to equip a new plant for the manufacture of its trolley base and other street railway supplies.



UNDER-FEED STOKER CO'S. NEW CATALOG.

The Under-Feed Stoker Co. of America has just issued a new catalog describing and illustrating the Jones under-feed system of mechanical stoking. It is an exceptionally fine exemplification of the art of catalog making, and contains 48 pages, 9x12 in., 33 pages being illustrated. The descriptive matter and the illustrations are on opposite pages, and each page is tinted with a delicate shade of green, with a 1-in. white margin. The reading type is double-headed, a neat filled-in letter being used for the captions. A striking feature of the compilation is the absence of tests and testimonials and all references to products of competitors. It is a clear, concise statement, calculated to interest the steam user in the economical possibilities of the Jones system.

Briefly stated, the contents point out the unusual advantages of the under-feed method as applied in the Jones stoker, by showing what it is, how it is constructed, how installed and the method of operation, together with the economical results

claimed for it. In summing up, the points emphasized are extreme simplicity of construction, perfect control in admission of fuel and air to the furnace at a fixed ratio, and the makeup of the retort, which is designed to make loss of fuel impossible under any circumstances. It is also pointed out that the Jones stoker is an excellent smoke preventer. Among the illustrations are views of the stoker and its parts, showing method of equipment, etc., and many half-tone views of plants where the Jones stoker has been installed.

The general offices of the company are in the Marquette Building, Chicago; the eastern office is in the Board of Trade Building, Boston, and there are branch offices at Cleveland, Toronto, Montreal, Philadelphia, St. Paul, Denver, Pittsburg and Detroit.



THE HOWE STEAM SAND DRYER.

The Howe Manufacturing Co., of Scranton, Pa., is exhibiting the Howe steam sand drier, which was recently invented, and which will be sure to interest the electric railway men in attendance. This drier is a radical departure from the old hopper and stove combination; the chief feature comprises layers of steam pipes so laid that all condensation in them immediately runs off. The machine will take one car load of sand at a time and after loading the sand into the hopper it is thoroughly dried, screened and made ready for use without requiring the services of an attendant. The idea is that a car load of wet sand in the hopper at night will be a car load of dry sand in the morning. The drier does not heat the sand above 212° F., and the flow of sand can be regulated by setting certain levers. The capacity of the drier is 30 tons of ordinary sand in 12 hours, or 60 tons in 24 hours. The company makes a 10-ton machine for electric railroad use. The drier is so simple in construction that it can be inspected and cleaned at any time; there is little or no wear to its parts, and it is well built, every joint being tight.

The president of the company, A. D. Blackinton, will be pleased to explain the drier to all interested.



SPRAGUE FLEXIBLE METALLIC CONDUIT.

The flexible metallic conduit manufactured by the Sprague Electric Co. is particularly adapted for car wiring as well as the wiring of buildings where thorough protection to wires and insulation is essential. This type of conduit has been ordered for the electric light wiring of the cars of the Interborough Rapid Transit Co. of New York, with the object of insuring the greatest possible safety to passengers against fire due to defective wiring. Mr. Bryan, manager of the Interborough Rapid Transit Co., in speaking of the fire-proof construction of the new cars for the subway and the impossibility of the recent Paris accident being repeated in New York says "the wiring for lighting the cars is one roof away from the passengers. Two small wires are insulated with asbestos and carried in conduits of flexible material." The flexibility of this conduit is such that it can be bent around corners and over obstructions with ease and it requires no more strength to bend it than is required to bend a manilla rope of the same diameter. For this reason no elbows are required and the insulation is reduced to the very simplest form.



U. S. ELECTRIC SIGNAL CO.

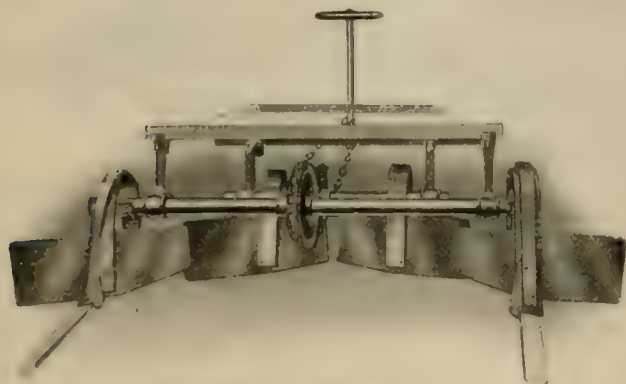
The United States Electric Signal Co. has removed to a new factory at West Newton, Mass., in which city it has always been located, and by reason of increased facilities it is able to supply signals very promptly. This company is now making a trolley switch adapted for high speed roads, and has constructed for those who desire them a signal box with semaphores at the side.

The company is represented at the convention by its treasurer, James H. Nickerson, and its electrician, Mr. Root.

TRACK SCRAPERS AND SLEET-CUTTING DEVICE.

The Root Track Scraper Co., of Kalamazoo, Mich., exhibits at space No. 51 a full line of scrapers made by it; and on the siding set apart for that purpose it has a car equipped with its No. 2 single scraper and its No. 5, or "Kalamazoo," double scraper, for the purpose of giving a practical demonstration of its principle of clearing snow from the tracks and groove rails of street and interurban railways. Two of the company's devices are illustrated herewith—the No. 5 "Kalamazoo" scraper and the device for cleaning the third rail, the latter being a combination scraper and sleet cutter. Both of these appliances have met with considerable favor and they will undoubtedly attract a great deal of attention during the convention.

The "Kalamazoo," as shown in the illustration, is designed to clean all the snow from between the rails, and 9 in. outside, throwing it each way from the center, and at the same time it cleans the top of the rail and the groove; it is further designed to protect the motors from snow, which it is said to accomplish fully. It is raised and lowered by the same device as the single



NO. 5 KALAMAZOO SCRAPER.

scraper and is easily handled by the motorman alone. With this scraper the company claims to be able to do a more practical job, and to clean more track than can be done by a sweeper, as it can be run much faster. In fact, better results are obtained when the car is moving quite rapidly. If the pressure on the rails is increased correspondingly. It deposits the snow farther from the track, obviating the need of large plows to clean up the banks thrown out.

The sleet cutter is believed to be the best device yet invented for removing sleet from the contact rail. It first breaks the ice, and the spring shown at the back of the sleet-cutting wheel scrapes it off. Any pressure desired can be put upon the springs, and no matter what the speed the ice is broken uniformly and when broken is easily removed, as the company proposes to demonstrate at its exhibit. The springs can be adjusted to either iron or wood shafts. With this device it is guaranteed to give a clean rail and contact at less cost and far more rapidly than by the other methods now in use.

All the scrapers made by the Root Track Scraper Co. are operated by the motorman and need no attention after being in position to work. The flanger shovel being independent of the main shovel, and of the same width as the rail, follows any depression or elevation of the rail readily, being always on the rail, even when the rail is below the pavement. The springs are of the best spring steel, oil tempered, and warranted not to bend or break for one year. The blades or shovels are also of a high grade of spring steel and it is almost impossible to break them.

F. N. Root, manager of the company, is in charge of the exhibit, with an able corps of assistants.

The company is distributing a new catalog.

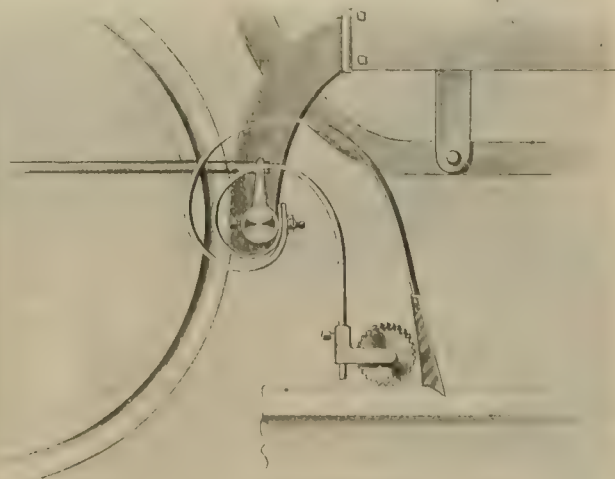


The Curtin Supply Co., of Chicago, engaged a local decorator to arrange its exhibit corner in like manner as for the Car Builders' convention, which was recently held at Saratoga Springs. The company is showing several new devices this year.

NATIONAL ELECTRIC CO.

The National Electric Co., of Milwaukee, successor to the Christensen Engineering Co., decided not to have an elaborate exhibit this year, but to show simply a complete Christensen air brake equipment in operation, and possibly some small models of an air brake equipment. This, together with photographs and catalogs, comprises the entire exhibit.

Those who it is expected will represent the company at the convention are the following: S. W. Watkins, president, and R. P. Tell, vice-president, Milwaukee; F. C. Randall, manager, and the following salesmen and engineers of the air brake department: J. H. Denton, J. T. Cunningham, Joseph Dixon, Jr., J. D. Maguire, New York; W. W. Power, W. H. Goble, Philadelphia; H. N. Ransom, C. N. Leet, Cleveland; S. I. Walles, Cincinnati; J. J. Nef, Chicago; J. S. Hamlin, St. Louis; W. A. Gratten, San Francisco. Also, F. L. Hutchinson, manager elec-



ROOT COMBINATION SCRAPER AND SLEET CUTTER.

trical sales, Milwaukee; C. G. Burton, electrical sales department, Chicago; W. L. Waters and Charles D. Knight, engineers, Milwaukee.



THE PITTSBURGH REDUCTION CO.

The Pittsburgh Reduction Co., of Pittsburgh, Pa., is represented at the convention by the following gentlemen: Arthur V. Davis, general manager; Alvah K. Lawrie, general sales agent; William Hoopes, electrical engineer; S. K. Colby and W. R. Darby, of the New York office; J. H. Finney, of the Washington office; E. H. Noyes, of the Chicago office; James A. Rutherford and C. M. Harris, of the Cleveland office; Percy Hodges, of the Boston office, and A. S. Vane, of Philadelphia. The company's exhibit consists of a wire-drawing machine for drawing aluminum wire, the rest of its space being used for reception purposes.



PENNSYLVANIA STEEL CO.

The Pennsylvania Steel Co. is represented at the convention by its various agents, as follows: H. F. Martin and W. C. Cuntz, Philadelphia; J. G. Miller, St. Louis; R. C. Hoffman, Baltimore; C. W. Rehnold, Steelton, Pa.; A. E. Aeby and John Clarkson Jay, Jr., New York; R. E. Belknap and Clifford J. Ellis, Chicago; Charles S. Clark, Boston. Also, George W. Parsons, superintendent frog, switch and signal department, and C. A. Alden, engineer of same department, of Steelton.

The company's exhibit includes an assortment of models of frog and switch material and it is expected to show some newly designed special work.

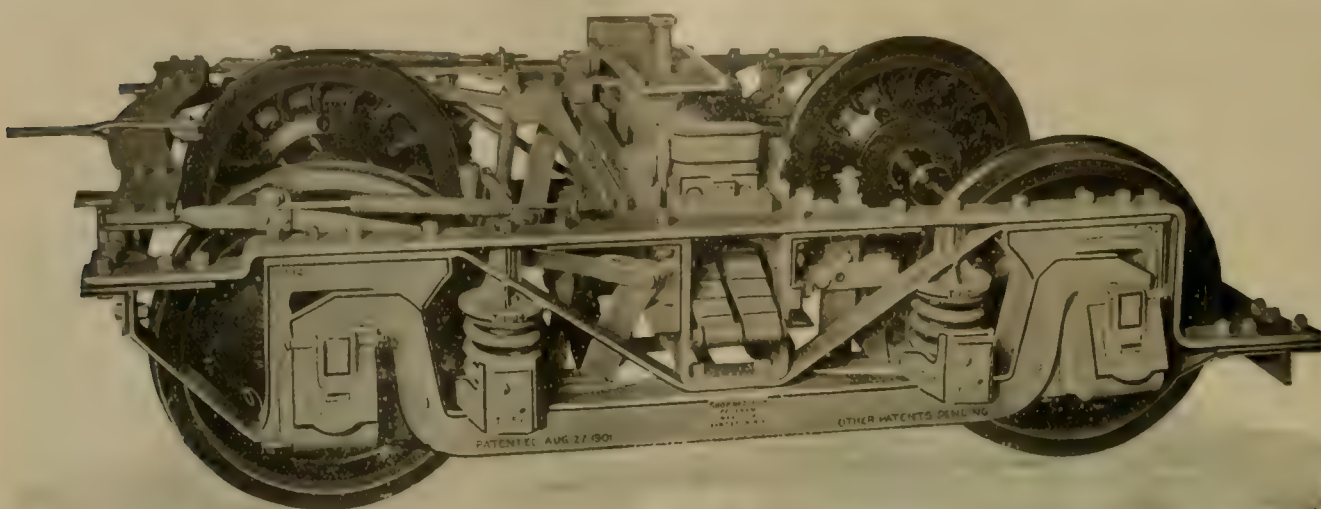
HIGH SPEED INTERURBAN TRUCKS.

The Peckham Manufacturing Co. of Kingston, N. Y., and New York City, is meeting with gratifying success in its work of adapting the M. C. B. truck to electric railway work, and the company's plant at Kingston is filled with orders for M. C. B. trucks to be used on several prominent interurban roads in this country.

The Peckham M. C. B. truck No. 46 is of extra strong con-

struction designed for the highest speeds in electric railway practice. It has the Peckham patent combination side frames, consisting of a combination with two equalizing bars, of a center truss frame rigidly secured to the pedestals and top frames, forming an "extra strong" construction. This combination is designed to give a double factor of safety, as the center frame alone is sufficiently strong to carry the weight of the car without the aid of double equalizing bars which are arranged on

each side of the pedestals. The transom bars are 10-in. bulb angles secured rigidly to the top frames and to the center arch bars. The top frames and transom bars are rigidly secured to each other by a center steel plate gusset which makes a rigid center brace that prevents the truck from getting out of square. The top frames extend around the truck. The end sections are of angle bar shape firmly secured to the side bars and corner

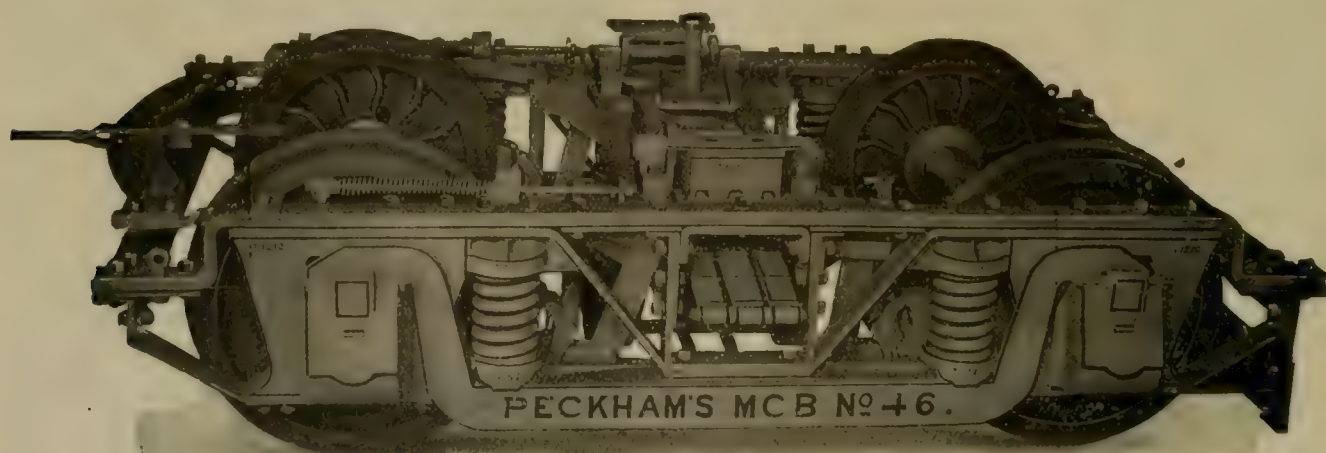


PECKHAM NO. 40 M. C. B. TRUCK.

tioned, among many others, the Jackson & Battle Creek Traction Co.; the Syracuse & Auburn; Danville, Urbana & Champaign; Washington, Baltimore & Annapolis; Lake Erie, Bowling Green & Napoleon; Topeka & Vinewood Park.

The Peckham Manufacturing Co. was recently called upon to develop a special truck for elevated service and this is known as the Peckham M. C. B. No. 46 truck, or the "Brooklyn Special", and the company has built during the past year or is now build-

ing 900 trucks of this type for elevated service in Brooklyn. This truck follows closely the lines of the M. C. B. No. 46 type and has Peckham patent combination side frames, special steel bolster, special top frame and Peckham flexible motor suspension. With 33-in. wheels and 5-in. axles the truck weighs 10,000 lb. and the carrying capacity of each truck (with a safety factor of six) is 40,000 lb., or 80,000 lb. per car.

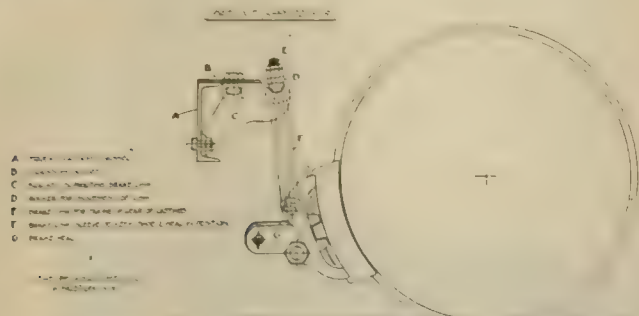


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All of the Peekham M. C. B. trucks are equipped with the Taylor non-chattering brake hanger invented by R. C. Taylor, M. E., of the Brooklyn Heights Railroad Co.



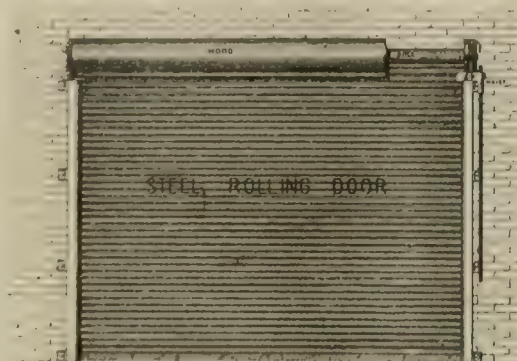
TAYLOR BRAKE HANGER.

The Peekham Manufacturing Co. announces that it has built at its Kingston shops a thoroughly up-to-date spring plant and is now prepared to furnish both spiral and elliptic springs of all kinds, quality guaranteed to be equal to the best.



COLUMBUS STEEL ROLLING DOORS.

The accompanying illustrations show a general view and details of the steel rolling doors made by the Columbus Steel Rolling Shutter Co., of Columbus, O. These doors and shutters, which may be readily adapted to any building, whether new or old, have been very largely applied to car barns, freight and round houses and warehouses, and are in many instances used for elevator openings, partitions and windows, being mechanically strong as well as fireproof. Mr. Peter Ebner, of Columbus, who has had an extended experience in the manufacture of such devices, has invented a new form of slatting which is used exclusively by the Columbus Steel Rolling Shutter Co. It is



STEEL DOOR—COLUMBUS STEEL ROLLING SHUTTER CO.

stated that experts have pronounced this slatting the stiffest, yet most flexible ever produced. The tubular form of the hinge and the absence of the sharp bends are the special features of its design. The small head within the large barrel of the pivotal hinge, combined with the tubular shape, are intended to produce great stiffness, resisting wind pressure or other stress, and to make a species of roller bearing to reduce friction to a minimum, obviate wear of contact surfaces and prevent jamming apart of the slats.

The shape is such that there are no pockets or recesses for the accumulation of water, snow or dirt and this prevents rusting out, premature decay, and clogging of joints. All doors and shutters are counterbalanced by means of a spiral spring within the shutter roll, so they may be quickly and easily rolled and remain in any desired position. Every shutter the Columbus company puts upon the market has the theoretical tension of spring carefully computed, and before the designs are executed in the shops each spring is carefully tested. The small floor

space and head room which these doors occupy affords additional storage room on valuable floor space, and allows for use the total height of opening when ceilings are not high enough to accommodate solid vertical lift doors. It is pointed out that the small cost for maintenance and repairs counterbalance the first cost of installation.

In addition to being fireproof doors of this type avoid the liability of accidents such as often occur with large swinging doors due to wind or other causes.

The illustration shown is a construction adopted for use in freight depots, warehouses, shops, factories, elevator shafts or car sheds. The cast iron brackets which support the shutter coil, and the grooves at the sides, in which the door moves, are secured to the face of the wall by expansion bolts, lag screws or through bolts according to the class of building. Springs within the shutter coil counterbalance the weight of the shutter.

The Columbus Steel Rolling Shutter Co. has exhibit space No. 48½ at the convention, where its representative will be pleased to explain the special features of these doors and shutters to all who are interested. Catalogs and samples of slatting will be mailed upon application to the company or any of its agents.



OHMER FARE REGISTER CO.

Three features of the Ohmer Fare Register Co.'s exhibit call for special mention — its No. 3, No. 4 and "Latest" registers. The No. 3 register has safety locks and conductors' identification keys, which are printed with each register record. The No. 4 register, in addition to all the features of No. 3, is designed to register and indicate 12 different classifications of fares, print the number which have been registered at the end of each half-trip, and give to the company a complete record of each and every transaction as to the time and how it occurred. The "Latest" register is adapted for city lines for two, three or four classes of fares. It is so constructed that it can be operated from the rod in the car used with any ordinary register, and with this register the cord is dispensed with.

The Ohmer Fare Register Co. is represented at the convention by John F. Ohmer, vice-president and general manager;



J. H. Stedman, secretary, and Walter E. Hinmon, M. MacDonald, H. A. Eckert and C. W. Kettelman.



THE LUDLOW SUPPLY CO.

An exhibit which will be sure to attract considerable attention is that of the Ludlow Supply Co., of Cleveland. A feature of this exhibit is a "Cleveland" track drilling machine, with electric motor, which is in operation at all times. The company has drilled with this machine repeatedly, in the office, ¾-in. holes through 70 lb rail in from 30 to 40 seconds, and undertakes to do the same thing at the convention. The company also exhibits pneumatic hoists, pneumatic pit jacks and other devices of interest to electric railway men.

The representatives of the company who are present are Col. W. E. Ludlow, E. S. Ludlow and J. B. Ludlow.

MONSTER ELECTRIC LOCOMOTIVE.

What is believed to be the most powerful locomotive in the world has just been built by the General Electric Co., at Schenectady, for the Baltimore & Ohio Railroad Co., for use in its tunnel underneath the city of Baltimore. This locomotive is to haul all the freight traffic of the Baltimore & Ohio which passes through Baltimore and will operate over the same section 3.12 miles, as the present electric locomotives built by the General

made of 1 1-2 per cent at 10 miles per hour with corresponding higher speed on lighter grades. This required a locomotive with approximately 160 tons on the drivers and the engineers of the General Electric Co. decided that the most practicable scheme was to build an articulated locomotive consisting of two complete 80-ton units operated together as one locomotive by means of the Sprague General Electric multiple unit control.

Under practical operating conditions the motors are designed to maintain the service hourly running loaded up the grade and returning light.

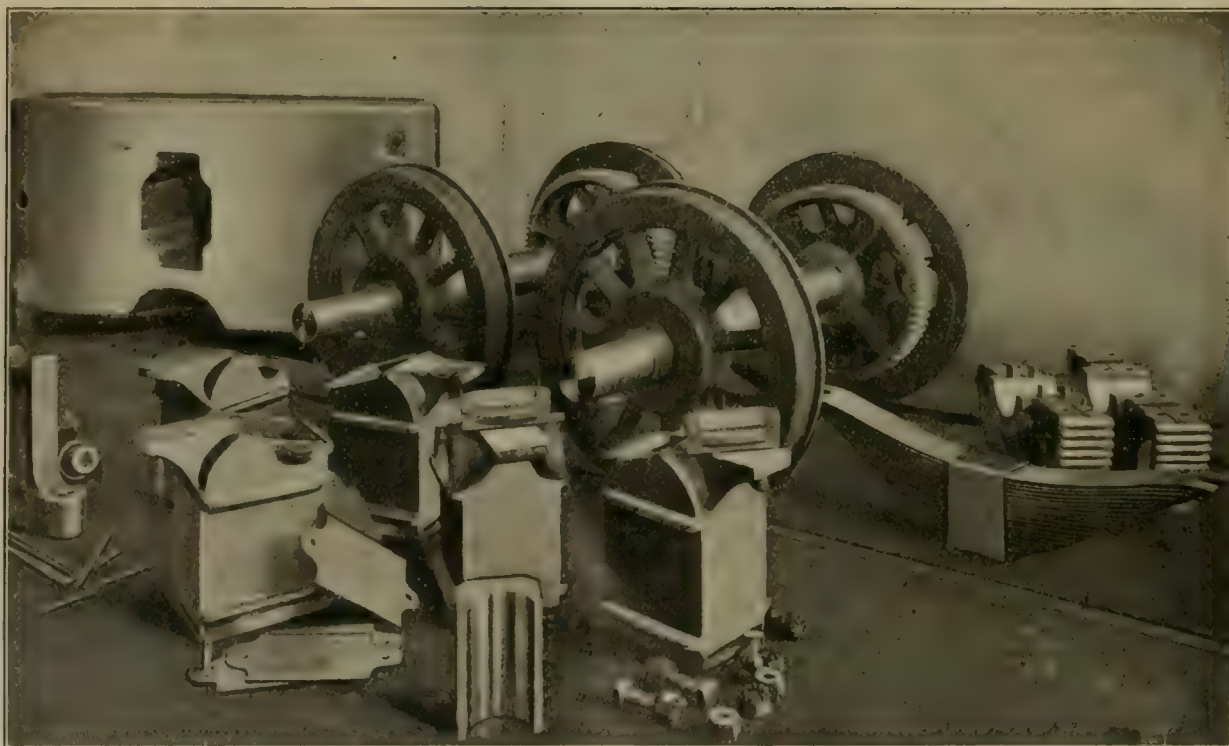


160-TON GENERAL ELECTRIC LOCOMOTIVE FOR BALTIMORE & OHIO.

Electric Co., and which have been in successful operation for the past eight years.

The specifications for this machine called for an electric locomotive capable of handling a 1,500 ton train including the steam locomotive but excluding the electric locomotive on a maximum

All wearing surfaces have been made large for the purpose of insuring long life; at the same time, special provision has been made for their easy replacement whenever it becomes necessary. There is a large space under the cab floor in which a man can stand and inspect the motors or truck gear.



DETAILS OF 160-TON ELECTRIC LOCOMOTIVE.

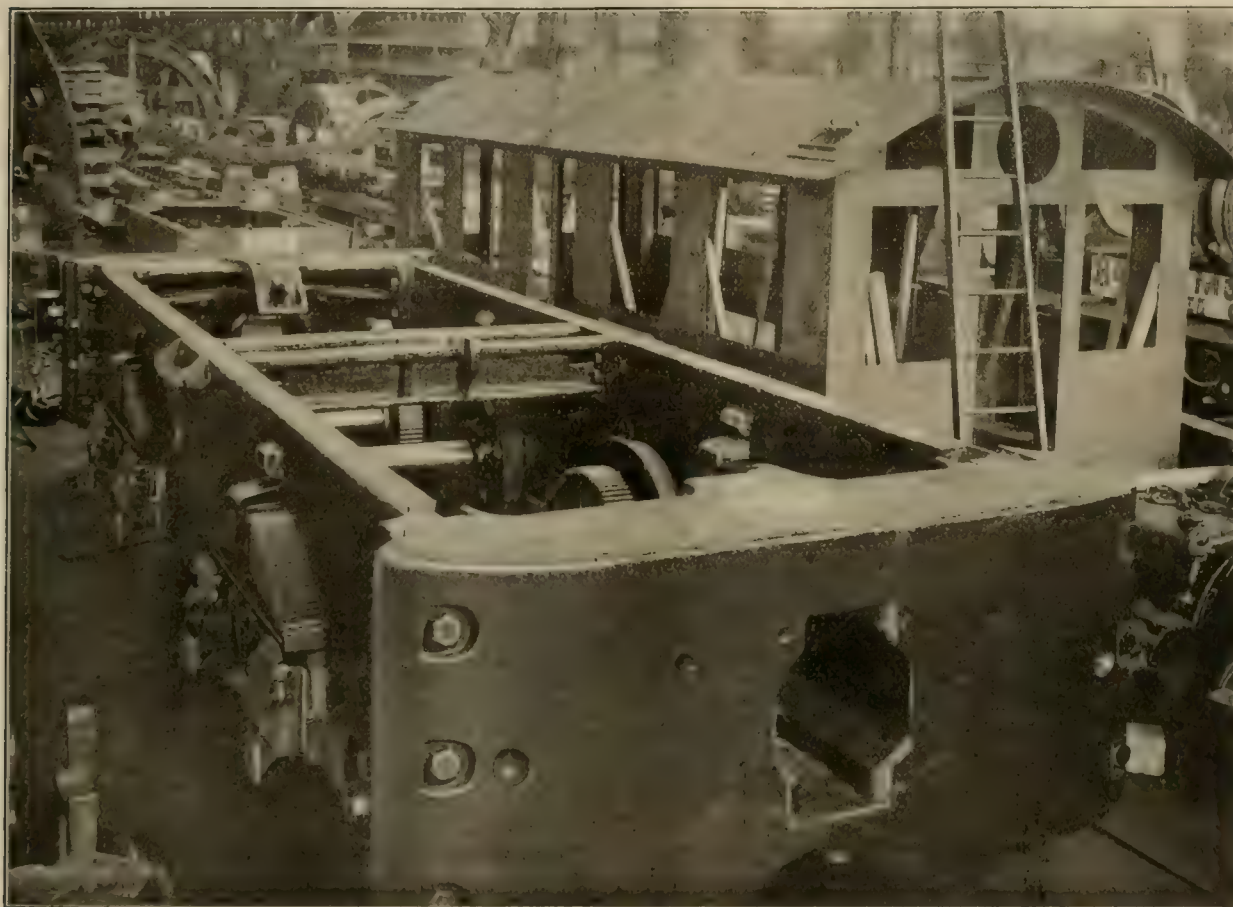
The whole locomotive consists of eight G. E. 65 motors, four on each half. These motors have each a capacity of 225 h. p., making a total capacity of 1,800 h. p. The main body of the truck frame consists of a rectangular frame work of cast steel built up of four pieces, two side frames and two end frames, made very strong and heavy. The parts are machined at the ends and securely fitted and bolted together to form a strong and rigid structure. The end pieces form the buffer beams and to these a suitable standard draft gear is attached. The side frames have machined jaws protected by wearing shoes between which the journal boxes slide.

The truck frames are supported at four points on equalizers.

between sections when coupled together. Large windows afford a practically unobstructed view in all directions.

The controlling apparatus consisting of master controller, engineer's valves, etc., is in duplicate, a complete set being located in diagonally opposite corners of each cab so that the engineer when it suits his convenience can stand in the front end of the locomotive when running in either direction.

Each section of the locomotive is equipped with one bell, one whistle, two locomotive head lights, approved air brake mechanism including two engineer's valves and air gauges, necessary brake cylinders, foundation brake, air reservoirs, couplers, draw heads and Leach pneumatic track sanders.



160-TON ELECTRIC LOCOMOTIVE IN ASSEMBLING SHOP.

Each equalizer rests on a pair of half elliptic springs the ends of which are supported on top of the journal boxes through suitable wearing plates. The journal boxes are made quite similar to standard car journal boxes, the parts, however, being made larger and stronger. The brasses can be easily removed and by dropping down the wearing shoes it is possible to remove a journal box complete without removing the wheels and axles or other parts of the truck. In order that the locomotive may round curves easily, the axles are given considerable lateral movement in the journal boxes. Wheels, axles or motors can be easily removed from the trucks by dropping into a suitably constructed pit by raising the truck frame.

Each section of the locomotive has eight steel fired spoked wheels. The tires are 2 7/8 in. thick with M. C. R. standard tread and flange and are securely held in place by approved fastenings. The axles are made of forged steel turned throughout 9 x 12 in. in the truck journal bearings 8 in. in the wheel fit and 7 1/2 in. in the motor bearings.

The sides and roof of the cab are made of sheet steel. On each side there is an entrance door and at each end there is an additional door which permits of ready communication be-

SELLING CAR FENDERS BY MUTOSCOPE.

It is usually as difficult for a salesman to obtain an interview with a busy street railway manager as it is to hold his undivided attention once an audience is secured, but the Eclipse Car Fender Co. has adopted a novel plan which accomplishes both with ease. It equips its representatives with portable mutoscopes of a size easily carried in the hand, and by turning a crank a series of rapidly moving pictures is shown demonstrating the efficiency of the Eclipse fender. The mutoscope is made by the American Mutoscope & Biograph Co., which photographed tests of the Eclipse fender recently made in Brooklyn, N. Y. Two trials are shown, one with the car going at the rate of 13 miles an hour and the other at 22 miles. In each instance the inventor of the fender, Benjamin Lev, stepped in front of the rapidly approaching car and was caught by the fender without injury either to himself or the cigar he was smoking. At one side of the truck a group of Brooklyn Rapid Transit officials is shown, the whole forming convincing evidence that the tests were bona fide.

AN EFFECTIVE "CUP LIFTER" FOR SIR THOMAS.

The accompanying illustration shows a novel "cup lifter" which was presented to Sir Thomas Lipton, on August 19th, with the compliments of the Duff Manufacturing Co., of Pittsburg. It is a miniature silver lifting jack, or working model of the "Barrett" lifting jack, bearing the America's cup on the top.



A CUP LIFTER THAT WOULD
HAVE WORKED

of the lifting jar. The height of the jack is five inches. The gift presented a unique appearance and, being handsomely finished, it makes a very attractive ornament. The presentation was made by Mr. J. R. McKinley, president of the Duff Manufacturing Co., and Mr. J. W. Duntley, president of the Chicago Pneumatic Tool Co.

C. J. Harrington, the well-known New York supply man, has his usual diversified exhibit, which is in charge of himself and J. E. Laughran, F. Boykin Jacobs, and Ross Taylor, representing the American Ventilator Co., and F. D. Masterson, representing the Chase-Shawmut Co., of Boston. These gentlemen have engaged Cottage "E," Grand Union Hotel, where they will be pleased to greet their friends.

THE SPOOK CAR.

"Well, things went on an' my new driver—his name was Tom—Tom Short. 'Tom-for-Short' he useter say for a joke—him an' me got along very well but I missed Bill Hendricks dreadful an' he was in my mind many a time when we was on our owl run. One night, about a month or two after Bill died we was comin' in on our late trip when Tom give me four bells an' I goes forward to him an' he says, 'Say, Mat, is that a car ahead of us or am I gettin' dizzy?' Well, I looks out an' sure enough, just ahead of us—how far, you couldn't tell—was a car.

"'Must be as Tyson's got a lame hoss,' I says, Tyson being the driver on the car ahead of us. 'Lame nothin,' says Tom. 'I've been hittin' a pretty good clip for a mile back,' says he, 'an' I ain't come no nearer to him,' he says.

"Just then a passenger signaled us an' when he come aboard he says, 'What sort of a crew is that on that car just ahead o' you?' he says, 'hosses trottin' like all possessed, driver sittin'

all wrapped up an' th' conductor runnin' up an' down inside th' car. Isn't 't a special?' he says.

"Well, when he commenced tellin' about the driver an' conductor I felt sort o' creepy—couldn't 'a' told you why, neither—but when he says 'special' I thought mebbe it was a special, they run 'em out sometimes when th' ol' man had been stayin' late at the barn, so I goes out to my driver an' I says, 'Tom,' I says, 'guess that's a special as 'as been takin' th' ol' man home,' an' Tom says 'Blamed queer way they're running,' says he, an' just then another passenger hails us an' when he comes in he says, 'What kind o' car is that just ahead o' you?' an' I says 'Think it's a special,' an' with that he says 'Well, I wish they'd put some on 'em on th' reg'lar service,' he says. 'Why?' says I. 'Why 't runs smooth 'a one o' these new veloc'pedes with injun-rubber treads, an' th' hosses must have felt shoes on!' says he. 'Don't it make no noise?' I asks. 'Not a bit,' he says, 'went by me like a dream,'—then's his very words—'driver sittin' up like a coachman an' th' conductor doin' a walk-around all to hisself inside.'

"Well, that did make me feel queer and I goes forward to Tom an' I says 'Hold up a minute, Tom,' says I, 'an' see if you c'n hear that car ahead,' an' he pulled up the hosses an' brakes her down an' we peered out ahead an' listened an' listened an' there was the car seemin'ly not a block away, all lit up an' appearin' to be hummin' along at a two-forty clip an' yet it didn't seem to be gettin' no further away an' not a sound could we hear—bells, wheels, car, hosses ner nuthin'! Then I was scared! I'm free to say I come out all over 'chicken-bumps' an' I could feel my hair stiffen under my cap, an' jus' then Tom says, 'What's that on the rail ahead?' an' sure enough there did look to be somethin' there an' I gets out an' walks up to see what it was—for th' night was pitchy dark an' there warn't no gas lamps jus' there—an' there lay a man with his head an' neck right on the rail! First off I thought he'd been hit by that car ahead of us an' I turned him over to see who he was an' it was a man by th' name o' Mike—one 'f our day hos'lers—drunk's you please, but no more hurt than I was—an' not as near as bad scared—for when I shook him up he looks at me a minute an' says, cheerful-like an' just as a matter o' course, says he, 'Hello, Mat!' he says, 'late ain't you? Been a waitin' for you!' says he—just that way—an' Tom hears him say that an' he chimes in, 'Yes, an' the devil was waitin' for you, Mike, an' if we hadn't held up to listen for that car ahead of us your head 'd 'a been smashed to a pulp, for the rate we was goin' I couldn't 'a got the brakes on quick enough t' 'ave saved you!' an' then 's if it 'd just struck him he goes on an' says 'An' how 'n blazes was it that car didn't hit you—an' where is the blame thing anyway?' for when he says that we looked an' there wasn't a sign o' that car 'n sight an' there's a straight stretch of over a mile right there. Well we didn't have time to say any more for a lot of passengers come on from some late party so we put Mike across th' front platform an' he went t' sleep there like a baby an' we had a fair crowd clean up to th' barn.

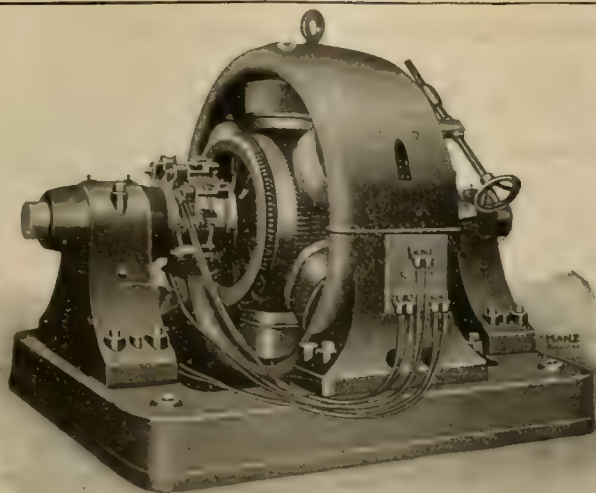
"Just as soon as we got into th' barn I says to th' hostler, 'Jim,' I says, 'what car was that come in just ahead of us?' an' he says, 'Ain't no car come in since 67 come in at 11:15.' Says I, 'I mean just ahead of us—not more 'n ten minutes ago. Wasn't there a special out to-night?' An' he says 'Special—nothin'! No special out to-night. Whatcher givin' me?' An' then me an' Tom told him an' th' night-watch about the car we'd seen ahead an' all that, an' you'd ought to heard 'em give us the laugh an' Jim says we'd had a glass o' beer too much at the city-end stand so me an' Tom told 'em what we thought o' them an' went home—an' I'm free to say I kep' a lookin' over my shoulder all th' way home. Well, th' nex' mornin' we was first car out an' when we got to th' barn we found them two fellers in a blue funk. They says that after they'd cleaned up, about one o'clock an' whiles they was eatin' their dinners they heard the bells 'f a car comin' up to th' barn an' someone outside give a

POSITION WANTED.

Wanted, position as General Manager or Superintendent of Electric Lighting Plant: 16 years' experience as Manager and Superintendent. Best of references. Address X., C o Street Railway Review, 39 Cortlandt St., N. Y. City.

POSITION WANTED.

A master mechanic of 20 years' experience—both mechanical and electrical work. Can furnish good references. Apply at Street Railway Review Booth, or address Street Railway Review, Chicago, Ill.



250 K. W. Bullock Railway Rotary

BULLOCK
ELECTRIC MFG. CO.

CINCINNATI, OHIO

We have a 400 K. W. Rotary on Exhibition at the
Saratoga Convention, Booth 96.

'Hol-loa!' jus' like Bill Hendricks useter when he drove up an' found the doors shet. 'Th' hostler jumps up an' says 'w — all the cars is in!' but he jumps up all the same, not thinkin', an' runs 'round into th' barn — an' the watchman after him — an' opens the door a bit an' they swore that they caught a glimpse o' my car, with th' hosses in an' Bill Hendricks sittin' up stiff in front jus' like he come home dead that night. Well, they was scared — stiff — an' before they could move the whole thing vanished, just went right out like a can'le, an' they slammed th' door to an' started to run back to th' office when they seen a flash o' flame down the barn an' smelled smoke. They run up there an' seen 't was a fire startin' in some greasy waste right under th' edge o' the hay loft an' in a minute more th' whole place 'd been afire. Well, they grabbed th' fire buckets an' had it out 'n a minute an' then they heard a noise up 'n the hay an' there was two o' the day hostlers who'd been on a bit of a spree an' 'd crep' up there to sleep it off. Lord! 'f that hay'd ever got on fire they'd 'a been roasted like Frankfurters — an' but for Bill a' drivin' up 'n his ol' car an' hollerin' it would 'a caught sure! Well, 'f course me an' Tom give 'em th' grand laugh an' asked 'em how big a can o' beer they'd smuggled in for the'r dinner — jus' to get even with 'em, but I knowed 'em both well enough to know as they'd seen somethin' as 'd scared 'em pretty bad, an' there was th' signs o' th' fire all right.

'Well, me an' Tom took our car out an' about half way to town a night cop gets on an' he says 'Heard the news?' An' I says 'No.' An' he says 'They found Mr. Walton'' (that was our President — ol' Johnnie — mind me tellin' you about him?) 'They found him, he says, 'dead 'n his bed an' the man as has that beat says that there was a car runnin' up an' down 'n front o' his house about two o'clock!' Says I 'Did he notice th' car?' An' he says 'Yes, he says, 'an' it wa'n't no real car. It didn't

make no noise an' he could see th' driver sittin' up 'n front an' th' conductor inside an' all, an' it 'd run past th' house an' stop an' th' lights 'd go out an' when they lit up again it 'd be down th' street again an' 't did that three times an' jus' as he was goin' up to see about it — puff! — out it went an' didn't come back no more!'

'Well, sir, 't was just so! Ol' Johnnie 'd died sudden, just about th' time that car was paradin' 'n front o' his house. Well, that got on to my nerves! 'T' think o' me — or so'thin' like me — goin' round 'n a spook car with a dead man, warnin' an' prognosticatin'. — I couldn't stand it. — Lord knows what me an' Bill an' that car 'd be doing next — so 't th' end o' that trip I walks in an' gets my time an' takes th' first train to Philadelphi. By George! I made up my mind that if Bill an' that car got cuttin' up any more didoes I'd prove an' alleyby, but I guess Bill couldn't run that car without his old side-partner in town — anyway 't wasn't never seen again. Now, that's all truth, sir; honest 's I sit here, there's men around here yet as 'll remember it. Now how do you account for it?'

I repeated Hamlet's remark to Horatio and No. 89 and Mrs. 89 seemed to think that I was quoting Scripture for they put on a becoming look of reverence and he said:

'That's so, sir, an' that's probably how 't was. But you ain't goin', sir? There's more beer here; have 'n other glass an' a sandwich?'

I took the beer but declined the sandwich, they were very strong of mustard and mustard affects the nerves. I know that's so, as I heard horse-car bells several times on my way home — and there isn't a horse-car line within five miles of there — likewise I looked over my shoulder several times and once I am certain I saw a car vanish!

ALUMINUM RAILWAY FEEDERS

AND ALL KINDS OF

ELECTRICAL CONDUCTORS

Aluminum feeders are less than one-half the weight of copper feeders and are of equal conductivity and strength.

If insulated wire or cable is required high grade insulation is guaranteed.

Prices with full information furnished on application.....

The Pittsburgh Reduction Company
PITTSBURGH, PA.

WHICH IS SIMPLER AND CHEAPER?



THE OLD WAY

Of Replacing Handles on Register Rods

The present practice is to have an eye or hole at one end of the handle through which the rod passes. The rod and handle are held in rigid relation by means of a set screw. The fact is that the eye stretches, and the set screw becomes worn or broken from continued tightening, and of course makes it incapable of holding the handle rigid on the bar. This necessitates the providing of a new handle, and the removal of the old one. The only way to get a new one on is to loosen all the handles on the bar, and remove the rod from its bearings and connections with the register. This of course involves considerable trouble, material loss of time, and a great expense, as it takes two mechanics five hours to do the job.

THE NEW WAY

Take a Wrench and an Oberg Handle and the job is done almost instantly.

C. O. OBERG & CO.

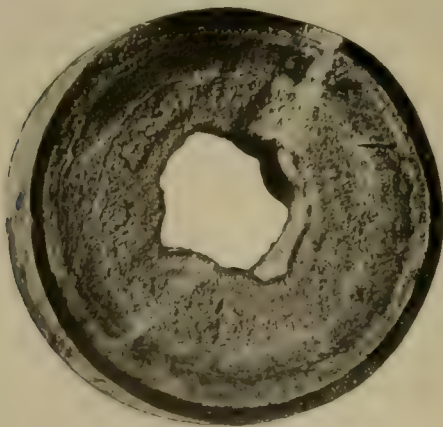
100 Purchase St., Boston, Mass.



Hardened Steel Key. Better than Ten Set Screws.

CLEANING BOILER TUBES.

It seems hardly possible that anyone would allow scale to accumulate in boiler tubes to the thickness of an inch, and yet there are many instances reported by the Lagonda Manufacturing Co., of Springfield, O., where even this much or more scale has been found in boiler tubes which this company was called upon to clean. The illustration shown herewith, represents one of over 215 tubes in the boilers of a large street railway company in the south. The engineers had no idea there was anything like this amount of scale. The water was very bad, and having use for all the power the boilers would furnish, without any opportunity to shut down, the scale accumulated before they knew it. The management was about to cut out the tubes when attention was called to the Weinland mechanical cleaner



A BADLY SCALED BOILER TUBE.

with which, and in a very short time with little trouble or expense, all of the tubes were cleaned without any injury to any of them, leaving the inside in as good condition as when new.

The Lagonda company makes a full line of cleaners for all kinds of boilers, notably, the turbine cleaner and its Mr. Weinland, who is a practical engineer and the patentee of this machine, is said to be the pioneer who "blazed the way" in this line. In the majority of cases, the manufacturer states, this turbine cleaner does the work and the company is ready at all times to send these machines on approval. It makes a business also of cleaning boilers by contract, and will be glad to enter into correspondence with anyone desiring information about such work. An illustrated catalog showing these cleaners at work will be sent on request.

CURTAIN FIXTURES



The Keeler "Eccentric" Fixture has no cables, adjusting or retaining devices. Its only bearing points are pivoted eccentric rolls.

The Keeler "Pinch Handle" Fixture is superior in action to other fixtures of this type.

FEDERAL MANUFACTURING CO.
Railway Equipment Dept.
Cleveland, Ohio.

EASTERN AGENT - H. E. HEELER
26 Cortlandt St. New York.

Among the representatives of the Ohio Brass Co. who are present at the convention are the following: C. K. King, secretary; George A. Mead, chief engineer; N. M. Garland, manager New York office; J. C. Warren, Jr., assistant to Mr. Garland; E. F. Wickwire and F. H. Jameson, from the home office, Mansfield, O.; Burt Gellatly, manager Pittsburg office; A. L. Wilkinsburg, general sales agent.

The Bruck Solidified Oil Co's. exhibit is in charge of J. N. Bruck, vice-president and general manager of the company.

Walter Chur, general manager of the American Railway Supply Co., of New York, is in attendance looking after the company's exhibit, as usual.

DAILY STREET RAILWAY REVIEW

5TH YEAR }
No. 2 }

SEPTEMBER 3, 1903

SERIAL No. } VOL. XIII
No. 8 B }

Freight and Express Accounts.

By Irwin Fullerton, General Auditor; Detroit United Ry., Detroit, Mich.

The freight auditor of a large railroad said to me, "A good system of accounting is, of course, better than a poor one. But the poorest system thoroughly carried out with constant attention to every detail is much better than the best system when it is not vigorously enforced; and I make it a rule to follow up every error, however small, and insist that every agent carry out my instructions and be accurate in all his reports." The steam roads have, however, some advantages over electric lines. Their consignments are larger; the rates average much higher and their employes have grown up with them. Our earnings do not warrant employing salaried men at some stations. The work is done by storekeepers who are paid a commission. They keep the most primitive accounts of their own business, and it is necessary to make up all their reports, and we are pleased when they are willing to pay cheerfully the amount the reports show due the company.

But I presume those who have to do freight accounting know



IRWIN FULLERTON.

of the troubles, and are only interested in the best method of doing the work. Let us then commence with the way bills which the billing clerk has just made out covering all the consignments from his station to all the other stations on the line.

These way bills are copied in a tissue copy book and an extra tissue copy is made, which is sent to the auditor's office by first mail. These tissues must be sent in full size even if but partially filled up.

Tissues from each station are sewed into a patent book in regular order, as shown by dates and numbers. These books will hold about fifteen hundred tissues, and keep them in condition for handy reference.

The tissues from all stations are checked daily by the rate clerk, who examines the classification of all articles, the rates, the extensions, and the additions of every way bill.

Errors are reported on a correction form, which is Exhibit No. 1. This is copied for our reference and an extra tissue copy made. The original is sent to the station whose accounts are affected by the correction, and the tissue to the agent at the other end for the purpose of calling his attention to the error.

We now return to the copied way bill, which is given to the conductor who checks the freight into his car by it, and receipts in a book for the way bill and all articles enumerated thereon in good order or with exceptions.

The conductor takes the way bill to destination and gives it to

the receiving agent, who checks his freight by it and receipts to the conductor. Articles over, short, or damaged, are reported at once on a form which is shown as Exhibit No. 2. The way bills as soon as received are numbered in regular order, and this number — called "Pro Number" (progressive) — is used by the agent for reference.

The agent must immediately make out expense bills covering each consignment on the way bill, and show on each expense bill the pro number of the way bill. The agent in expensing must check the weight, classification, rate and extensions, since he is held responsible for the collection of the correct freight charges when an error has been made by the biller. When he finds an error he makes the expense bill for the correct amount, and makes a correction, Form Exhibit No. 1, for the difference, sending the original correction and two tissue copies to the auditor, who approves the same, keeping one tissue on file and returning the original to the station affected, and tissue to the other station. The original figures on way bills are never changed. When the expense bills are made out they should be checked back on the way bill to see that they are all made out, and are correct.

Agents are particularly instructed to secure the receipt of consignee, or his authorized agent, at the time the freight is delivered on one-half of the expense bill, and the halves should not be torn apart until the charges are paid. The consignee cannot dispute payment of charges when the half bearing his receipt is presented attached to the bill for freight. The agent next enters an abstract of the way bill in his Warehouse Book, (Exhibit No. 3) in pro number order, and the total of the consignments should be checked with the total of the way bill. Next, the way bill is pasted in a Scrap Book in the same order. This Scrap Book makes a convenient and safe file for the way bills to which the agent can refer at any time. The Warehouse Book being condensed is of great benefit in checking up the months' work, and agents are always anxious to keep it because it saves time in the end, being a check on abstracting, as will be explained later. But in the case of small stations the checking can be done on way bills in the Scrap Book. At large stations it is best for agents to keep a Freight Forwarded Book similar to the Warehouse Book, and abstract in this book from the tissue copy book of forwarded way bills all consignments on which freight has been billed prepaid, or with advance charges — but for the smaller stations this is not necessary.

The next record, the Cash Book (Exhibit No. 4), is the most important of all; and when this book has not been properly kept the traveling auditor "is up against it." We, therefore, insist that this book be written up and balanced daily.

When this is done, and the other records have been kept, it is only a question of checking to determine not only the exact balance due from the station, but also to show an agent whose accounts do not balance, the various errors he has made.

The agents check the entries in the Cash Book with the Warehouse Book, noting after each consignment paid the page in the Cash Book, and also noting Cash Book page in the Way Bill Tissue Copy Book of all prepaid items and items advanced.

The uncollected expense bills on hand should always agree with the items not checked off in the Warehouse Book and the unchecked prepaid items, while the advance items not checked (or advances to be paid) are a debit against the agent.

Agents are requested to remit the exact amount of each day's

Petroleum Pipeline

[illegible][illegible]

Detroit United Railway.
RAPID RAILWAY SYSTEM

Detroit United Railway.
RAPID RAILWAY SYSTEM

INSTRUCTIONS.

Report W. D. A. Way-Bills must be reported at original figures.

The corrected figures for Expenditure are as follows:

Entries and distances for Make entries in the order of Stations, and always at two blank lines at least between stations.

Extend - Extend the amount of the "Undercharge" or
 Amount of - "Overcharge," as the Expense for the balance
 corrected of the "Undercharge" or "Overcharge" and
 show the "Undercharge" and "Overcharge" from
 calculation. Total amount

We're corrected instantly for making the correction most infernally,
but finally, to prove in the project column

How collected In the column at the right, note whether charges were collected by mail or by telephone.

Attached receipts
etc. for reference

Appear to Frt. All correct and complete. Details will appear in
 Rec'd account details in the Freight Received Account Book.

When the
abstract

Recompute and prove Do not carry forward the totals from one sheet to another but recompute the *total sheets in each agreement* on the last page thereof, and so that the difference between the total A, listed and A_o (Corrected) columns is the same as that of Under-charges and Over-charges columns. Do not crowd recomputations but use a separate sheet for this purpose, if necessary.

Final gross land result When each statement is completed as above, re-calculate the balance of each statement on the last sheet.

to the Station.

Detroit, 1901.

BACK OF EXHIBIT No. 5.

month. But one balance statement is made out covering the work for the entire month.

Abstracts of forwarded way bills are made up from the tissue copy book. All way bills to each station are entered in regular order, as shown by numbers and dates. The footings of the prepaid and advance columns are proved by those in the Forwarded Book where one is kept; if not, the prepaid and advance columns are checked with the Cash Book before abstracts are sent to the auditor's office.

Received abstracts are made up in the same form from the original way bills posted in the Scrap Book. When totaled the footings are checked with the footings of the Received Warehouse Book. Forwarded abstracts are sent in promptly at the end of the period, but the received abstracts are held three days to allow all way bills forwarded each period to reach the receiving station.

A correction statement is made out on Exhibit No. 5, shown herewith. On this blank are entered all the corrections for the month, and these entries are checked with those made on the Warehouse Book when checking the Cash Book.

The agent is next ready to make up his balance statement (Exhibit No. 6).

He first enters his balance from last month, then fills in the totals from his abstracts and correction statement as indicated, also baggage collected, remittances made—and auditor's corrections, on his previous month's abstracts. Next, the agent enters in the amount of the uncollected items made up from the uncollected expense bills on hand and proved with the amounts unchecked on the Warehouse Book and in the Tissue Copy Book. At large stations there is also a debit entry "Charges advanced on way bills and not paid out," and a credit entry "Advances paid and not way-billed." Another debit entry "Charges prepaid and not way-billed," but the items billed prepaid and not collected go in with the uncollected items. These last entries are not necessary at small stations because they usually do a cash business.

The debit and credit sides of the balance statement should agree. If they do not the agent should check over his month's work and locate the errors. Agents are required to list on the back of their balance statement all the items uncollected, and bring forward on the Warehouse Book the unchecked items, so that it is not necessary when checking to go back in the Warehouse Book further than the first of the month. At large stations we allow the agents to hold their balance statement and make up a list of uncollected on the 10th of the month. They show the uncollected account on their balance statements in two items, "Amount paid 1st to 10th," and the "Amount unpaid on the 10th."

This reduces the work as most of the last month's collections are made by this date. In the auditor's office the footings of abstracts are proved, and the forwarded abstracts are checked with the received abstracts. Each way bill should be checked.

I have already told you that all way bills are abstracted at once to bring forward the next month. From this book all abstracts should agree with the total shown by the receiving agent's abstracts.

Errors in abstracting are corrected by reference to tissue copies of way bills. Agents' correction statements are also checked with the tissue copies on file in the auditor's office to see that they have taken up all corrections issued.

Reports of remittances are checked with the Cashier's record. The abstract footings of each station for each period are entered in a Freight Record Book (Exhibit No. 7), together with all debits and credits. In this book each agent has a separate page every month. The page is practically a balance statement made up from agents' abstracts with the debits and credits necessary to correct errors, but in addition, we enter the total freight and baggage forwarded. This book is, therefore, a summary of the freight movement at each station, as well as a record of total debits and credits. The balance in this book will agree with the agents' balance, if correct, after adding the remittances in transit. If agent's balance does not agree all errors are reported to him and he is advised of the correct balance to bring forward the next month. From this book an abstract is made showing the earnings of each station, and the total represents the freight earnings for the month.

Our company handles most of the milk coming into the city from the districts we reach. It is shipped in ten-gallon cans. The revenue from this source is considerable.

We have a ticket (Exhibit No. 8) like a shipping tag, one of which must be attached to every can. This ticket has two coupons. The first reads:

"Good for the transportation of one can of milk or cream not over ten gallons between ———— and Detroit," and it is detached by conductor bringing the full can into the city.

The second coupon provides for the return of the empty can, and is taken up by conductor on its return.

The body of the ticket shows the address of both the Consignor and Consignee. The blank is printed with the name of the farthest station from which milk can be shipped at the rate at which ticket is sold. These tickets must be purchased in quantities and in advance.

No receipts are given or taken for full or empty cans.

Conductors make daily reports of each consignment of full and empty cans, and return the coupons collected with their report.

It is our custom to send the traveling auditor periodically to check up stations. He does not go like the bank examiner so many times each year, but rather like the doctor, when there is sickness. Sometimes the disease is weakness. The agent writes that he is not strong enough to make out a balance statement. Sometimes it is a case of disordered intellect. When I went to school one arithmetic had all the answers in the back. The teacher used often to remark sarcastically at the number of mistakes and incorrect methods which ended up with the right answer.

There are social visits when there is nothing wrong, but he has only to see that the agent's records are properly kept.

In each case the traveling auditor should proceed in about the same manner. First count the cash and see that it agrees with the balance shown on the Cash Book; then go back to the last correct balance and check over the agent's work down to date. This is only a matter of time when you have the Cash Book properly written up.

Next to the inefficient agent we find the greatest trouble with some agents who cannot understand the necessity of keeping their accounts your way.

I think that there is a certain literary instinct in every one which suggests that a paper should be interesting as well as instructive, but I shall be satisfied if this effort is worthy of the last adjective, and will content myself with the belief that I could have earned the first if I had written my experience with agents' accounts.

DECISION IN TRACTION SUIT.

The petition of the Salem Terminal Traction Co., of Salem, W. Va., to annul the injunction obtained against it by the Fairmont & Clarksburg Electric Railroad Co., and also to grant the Salem company a broader injunction against the Fairmont & Clarksburg Co. than is in force has been denied. The court also decided that the Fairmont & Clarksburg company may continue the construction of its line between Clarksburg and Salem upon ground not actually occupied by the tracks of the Salem company. Both companies are building electric lines between Clarksburg and Salem and the Salem company claimed that the other was laying track on its survey, and, as mentioned in the "Review" for August, the Salem company caused part of the other company's track to be torn up, and the Fairmont & Clarksburg company secured an injunction against the Salem company in consequence. The Salem company had already obtained an injunction against the other prohibiting it from encroaching upon its right of way.

The representatives of the Lorain Steel Co. in attendance are: William W. Kingston, Atlanta; D. J. Evans, Chicago; E. B. Entwisle and H. F. A. Kleinschmidt, Johnstown; H. C. Evans, New York; S. P. S. Ellis, Pittsburg; R. Clitz and P. M. Boyd, Lorain.

SHOP PRACTICE.

By Mr. Alfred Green, Master Mechanic, Rochester Railway Co., Rochester, N. Y.

In my opinion, the best way of treating the subject which has been assigned to me will be simply to give my own experience, describing the plant of the Rochester Railway Co. and some of the practices in vogue.

Our shops have a frontage of 166 and a depth of 191 ft., being divided into three parts by walls at right angles with the front of the building. On the north side are the carpenter and paint shops, on the south side the motor repair and machine shops, the center being occupied by the office and store room, with the blacksmith shop at the rear. A door leads from each department into the store room; a very convenient arrangement. All



ALFRED GREEN.

orders for material are signed by the foremen of the various departments, and are filled by the stock keeper. The store room is 26 ft. wide and 143 ft. deep. All necessary equipment for the entire system is kept in stock, the small material on the ground floor and the heavy material in the basement. The basement is also provided with a large room for the storage of car wheels,

extra motors, controllers, etc., and is equipped with a narrow-gage track and overhead travelers for the handling of heavy machinery.

Our road being a small one, of course we have not the facilities for doing work that perhaps larger roads have. In the motor and truck department at the main shops on St. Paul St., we have eight men. The special tools in this department are two wheel elevators, as shown in Figs. 1 and 2, one piston air

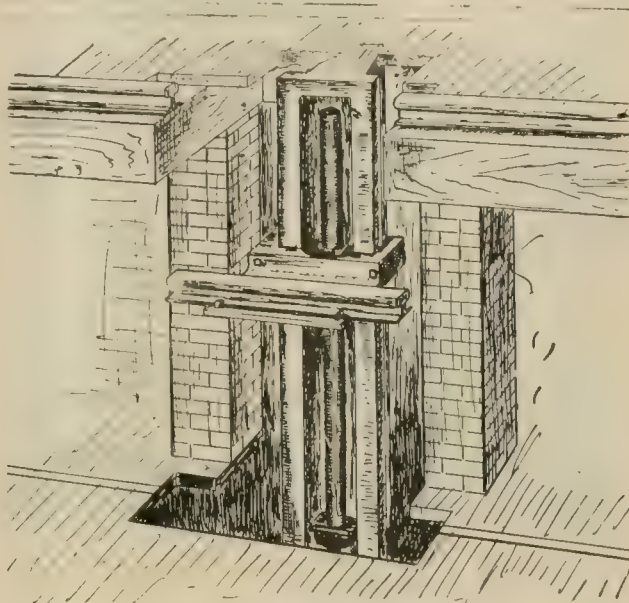


FIG. 2 — WHEEL ELEVATOR.

crane, and one motor air lift. The wheel elevators are operated by an electric motor at the bottom of the pits; the construction of the wheel-elevators being two long vertical screws set in a casting having a face for two large iron castings, with a section of rail fastened to the top of them, and working on the screw the same as a large nut, the two sides being connected by a longitudinal shaft with bevel gears on each end.

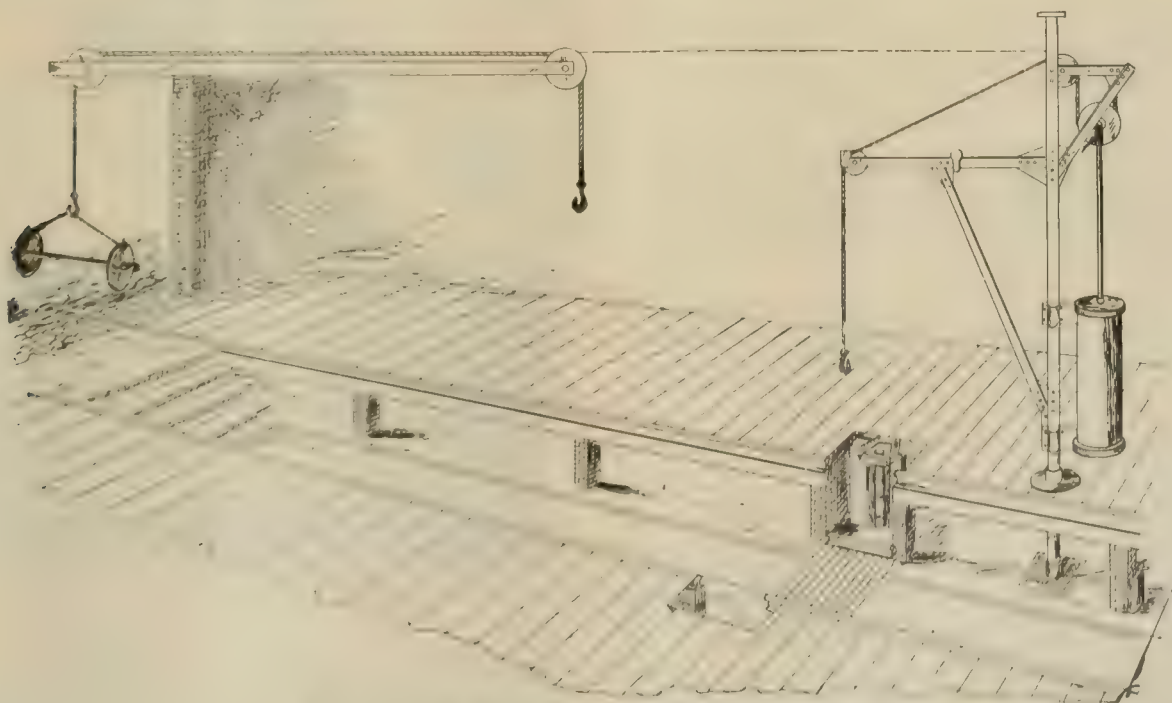


FIG. 1 — AIR CRANE AND PIT, WITH ELECTRIC ELEVATOR

On the floor line of the pit there are two transfer tables, one to take the old wheels and set them to one side, the other to get a new pair and bring them on a line with the floor of the pit where they can be placed on the elevator and carried up, directly under the car and into their place.

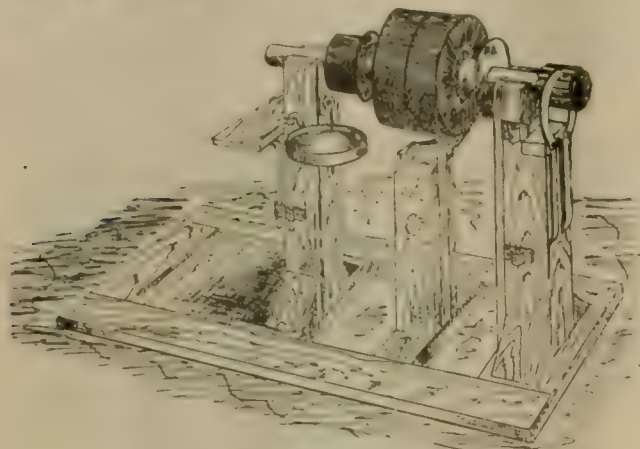


FIG. 3. ARMATURE HOLDER.

As you will note by Fig. 2, the air crane is near the wheel elevator, so that we have two ways of taking wheels out of the pits. With this arrangement we are able to take out a pair of old wheels, replace them with new ones, and have the car ready to leave the building in forty minutes.

The air compressor which furnishes the air for all departments is placed in one corner of this room and is belt-driven, being operated by two 20-h. p. motors, placed on the floor line of the motor repair pits. All repairs to motors are made from underneath the car, and the car body is not taken off the trucks unless the car is going through the shops for general overhauling.

The armature repair department and machine shop are in one large room, 100 by 96 ft. In this room all the field and armature coil work is done.

The machine shop contains five lathes, five drills, one taping machine, large shears, thread-cutting machine, pinion press, drill

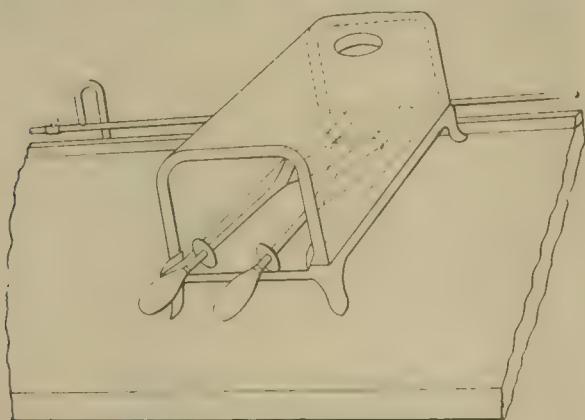


FIG. 6. SMALL FURNACE.

grinder, speed lathe, cold cutting-off saw, shaper and planer, two milling machines, two emery wheels, also buffing machines for brass polishing. This department is operated by a 30-h. p. motor.

In the field and armature room we have one lathe for winding fields and one taping machine, one armature band wire machine and two armature coil winders with interchangeable heads for different kinds of coils, also the necessary dipping tanks and dry boxes. One of the novel features in our armature room is the horse used for holding armatures while being repaired, which is shown in Fig. 3. This armature holder can be raised to any height, and stretched out to accommodate any length of armature shaft. It is provided with a center support operated by a rack which can be arranged to take the weight of the armature, so

that the front part of the armature rack can be removed to take off or repair the commutator. Attached to this frame is a holder for a seat so that the man doing the work can sit down to con-

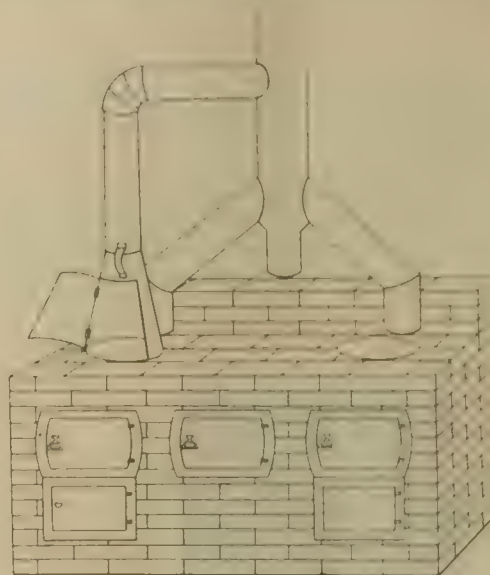


FIG. 4. FURNACE.



FIG. 5.

nect his commutator. There is also attached to this horse a removable table for holding the workman's tools, and on the back end are two adjustable hooks that can be thrown over the pinion in case the commutator is to be tightened or loosened. The room is fitted up with overhead tracks and air lift for handling the armatures and carrying them to the different parts of the shop. The armature room is also equipped with small furnaces as shown in Fig. 6, for heating soldering irons, air and gas being used, which can be so regulated as to heat the solder

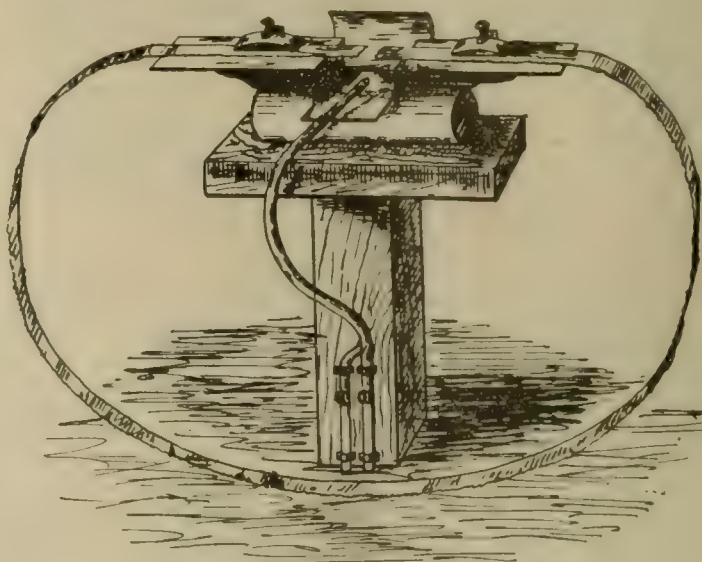


FIG. 7. BAND SAW BRAZER.

ing irons to the necessary temperature without burning the face of the iron. This does away with all charcoal furnaces and gasoline lamps. All hard soldered joints in the motor fields are also made with an air and gas burner of very simple construction.

The blacksmith shop is directly over the boiler room, 18 ft. above the ground, and consists of five forges and one power hammer. The coal for this department is delivered into a bin in the boiler room and is carried up into the blacksmith shop by

an endless chain with buckets. The blower is operated by a 20-h. p. motor. The furnace in the blacksmith shop, as shown in Fig. 4, is both a soldering furnace for tinning and a babbitting furnace for babbitting all motor journals.

In the babbitting of motor journals, we have tried to arrange our mandrels and babbitting devices so as to leave as little work as possible to be done on them after the boxes have been re-babbitted. Fig. 5 will give you an idea of the devices used for babbitting journals. The idea is probably old and in general



FIG. 8 — 27 FT. CONVERTIBLE CAR.

use, and there are undoubtedly better arrangements for accomplishing this work.

One of the features in making repairs on double truck cars is the use of the transfer table, which, you can readily see, saves a large amount of work by being able to take the truck out sideways, in which case we have to jack the body only high enough to clear the truck, and it certainly saves a great deal of labor, as it is only necessary to raise the end of the body from which you are going to take the truck, six inches.

Our carpenter department is 76 by 98 ft., having five tracks running its entire length. Under one of these tracks is a pit 4 ft. deep for the examination and repairing of cars. At one side of the pit is an entrance to a large store room, where all parts are put away while the car is being repaired. By having

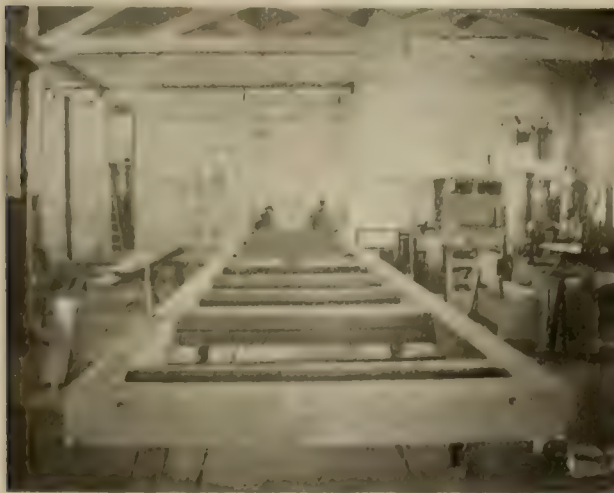


FIG. 12 — FRAMING FOR BODY.

this room, all unnecessary material is kept off the carpenter shop floor; there is no possible chance of anything being damaged by careless handling, and we know where every part is when we want it.

This department has a complete equipment of wood-working machinery, including all tools necessary for car building and re-

pairing. These machines occupy a space 24 by 98 feet on the north side of the building, and include the following: Mortiser, one large cut-off saw, rip saw, band saw, tenoner, jointer, shaper, sticker, turning lathe, router and planer.

All shafts and counter shafts are in the basement underneath the carpenter shop, and all belts come up from below directly to the machines which they drive, thus doing away with the inconvenience of having belting in the way when handling timbers. These machines are driven by two 25-h. p. motors, one-half of the



FIG. 9 — INSIDE COMPLETED.

machinery being entirely independent of the other, so that in case of repairs or break-down, one-half of the shop can be run independently of the other half.

Special attention is given to cleanliness and keeping the shop neat at all times, this being accomplished by a large Sturtevant exhaust fan piped to the different wood-working machines, which blows all the shavings and sawdust into a large shavings bin in the rear of the building.

This department is also piped for air the same as the other departments, and is equipped with connections between the tracks so that it is convenient at all times and at any part of the shop to connect the Little Giant pneumatic tools, of which we have two. Also, in connection with this, we have a device for brazing our band saws, of very simple design, which is shown in Fig. 7. We were unable to find anything for this class of work, so necessity forced us to make the present arrangement. It is simple, and as you will note by the sketch, the two ends

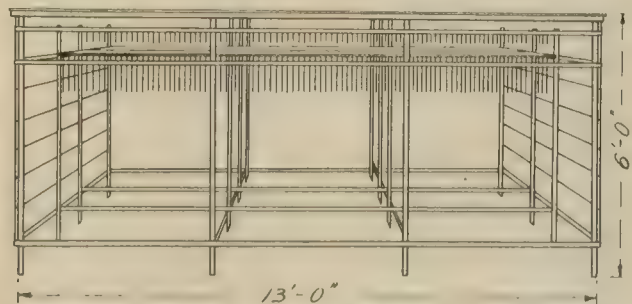


FIG. 13 — SASH RACK

of the band saw are held by clamps and hard soldered, borax being used with a Bunsen burner for doing the brazing.

Among the conveniences in this department, there is also a panel bender which is heated by gas, and a set of glue pots, which in the winter are heated by steam and in the summer by gas.

All finished material for car construction is kept in a large store room in the basement, which is provided with racks. These racks are numbered, thus enabling the man in charge of this room to keep his stock up, and doing away with unnecessary waiting for materials.

In another large room in the basement is kept all rough lumber until it becomes thoroughly well seasoned. The runway is so arranged as to take all lumber directly to the large cut off saw, thus enabling us to keep down all extra expense of handling same.

In regard to shifting cars from one department to another or getting cars from the carpenter shop to the paint shop and out to the street, there are only two ways in which this can be accomplished with any economy. The first is to have the carpenter shop at one side of the paint shop, the second is to have the paint shop directly in the rear of the carpenter shop, with a rear exit, so that cars can be moved from one department into the other without interfering with work in other departments.

The arrangement depends upon the amount of room you have for buildings and tracks. In the laying out of the Rochester Railway Co's shops it was impossible to accomplish the first named plan on account of the scarcity of land, and therefore the second was followed.

We have all kinds of rolling stock in operation on the Roches-

ter water will work in between the joints and rot the timber. But each and every one must admit that it gives us a sill of greater strength than we could possibly get from a solid timber, so that by putting the planks together with white lead, breaking joints by six feet, and bolting together thoroughly, I do not think we are liable to have any trouble with water. Additional strength may be readily obtained in a built-up side sill by placing a steel plate from $\frac{3}{8}$ to $\frac{1}{2}$ in. thick between the second and third planks.

[For Figs. 10 and 11 see the article by Mr. T. J. Nicholl, vice president and general manager Rochester Railway Co. in the "Street Railway Review" for Aug. 20, 1903, page 160, on "The Best Form of Car for Average City Service."—Ed.]

In regard to the paint shop, there is a great deal that can be taken up and thoroughly discussed for the benefit of every one concerned, but as the painting of cars will more correctly come under the head of "Care and Maintenance of Car Bodies," which paper is to be handled by Mr. Baker, I will say only a word on this subject.

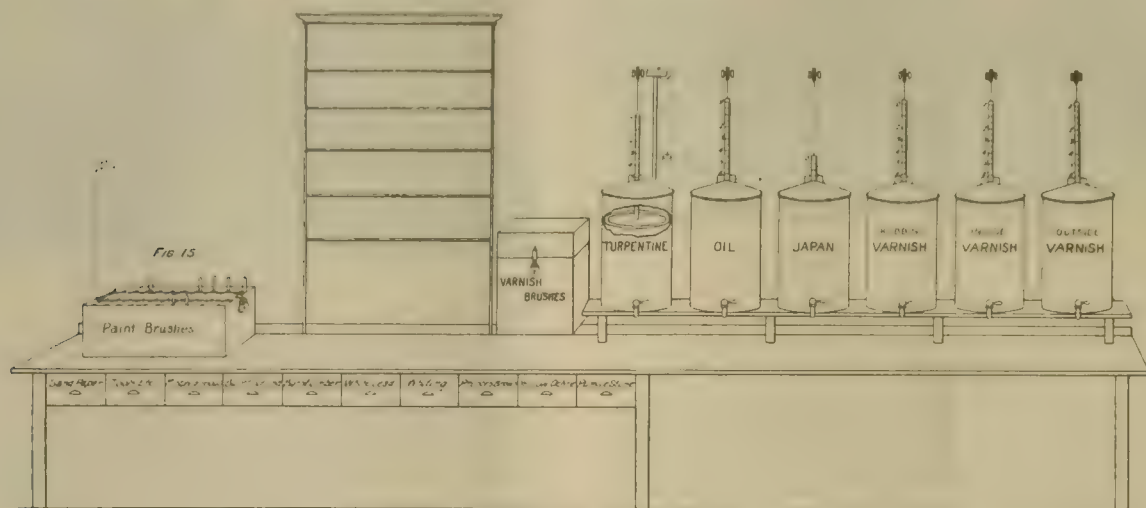


FIG. 14 — PATENT SHOP DEVICES.

ter Railway and the Rochester & Sodus Bay, giving us a number of different classes of cars which we both build and repair, including flat cars for hauling gravel, box and flat cars for freight, combination cars for express and passenger service, cars with longitudinal seats for the winter and cross seat open cars with center aisle for summer service.

There are no cross bench open cars in operation on this system, on account of the number of miles of track which are placed between the curb and the sidewalk, making it unsafe to operate this style of car.

We have no funeral cars on this system.

Fig. 8 shows one of our 27-ft. convertible type mounted on maximum traction trucks; Fig. 9 shows the interior complete.

Another detriment to the building of cars for this system is the number of low iron railroad and canal bridges under which our lines run, making it impossible for us to operate a car over 11 1-3 ft. from the rail to the top of the bridge board. Still another bad feature in regard to our tracks being inside the curb, is that it only allows us to use a car 8 ft. wide over all, which gives, in a cross seat car, a very narrow aisle.

The interior of our latest type of car, with the seats arranged part across and part longitudinal, is illustrated in Fig. 10, and Fig. 11 shows the exterior. In one of the last cars that we rebuilt out of two trail cars, not having sills on hand long enough, we built up our sills of four pieces of 2x9 in. oak. The length of this car over corner posts is 40 ft. Fig. 12 shows the framing ready for the body. This car is 51 1/2 ft. over all, and is to be used on the Rochester and Sodus Bay road, which runs between Rochester and Sodus Bay, a distance of forty miles. Undoubtedly there will be much criticism of the building of sills out of 2-in. oak, but while there are some things against it, there are others in its favor. The most that can be said against it is that

Our paint room is 100 by 69 ft., with five tracks, each capable of holding two cars 44 ft., or three cars 26 ft. over all. Part of this room is used for washing and varnishing sash and other car parts, which are kept on a rack as shown in Fig. 13. I would call special attention to Fig. 14, which shows our master painter's mode of taking care of his varnishes, turpentine and other materials. The figure shows a number of tanks on a rack with faucets attached. A graduated stick, which is fastened to a float, passes through a slot in the cover indicating the quantity of material in the tank. The bench beneath the rack used for mixing paints, putty and colors, is covered with zinc, which is easily cleaned. In connection with this is a box or paint brush holder, which is simple in design but very effective as you can see by Fig. 15. No one can take a brush without the master painter first unlocking the rack, which enables him to know at all times where his brushes are and that they are properly cared for when returned. We keep our paint brushes in water suspended on a wire and the end of the brush about 2 in. from the keeper. Varnish brushes we keep in oil and turpentine in the same manner.

The next important feature in this department is the use of gas and air for burning paint off cars. In our opinion it is not so much the question of economy in the use of air and gas as against the gasoline torch, but the burner is safer and more convenient to carry about. It is also light and durable, and when once regulated will remain so as long as it is in use.

In regard to the grinding of colors, I do not think it economy for any ordinary sized road to go to the expense of equipping a shop with the necessary apparatus for grinding colors, when we can buy them ground in any shade ready to thin down with turpentine, and we know then just what they cost.

As to the paint skins, we have a slush bucket that all odds and ends go into. We stir in with this a little princess brown and

other material necessary to make paint that will do for slushing bottoms and canvas panels of cars, so that we waste very little material.

In every department, a great deal depends upon the ability of the foreman in getting the best results, not only out of his tools, but also from his men, and it is for the master mechanic or chief engineer to demonstrate to his company, the value of tools and equipment, and prove to them that they are not luxuries, but every-day necessities.



"TYPE-M" CONTROL.

By W. O. Mundy, Master Mechanic, St. Louis Transit Co., St. Louis, Mo.

In view of the fact that we should be very careful not to allow our Association to be in any way an advertising medium for the manufacturer, I had intended making this paper somewhat broader than indicated by the title, or, in other words, to cover the subject of "Train Control."

There are but three recognized systems of control in use in this country, namely, the Sprague Pilot Motor Control, used on the South Side Chicago, Boston Elevated and Brooklyn Elevated; the Westinghouse Electro-Pneumatic Control, used on the Brooklyn Elevated and several small installations, and the General Electric "Type-M" Control, used by the Manhattan Elevated, and adopted by the Interborough, both of New York, the Aurora, Elgin & Chicago, and a large number of others.



W. O. MUNDY

Taking these three in order, I find that since the Sprague company has been absorbed by the General Electric Co., it is no longer pushing the pilot motor control; and, in fact, the Sprague company, before the consolidation, had proposed and was advocating a scheme somewhat similar to the contactor system. Thus we can safely drop the pilot motor control from our discussion, considering it as not being up to date.

Referring next to the Westinghouse Electro-Pneumatic Drum Control used in Brooklyn, we find that the company is no longer advocating this, but has only recently come upon the market with the so-called Turret Controller. However, upon investigation, I find that the company is not ready to give to the public details of the system, and we are, therefore, compelled to drop it from our considerations today.

Thus, unfortunately, places us so that the only remaining system for discussion is the "Type-M" Control of the General Electric Co.

It is safe to say that in no part of the electrical equipments of our cars are the effects of the dearest conditions imposed upon us by the constantly heavier and faster cars we are putting into service more markedly shown than in the operation of the contactors themselves. Apparatus that was almost ideal when used with motors of comparatively small power has been both enlarged and strengthened to meet the more severe conditions, and yet, with the very best of construction has failed to be entirely

satisfactory; consequently, the majority of us are looking for something better. Whether or not we will be able to find it is as yet problematical, and the future alone can tell.

Undoubtedly the principal causes of our troubles are that the necessarily heavier working parts of the controllers must move more slowly, and the arc is, therefore, longer in being broken. That, combined with the greater amount of metal vapor caused by the larger currents, makes the arc the harder to break, even if the voltage is no higher, and in the majority of cases we are compelled to use higher voltages in order to give the proper service.

These three causes combine to make the problem a most serious one to meet, and is, without doubt, the reason that while the Sprague controllers were very successful in Chicago when used with 80-h. p. motors, they were not nearly so satisfactory when used in Brooklyn and Boston with 160-h. p. motors; hence the newer electric switch control proposed by the Sprague company before its absorption.

Although having no definite information on the subject, it is probably safe to say that these same reasons were of prime importance in causing the change of front of the Westinghouse company, as, without knowing positively, I think that the turret controller is a segregated piece of apparatus having small working parts that work somewhat independently.

As most of you are probably aware, the "Type-M" control consists of a number of electrically operated switches or contactors that make the motor current connections, the contactors being controlled in turn by a small master controller operated by the motorman. The only current passing through the master controller is that small amount necessary to operate the contactors, and as the contactors on every car are connected in the same kind of groups, and these groups in multiple, the operation becomes the same whether one or more cars are connected, the only difference being that the master controller in use must handle an additional small amount of current for each car attached to the train. But the operation of the motors themselves is identical and simultaneous from necessity, no matter in what part of the train they may be.

This apparatus has been so well described in the excellent articles that have appeared in our technical journals that I shall not go further into details at present, but will be glad to give further information, if it is desired, when we come to the discussion of the paper.

While developed to particularly meet the conditions of train control, the use of the "Type-M" apparatus has created for itself many uses, and has demonstrated a number of almost self-evident facts that were not fully appreciated before.

The almost absolute necessity of increasing the rapidity of the movement of the contact-making and breaking devices as much as possible, especially when handling heavy currents at high voltage, is one of these facts, and it is undoubtedly due to the use of a working member weighing not over 5 lb. together with a large excess of power, that the contactors are such a success.

The apparent greater capacity per inch width of contact and the much longer life is readily traceable to this cause, combined with the better type of blow-out possible when used for one arc each. Why these differences should exist is apparent when it is considered that drum controller cylinders, to do the same work, must weigh not pounds, but hundreds of pounds each, and the gap between the arc blowing poles must be much greater and the field more indirect.

From experiments made to determine the rapidity of movement it was found that the average contactor requires less than 1/50 of a second to attain its widest gap from the instant the contacts first part in breaking the circuit, and accordingly, only a small amount of metal vapor is formed; hence the small amount of arc developed.

The "Type-M" control is of necessity more complicated than an ordinary series-parallel controller, but there are some advantages that will give it a field outside of train use; for instance, as nearly all the weight can be placed under the car-body, the platforms have much less to carry besides making more room for passengers. Again, as the motorman has a much smaller

handle to operate and there is so much less work to do, he should do it more carefully, but whether he will is quite another question.

The case of handling has caused quite a few electric locomotives to be equipped with this apparatus, although they will in all probability never be connected so as to use the train system feature.

Of course, as the system readily lends itself to distance control, new uses will continually develop, such as hoists, cranes, rolling mills, printing presses, etc. But these are aside from the question and do not particularly interest us, as they have almost nothing to do with our line of work.



SERVICE TESTS WITH THE "AUTOMOTONEER."

As brought out in the discussion at Tuesday's session of the American Railway Mechanical and Electrical Association a source of considerable expense is frequently found in the careless handling of controllers by motormen who are not properly instructed, or who neglect to obey their instructions as regards the proper manipulation of the controller handles. Several methods have been suggested from time to time for preventing waste of current from this source. Wattmeters on the cars for recording the current consumed in starting and running have been advocated, but this expedient has been found not altogether

An abstract of the report of the engineers is as follows:

"The test was carried out upon the lines of the Madison Traction Co. on a run of a little over six miles in length, which has many sharp curves, grades and switches. It was made upon the company's Car No. 17, during its regular morning runs. This is a single truck car 30 ft. in length over all, weighing about 8 tons and equipped with two G. E. 800 motors and K 2 controllers. The automotoneers were set to take the total nine notches of the controller in $1\frac{1}{2}$ seconds or about $\frac{1}{2}$ a second to a notch.

"The results of the test show that when operating the cars as they will normally be handled by a fairly careful motorman, when not using the automotoneer, the consumption of energy is about $7\frac{1}{2}$ per cent greater than when the automotoneers are attached.

"As an illustration of what the automotoneer accomplished in the runs, as regards peak currents drawn by the motors, when the car was driven in a somewhat careless manner, as is commonly done by a raw or careless motorman, the maximum current was 160 amperes as compared with 110 amperes when the controller was equipped with the automotoneer. Thus the peak current was reduced 25 per cent while the regular schedule was maintained.

"The accompanying diagrams are curves of current for a small part of the line, showing the effect of the automotoneer upon the maximum current used by the car when running on somewhat

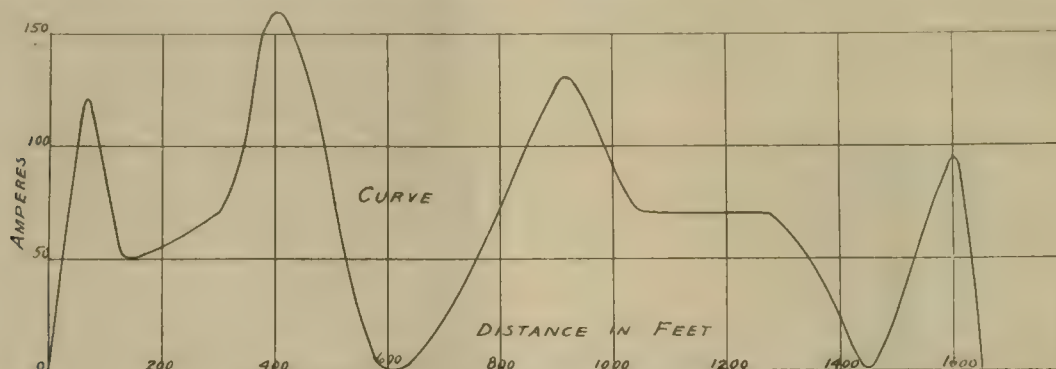


FIG. 1—CURVE SHOWING CURRENT PEAKS WITHOUT AUTOMOTONEER.

satisfactory as it is possible to feed current so fast that the instrument will not record accurately the amount of current consumed, and it was found that some of the men who make the best readings on the voltmeters had the hottest motors.

A device for automatically regulating the moving of the controller handle has been developed to a high state of perfection by the Garton-Daniels Co., of Keokuk, Ia. This regulator, which

of a grade where the highest peak currents referred to above were observed. Fig. 1 shows the peak currents absorbed when the controllers were not equipped with the automotoneers, and Fig. 2 the same when the automotoneers were attached. The horizontal scale represents distances traversed and the vertical scale amperes input. A similar difference between the maximum currents, with and without automotoneers, was observed through-

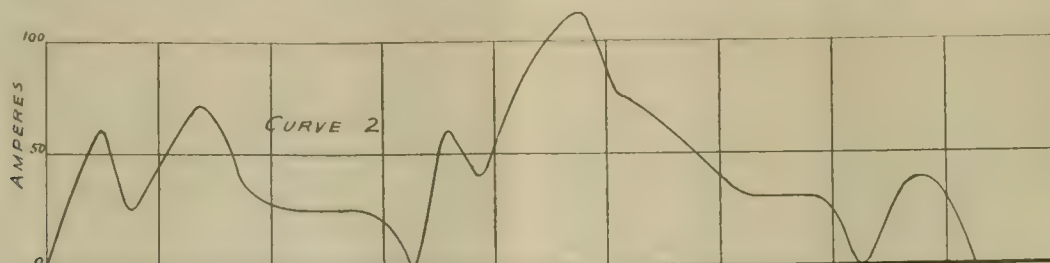


FIG. 2—CURVE SHOWING CURRENT PEAKS WITH AUTOMOTONEER.

is known as the "Automotoneer," was fully described in the "Daily Street Railway Review" for Oct. 8, 1902.

For the purpose of determining the actual results secured with the use of the "Automotoneer," the Garton-Daniels Co. recently requested D. C. & William B. Jackson, consulting engineers, to make a series of service tests under operating conditions. The tests were made with a set of standard "Automotoneers" for use on controllers having five series and four parallel steps.

out the runs. The conditions during the runs were as nearly alike as service requirements would warrant.

"In the course of the test it was found that in emergency stops through reversing the current in the motor, the most satisfactory braking effect was obtained by allowing the controller to rest upon the first and second notches, and that the automotoneer proved valuable in preventing the controller from being carried around quickly to the last notch and thus slipping the wheels and reducing the retarding effect, besides causing serious

danger of the opening of the safety devices or of injury to the motomeer, either of which results will make the emergency stop impossible.

"We also give a curve showing a start and stop with the automotoneer in use, the vertical scale representing the speed, the horizontal scale representing the distance traversed. It was found that an emergency stop could be made from 20 miles an hour to standstill in 88 ft. or $2\frac{1}{2}$ times the length of the car.

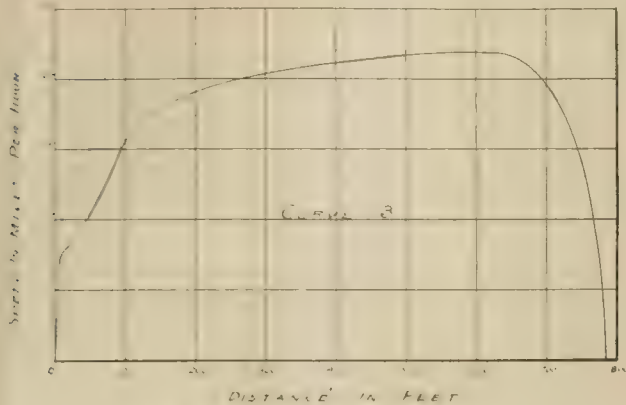


FIG. 3 START AND STOP CURVE.

"In starting it was found that with the automotoneers set as already described, the car could be brought from standstill to a speed of 20 miles per hour in 16 seconds, in a distance of 200 ft. while it could be brought from standstill to 18 $\frac{1}{4}$ miles per hour in 12 seconds, and in a distance of 170 feet.

"The results of the test show that the automotoneer permitted the operation of the car in the best possible manner and at the same time proved an effective check upon the abuse of the equipment and waste of power through careless handling of the controller."

AUTOMATIC BLOCK SIGNAL FOR ELECTRIC RAILWAYS.

We present herewith views of the signal adopted by the American Automatic Switch & Signal Co., in connection with its perfected automatic semaphore block signal, which is being exhibited at the convention, and which has been attracting considerable attention from electric railway managers for some time past. The maker of this signal is prepared to produce evi-

signal at near end of block unless the danger signal at the far end is set; the setting and clearing circuits are closed automatically and when the signal has been set at danger it is locked and cannot be cleared until the car has passed through the block; it will work only one way when two cars enter the block from both ends at the same time; it will operate anywhere between 250 and 550 volts.

Incandescent lamps do not form a part of the main circuit, as it is believed that they should not be the only visual indication of a signal, but should follow the movement of a semaphore blade which will move each time the signal is operated whether the lamps burn or not. Having the lamps work in conjunction with the semaphores, however, instead of independently both day and night, makes it an added safeguard. Not only are there many dark, misty or stormy days when the bull's eye signal is a necessity, but even in pleasant weather the incandescent light serves to bring the signal target into such strong relief that it cannot be misunderstood. The trolley contacts for operating the signal are so arranged that it looks to be impossible for a car to get past the point of contact without setting the signal, no matter what the speed of the car may be. In fact, it is asserted that it will operate with a car running at 60 miles an hour with absolute certainty. The signal mechanism is enclosed in a galvanized iron box, with glass doors, and this insures protection from the elements. Leading engineers have not hesitated to pronounce this signal the best yet produced.

The American Automatic Switch & Signal Co. is composed of men of high standing commercially and financially. The president is Martin B. Madden, who is also president of the Western Stone Co., and a director of the Metropolitan Trust & Savings Bank, Chicago. T. N. Jamieson is secretary and treasurer, while the general manager is Robert Skeen, who is well and favorably known to electric railway managers. The company's general offices are in the Oxford Building, 84-86 La Salle St., Chicago, Ill.

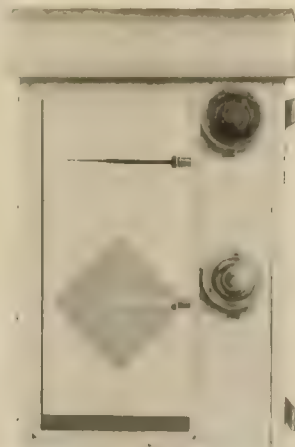
THE E. W. BLISS CO.

The E. W. Bliss Co., of Brooklyn, exhibits this year its "Projectile-Bliss" brand of high carbon steel gears and pinions for all electric systems. A feature of this exhibit will be heavy gears for suburban work; also a device showing one of the company's regular gears surrounded by nine pinions fitted with a handle, all of which can easily be turned by hand. This demonstrates the accuracy and smooth running of these goods.

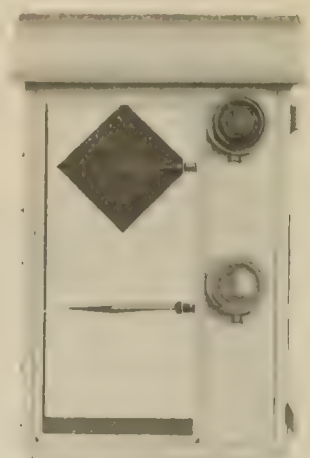
The exhibit is in charge of Charles E. Porter, who is assisted by B. W. Stone.



NORMAL



WHITE MAY PROCEED IF
THROWN BY YOURSELF
OTHERWISE IS A REAR
BLOCK



RED BLOCKED BY CAR
COMING

dence that wherever it is in operation it gives entire satisfaction, and also to substantiate the claim that it absolutely prevents head-on or rear-end collisions. Among other claims made for the signal are the following: When the signal is obeyed two cars cannot occupy any block or section of track at the same time, it will not permit the setting of a cautionary or permissive

R. W. Conant, who is well known to delegates as the former electrical engineer of the Boston Elevated Railway Co., is in attendance at the convention with an exhibit of the Conant testing instruments, for use in testing rail bonds and electric car equipments. These instruments have been illustrated and described in the "Daily Review."

TWENTY-SECOND ANNUAL MEETING AMERICAN STREET RAILWAY ASSOCIATION

Saratoga, N. Y.—Sept. 2—4, 1903.

WEDNESDAY

In the absence of President Hutchins, of Detroit, First Vice-President W. Caryl Ely, of Buffalo, called the meeting to order and said:

Ladies and Gentlemen: By reason of the absence in Europe of President Hutchins, the pleasant duty now devolves upon me of calling to order the Twenty-second Annual Convention of this association. During a recent visit to Europe from which I have but just returned, it was my pleasure on the outward voyage to be a fellow passenger of President Hutchins' whom I afterwards saw at several different points and on different occasions. I bear to you his personal greetings, coupled with the highest expressions of regard and of regret at his inability to be present at this meeting. I am glad to be able to confirm the statement concerning his health contained in his letter to the Association, and to say that it has continued to improve, and that he now confidently expects to return within the month and resume the active duties of his business position. The duties thus devolving so unexpectedly upon me, pleasant and agreeable though they may be, are not without embarrassments, but I shall enter upon them confidently relying upon your forbearance and asking your assistance and co-operation at every stage of the proceedings.

We assemble today at one of America's oldest, most famous and beautiful watering places in the midst of the historic associations and beautiful scenery of the upper Hudson Valley. Concerning all that may be said of the locality and its surroundings; its people and their hospitality, and of the great State within whose borders it is situated, there is no one better qualified to speak than the able and distinguished lawyer who has been selected by the local committee to welcome you to the place. I have pleasure in introducing to you one of the leaders of the Senate of the State of New York, the Honorable Edgar T. Brackett, of Saratoga Springs.

ADDRESS OF WELCOME.

By Hon. E. T. Brackett.

On behalf, and in the name, of the municipality in which you are assembled, I give you welcome to her borders. Saratoga, the greatest pleasure resort of the western continent, extends to you her most cordial greeting.

If it were my purpose to advertise to you, and to the world, the attractions that you will find here, I could stand and recount to you a multitude of them, but a becoming modesty forbids that I should do more than to say to you that you have come for your meeting, to a place that for more than a hundred years has been sought by those in search of health and recreation, while back of the times when we have any record, the original inhabitants recognized it as a spot where they could come and cure their ills.

You will find here mineral springs such as do not exist anywhere else on the globe—springs that are adapted to such a variety of infirmities that I cannot enumerate them; springs saline, springs alkaline, springs sulphur, springs iron, springs iodine, springs neutral, springs suited to any condition of stomach, or bowel, or kidney. You will find here too, that nature's chemistry has given us the most wonderful air, that literally bears healing on its wings.

To this village, such a place as I have described to you, I therefore extend to you a warmest welcome. Yet, I should not fully

perform my duty of welcome to you, as I certainly should not get from it the full pleasure of welcome, if I only described to you the merits of the place where you meet.

As a layman I cannot forbear to extend to you, workers in one of the most important lines of the world's industries, congratulations on the progress you have made in the last decade.

The problem of transportation, of the comfortable, speedy carrying of the crowds in our cities and villages, is second only to the problem of feeding the same crowds. Indeed, the problem of carrying is correlated with, and not a little involved in, the problem of feeding.

How well you have worked out this problem, both in urban and country communities, will be recalled and appreciated by everyone who compares the present lines and methods, with those of twenty years ago, when behind a sorry team you entered a little car and reached through an opening in the front door to pay your fare to the driver, who furnished you change up to two dollars.



HON. EDGAR T. BRACKETT.

The world moves, and with it, our crowded populations move too, and with speed and comfort. It is too not only in the centers of population that your work has resulted in comfort and in satisfaction to the people; to my mind, if possible, a greater good has come to our rural communities from the extension and perfecting of your work. No one who has failed to have the experience of life on a remote farm can appreciate the monotony and loneliness there existing during the months where the highways are practically impassable. I do not forget that there are compensations, but the monotony and loneliness are there.

I know of nothing that so relieves from these conditions, as the coming of an electric line through a neighborhood. With its facility of boarding at any point, it often means to a rural community, especially the women, all the difference between absolute isolation, and a reasonably close touch with the rest of the world.

And so I place your work, not simply as one that develops commercial propositions, but one that goes further and becomes one of the positive forces in the diffusion of education and in the development of our civilization, and as such workers, I again bid you welcome to Saratoga Springs.

The Chair: We return our hearty thanks to Senator Brackett for his most gracious welcome to Saratoga Springs.

The next order of business is the calling of the roll. If there is no objection, the registration at the door will take the place of the roll call and will be passed. Not hearing any objection, it is so ordered.

The next order of business is the reading of the minutes of the last meeting; unless objection is made the minutes will stand approved, as heretofore printed. There being no objection they are so approved.

Mr. Vreeland offered a resolution to approve, ratify and confirm the action of the Executive Committee in fixing the place and date of the Twenty-second Annual Meeting of the Association at Saratoga Springs, Sept. 2-4, 1903. The resolution was on motion carried unanimously.

The chair extended an invitation to non-member companies to join the association, and the secretary then read the following letter from Mr. Hutchins:

Zurich, Aug. 3, 1903.

Mr. T. C. Pennington, Secretary A. S. R. A.

My dear Mr. Pennington: I have delayed writing you until now because my plans were not quite certain; but it is now finally settled that I will not be able to return in time for the Saratoga convention. I am much disappointed that this is the case. My health is very much improved—in fact I feel as well as I have ever been, but it is thought I should not risk a relapse by hastening back, and consequently I have concluded to remain in Europe until the middle of September.

I am sure, remembering our trip to Saratoga, that you have everything in good shape for the convention. Mr. Ely will doubtless be back in time to preside, and I am confident everything will pass off all right—better in fact, under his skilled handling, than would be the case were I present. My duty, however, is there, and it pains me that I have to write that I cannot discharge it. Hoping that I may make amends by such work as I may be able to do for the association in the future, I remain

Sincerely yours,

J. C. Hutchins.

The Chair: The very great sorrow I have felt at knowing it would be impossible for President Hutchins to come here, I know will be shared by all the members of this convention. His integrity, his ability, his stick-to-itiveness in the transaction of his business and his work are well known to you all. It is also well known that his devotion to the duties of his position brought him well nigh to death's door, and that he left the country under the imperative orders of his physicians as the only way to save his life. He is a better feeling man and is more hopeful now than he has been for a number of years, and I congratulate him upon it and I congratulate you all upon it, because we could ill afford to lose so useful a member of this association.

It is customary, gentlemen, to have an annual address presented by the President of the association. Mr. Hutchins has been in such condition that he could not prepare one. I arrived in New York last Saturday, reached my home in Buffalo on Sunday, and got here on Monday, and have felt that something should be presented to you. I have prepared something in the nature of an address, rather hastily, but I could not affront you by offering anything to you which was not the result of careful thought. The following is what I have prepared for this occasion:

ADDRESS OF MR. ELY.

In presenting to you under existing circumstances a few brief references to matters and things of importance affecting the interests of your Association, a proper sense of the importance of the occasion and the magnitude of the interests represented here impels me to ask your indulgent consideration of the statements, which, while representing the result of careful thought and reflection, have been somewhat hastily formulated and put together.

The present condition of your Association, as appears from the reports of the executive committee and secretary and treasurer about to be submitted, is most gratifying and calls for sincere congratulations.

Statistical information of any great length concerning the magnitude of the interests represented in this Association would be wearisome and perhaps confusing. It is sufficient to say that from the recent United States Census report upon the street railway industry it appears that there were on June 30, 1902, in the United States 987 companies, owning and operating 22,589 miles of single track, upon which were transported in that year more than four and one-half billion passengers, by the use of more than one and one-quarter million of horse power. The aggregate mileage run by the cars used in these operations exceeded one billion miles. In these stupendous operations capital is employed as represented by capital stock and funded debt in the aggregate amount of two billion, four hundred million dollars. These figures represent the investments of many thousands of people and relate to the intimate concerns and the daily life of millions of people. They are therefore the legitimate subject alike of popular and governmental interest and inquiry, and correct data and information concerning them are matters of the very highest importance.

I am glad to be able to state that the methods of keeping the records and accounts of this class of transportation companies are improving from year to year, and that it is rare to find an instance where the fullest and freest information is withheld from even the most casual inquiry. Service of great value has been rendered in this department of street railroad work by the Street Railway Accountants' Association of America. The classification of construction accounts and operating expense accounts which has finally been settled upon by this Association was adopted by the United States Census Bureau in gathering statistics for its census of electric railways, and a representative of the Census Bureau has prepared a paper on the subject, which is to be read in the Accountants' Convention now being held here. This classification has been officially adopted by the State Railroad Commissions of New York, Massachusetts, Connecticut and Maine, and is about to be adopted by the Commission of the State of Pennsylvania. The Association's form of monthly and annual report has also been approved and adopted by the National Association of Railroad Commissioners. The standard classification and forms of report have been approved by the leading bankers and financiers of the country. It is quite common, I am informed, at the present time for a banking firm examining properties with a view of purchasing to require the accounts to be changed in accordance with the forms of the Accountants' Association. It has already been adopted by many of the most progressive electric railways and by a larger number of companies than any other one system of accounting. Exact and precise uniformity in forms of classification and report are highly desirable, and the sooner it is attained, the better it will be for the stability and value of electric railway investments, and it would seem that the system which has been worked out by our Accountants' Association and adopted by such high governmental authorities, and which has received the approval of the financial and banking community, ought to be speedily adopted by all. The members of the Executive Committee of your Association join me in urging upon members the desirability of immediate affiliation with the Accountants' Association, and the speedy adoption of its forms of classification and report.

The work of the various State Railroad Commissions has come to be of the highest value, not only in this regard, but in its bearing upon the actual operations of railroads in states where such commissions exist. The annual reports required to be made to such commissions are full and complete, and present data and statistical information exhibiting in the clearest manner the actual results of the operations of all of such properties within their jurisdiction. Their investigation of accidents and their causes, and their directions and recommendations concerning construction of safety appliances; condition of roadbed and bridges; signal systems and various other matters bearing particularly upon the operation of cars are in the main in accordance with the highest state of the art of railroad operation. The railroad commissions have come to be regarded by all progressive managers as wise and safe tribunals for the settlement of vexed questions which are continually arising. It is a singular fact that these institutions, which at the beginning were so vigorously combated by railroad managers, almost without exception have come to be regarded as

almost indispensable and of the highest benefit and advantage to the very corporations which are subject to their control and regulation. The rapid growth of interurban electric railways and their extension through long stretches of country have brought the street railroad fraternity face to face with the problems which for 50 years have been from time to time the subject of settlement at the hands of steam railroad managers, and the wisest and most progressive electric railway operators are now following more and more closely steam railroad methods. The safety of the passenger entrusted to your care is your first and highest duty. In a short time your business has been almost revolutionized; the light cars drawn slowly by horses have given place to heavy ones, swiftly propelled by the powerful agency of electricity; the dangers attendant upon the operation of cars have been multiplied, and have in many cases far outstripped the protective measures and appliances absolutely necessary for proper and safe operation. The frequent recurrence of accidents on electric railways has been the subject of criticism by the press of the country, and the public mind is thoroughly awakened upon the subject. The attempt is now being made in a sister state to hold directors criminally responsible for an alleged failure to install safe-guards at the crossing of a steam railroad where a fatal accident occurred. Apart from considerations of humanity and law, the proper discharge of your business requires that money shall be expended wherever improvements of this kind are necessary. From every point of view money spent for the prevention of accidents is money well expended, and you should never fail to impress upon those in control of the finances of your companies these views and never flinch in pressing your recommendations until favorable action has been secured.

The greatest activity displayed during the year has been in the development of the suburban and interurban properties as distinguished from the purely local service of city companies. This development has been notable not only in the increased mileage, equipment and volume of business transacted by the interurban and suburban properties, but also in the extent of the field occupied and the scope of the service given.

The discussion of the possibilities of interurban electric roading cannot fail to be of interest to any gathering in the Hudson Valley, where some of the most notable pioneer work in this branch has been done. The operating companies of this section have not only set a good example in indicating the possibilities of this class of service, but have gone on developing it and have maintained their commanding position as leaders in this field. It is estimated that there are now nearly 100 companies throughout the country engaged in the handling of freight and express business, and there are possibly many more who are contemplating engaging in this work. All of these will be interested in the Mohawk Valley, and by the city systems of Albany, Schenectady, Troy and other large communities which serve as distributing points. The organization which has been perfected in these places and the experience gained by the management will, of course, be placed at the disposal of the visiting managers, who will need no assurance of the value of this opportunity for the examination of the practice adopted. At the present time the water power development in this region is one of the largest and most important in the country, and the street railway properties are taking advantage of it in securing their current at a low rate and insuring reliable and constant service. The engineering features that have been developed in this connection appeal to those who are directly in touch with this branch of the service. Preparations are now being made for greatly increasing the available power from this source, and it is anticipated that within a few years the entire electrical service of this region will be operated by current produced by water power.

Another striking development of the year has been the tendency displayed toward consolidation of the street railway properties in the smaller cities, together with the electric and gas lighting service, in fact, this tendency has been so marked during the last year that in spite of the large number of new street railway corporations that have been formed in the last 12 months the actual number of operating systems has been only slightly increased. The value of the properties, however, has been growing constantly and the general average increase in gross receipts

for 1902 over 1901 was 9 per cent. The largest individual consolidation was that of the properties of the North Jersey Street Railway Co. and allied lines in the Public Service Corporation of New Jersey. Other notable consolidations were those at Augusta, Mobile, New Orleans, Kingston, Oakland and Norfolk and Newport News.

From a financial standpoint probably the most important development of this character was the acquirement by the Interborough Rapid Transit Co. of New York, through lease, of the lines of the Manhattan Railway Company, thus assuring the operation of the elevated and subway properties of New York under a single management. The physical union of the two properties had already been recommended by the Rapid Transit Commission, and it had been suggested that the trains pass between the subway and the present elevated structure at several different points. This is hardly practicable at present, although it is within the possibilities that an exchange of traffic may be effected. The rolling stock of the elevated system would not be suitable for operation through the subway, and the great weight of the cars that are being built for the latter would prohibit their operation in long trains upon the present elevated structure. This feature of the change in methods of construction and equipment is, of course, suggestive of the general advancement that has been made in the rolling stock of all branches of the service with a view of increasing the comfort and convenience of passengers, as well as the safety and reliability of operation.

The growing importance of mechanical and engineering departments in electric railroad operation has resulted in the formation of a new association, the American Railway Mechanical and Electrical Association, which is meeting for the first time this year in connection with this Convention. It is the purpose of this new organization to discuss mechanical and electrical subjects; exchange ideas on construction and equipment, and raise the standard of operation wherever improvement is possible. The necessity for better shop methods, and the advantages of correct and comprehensive records in the mechanical department are now generally recognized, and it will be the duty of the men forming the new organization to determine the best practice to be followed and see that it is adopted. It will be recognized therefore that the new association has an important mission and is entitled to the support and co-operation of this, the parent organization.

A number of individual instances have been afforded during the year showing the progress that has been made in electric railway engineering. In Pennsylvania two very important interurban properties operated by third-rail systems have been opened. One of these employs a protected third-rail, and is the first attempt to commercial operation of such a system. The line extends from Hazleton to Wilkesbarre, through a district that is visited by severe sleet and snow storms, and this feature of the equipment will receive a severe practical test of its efficiency. The other third-rail system mentioned is that recently opened through the Wyoming Valley and intended for freight and express service, as well as the transportation of passengers, in competition with several well established steam lines. This property is particularly noteworthy because of the terminal facilities that have been provided and the organization effected for the collection and distribution of freight and express as well as its transportation over the electric lines. It is really the first instance of the organization and establishment of an electric property intended for this class of service in which provision was made for handling a large volume of business from the opening of the road.

In station equipment and distributing systems, as well as in the character of the rolling stock, appreciable advancement has been made. At the last annual meeting, it will be remembered, a very interesting paper was read upon the steam turbine. The investigation of this important subject has been continued during the last twelve months, and a further contribution is promised for this meeting, which it is hoped will embody the record of the advancement during the last year. Already plans have been prepared and actual work has been begun upon the installation of several large power stations in which this class of apparatus is to be installed. The most important of this character for street railway service thus far announced is that of

the new station of the Union Traction Co. of Philadelphia, where an installation of ten 5000 K. W. units is contemplated.

A year ago considerable interest was awakened among street railway men, particularly those interested in interurban electric railroading, in the possibility of developing a single phase motor for railway service. It was, of course, understood that such a motor would not be adaptable for city service, but many promises were held out to those who were interested in the development of long interurban lines. During the last twelve months assurances have been given that progress was being made, but up to the present time no reliable information has been available and the electric railway engineers are still dependent upon the direct current motor for interurban as well as city work.

This brings us in a somewhat crude manner to the close of the year. If you will bear with me yet a few minutes, I wish to speak very briefly upon several points of the highest importance, and as I have run out of manuscript, I feel that you will pardon me if I go ahead without any.

First, I wish to refer to the work that has been done by the Committee on Rules, and I ask and earnestly urge every member here present to read the report of that committee with great care between now and tomorrow morning. I feel also that the members of the Association are greatly indebted to the Committee on Rules, because I know of my own personal knowledge that that committee has done a great deal of hard work, and have done it in the same painstaking, thorough and continuous manner in which the men who compose the committee perform the duties for which they are paid large salaries. This class of work when deputed to committees is sometimes not so well done as the work of this committee has been performed.

I wish to refer to the papers to be presented here. The subjects were chosen with great care at the meeting of your Executive Committee held in this place last February and which meeting was very fully attended. A businesslike and intelligent method in the printing and distribution of the papers upon the subjects so chosen has been heretofore adopted, and it is earnestly to be hoped that the same method will hereafter be pursued. It is right and proper that the subjects should be chosen in advance, and the papers written and distributed in advance of the meeting of the convention so that those who come here for actual benefit may read the papers, have them carefully digested and be ready to exchange views with each other upon the subject of the papers. The old method of presenting papers and reading them in the convention, and at that place first making the members aware of their contents was of but little value.

I wish also to speak of the admirable exhibit which has been prepared and installed here by the suppliers. I think that a good, fair share of each delegate's time should be given, not only to a careful examination of the exhibits, but to a pleasant greeting and extension of thanks to the representatives of the company who have expended so much money and so much effort in getting these exhibits here and installing them in perhaps a somewhat difficult and expensive place.

A most important subject is that of general standardization. We have now arrived at a point in electric railway practice where it would seem that it would be possible to very shortly reach a general standardization which should extend, not only to road construction, equipment, and other features of the system, but also to every branch of accounting, and every branch of the operating, mechanical and engineering departments. There was a time when a steam railroad car starting from Maine to go to California was dependent, as to its progress, on the good stomach and digestion of some eight or ten car inspectors stretched between here and San Francisco, each one of whom had to pass on the question whether the car could go through. Now a steam railroad car can be started from the Atlantic coast and run to the Pacific coast, and there is no one who has the right to question its passage if it is in proper condition, and the car conforms to certain standards of equipment which have been adopted by the steam roads. As I have heard a member of this Association who has been in the steam railroad business remark, there was a time when every man who applied for the position of locomotive engineer on a steam road had to pass a different set of examination rules in every place where he ap-

plied; but today, thanks to the skill, persistence and intelligence of the steam railroad managers the same qualifications for locomotive engineers pertain through this country.

All these things appeal to business men; all these things appeal to men who have dollars in their pockets. It is business, and the quicker we arrive at a similar situation in our affairs, the better it will be for the value of the stock and bonds of our properties, and the better we will stand in the face and eyes of the world, because you are charged, first of all, and most important of all, with the safety of millions of people every year of your lives.

The present status of this Association seems, according to expressions which yesterday found vent in your executive committee, to be somewhat incompatible with the nature and extent of the work now before it. It represents at the present time an attempt to mix fun and business, and from the mixture to obtain valuable business results—oil and water will mix as easily. No one can deny that it is a source of genuine pleasure to meet each other annually, but that feature could still be retained, though the plan of the Association were to be changed. If the Association shall serve its highest purpose there should be, perhaps, a permanent place of meeting, with a settled, businesslike method of defraying expenses, and no reliance upon the good nature and generosity of local companies for free entertainment; but a payment for all amusement by the individual members enjoying or participating in it. In this way the expenses could be reduced to a small sum, which might be defrayed in a manner similar to that adopted by a leading steam railway association.

Your executive committee has devoted considerable time to the consideration of this matter, and some plan will undoubtedly be by it communicated to the members in due time. Meanwhile, it may be perhaps proper to state that as yet no invitation has been extended to the association by any company for next year's meeting.

I do not intend to weary you with long remarks, but I cannot refrain, in closing, from saying a brief word concerning the nature of your business. It sometimes seems to me that we act as if we were ashamed of the business in which we are engaged. There is sometimes, I am sure you will agree with me, evidenced a timidity in presenting to public bodies requests for extensions of routes and other requests concerning matters indispensably necessary for the upkeep and the proper operation and the proper conduct of the business of the properties in your charge. No such demeanor should ever characterize the actions of any of us. There is no other business in the world today that more intimately concerns the private life, the private necessities, the private conveniences, of the citizens than the street railroad and the electric railway business; (Applause) and as Senator Brackett observed so correctly, not only the people who dwell in cities, but those who live in the small communities and upon the farm lands and in the by-ways of the land. I have not had an opportunity to carefully mature and put down in regular order and sequence the thoughts which occurred to me in this connection, and I again beg your indulgence for remarks that may perhaps seem somewhat disjointed. What I have wanted all my life has been more time, and I certainly needed it on this occasion. I believe that the proposition cannot be controverted, that private capital invested in the operation and extension of street railways in cities and towns, and between them, has done more actual good for the State, speaking in the broad sense, than the investments of private capital in any other direction. (Applause.) This country is dependent upon its citizens—there is no governmental paternity here. The citizen is the State. His quality is a matter of the highest economic and governmental, as well as social, concern. You, and the people back of you, by extending the street railway lines and giving good service, have doubled and trebled the territorial extent of cities. You have knocked down unhealthful, crowded tenements, and their former occupants now live in isolated houses with free air, good light, abundant grass, and plenty of yard room and elbow room; and, more particularly, with that degree of privacy without which a self-respecting man or woman cannot

be raised. (Applause.) To crowd men and women, and their children, boys and girls, into tenements, six and seven stories high, as is done in the cities of Europe, where are now enjoyed the blessings of municipal ownership, is to raise men and women unfit to exercise the duties of American citizenship! They are all very well to be hitched with dogs to carts and to be driven through the streets of cities hauling loads, but not to exercise the rights that accrue to citizenship in a government which is "of the people, for the people, and by the people." Draw a line which shall fairly define what belongs to you from the property of the public; then toe the mark, do not run away; be aggressive, be well informed, be prudent, fair, and confident, and win every fight that you go into because your cause is just. (Applause.)

Mr. E. C. Connetter:—I move that we tender the thanks of this Association to our presiding officer for the very able address which he has presented to this convention.

The Secretary put the motion, which was unanimously carried.

The Chair: Gentlemen, I thank you, not only for your vote, but for the kind and courteous manner in which you listened to my remarks.

The Secretary announced that the Hudson Valley Railway, the United Railway of Albany, and the Schenectady Railway extended the courtesy of their roads to the delegates and their friends. Free transportation to be given on the badges of the Association.

The Secretary also announced that the American Telephone & Telegraph Co. and the Hudson River Telephone Co. extended the courtesies of their long distance telephone system to the delegates; the service to be given between 5 p. m. and 8 a. m. on presentation of the badge of the Association.

The Chair: The next order of business was the presentation of the report of the executive committee, which the Secretary will read.

The report of the executive committee decided the business transacted at two meetings of the executive committee during the present year, at which arrangements for the convention were made, including the selection of topics for papers, the assignment of the topics to the writers of the papers, and the various details relating to the convention.

On motion of Mr. C. D. Wyman the report of the executive committee was adopted.

Secretary Penington read the report which showed that twenty companies had joined the Association since the last meeting; that five members had withdrawn, mainly on account of consolidation; membership on August 24th was 206 companies.

The following companies are the new members:

Beaumont, Texas.—Beaumont Traction Co.
 Boston, Mass.—Boston & Worcester Street Railway Co.
 Chicago, Ill.—Northwestern Elevated Railroad Co.
 DeKalb, Ill.—DeKalb & Sycamore Electric Railroad Co.
 Detroit, Mich.—Detroit, Ypsilanti, Ann Arbor & Jackson Ry.
 Detroit, Mich.—Grand Rapids, Grand Haven & Muskegon Ry. Co.
 Detroit, Mich.—Rapid Railway System.
 Eureka Springs, Ark.—Citizens' Electric Railway Co.
 Greenburg, Pa.—Pittsburg, McKeesport & Greenburg Ry. Co.
 Huntington, W. Va.—Camden Interstate Railway Co.
 Indianapolis, Ind.—Indiana Union Traction Co.
 Indianapolis, Ind.—Indianapolis & Northwestern Traction Co.
 Ithaca, N. Y.—Ithaca Street Railway Co.
 Menominee, Mich.—Menominee Electric Light, Railway & Power Co.

New York, N. Y.—Interborough Rapid Transit Co.
 North Adams, Mass.—Hoosac Valley Street Railway Co.
 Oshkosh, Wis.—Winnebago Traction Co.
 Sanford, Maine.—Atlantic Shore Line Railway.
 Sault Ste Marie, Ont.—International Transit Co.
 Wichita, Kan.—Wichita Railroad & Light Co.

The financial summary is as follows:

Balance in bank October 1st, 1902, \$9,948.03; receipts, \$7,677.28; total, \$17,625.31. Expenditures during the year, \$7,286.62; balance on August 22nd, \$10,338.69.

The Chair: The Chair announces the following gentlemen as the members of the committee on nominations to nominate officers and select a place for the next meeting: Messrs. Laffin,

of Worcester, Goodrich, of Hartford, Sloan of Chicago, Stanley, of Detroit, Henry of St. Louis. This completes the preliminary business laid out for this session, and unless there is some other business to come before the meeting, we will adjourn until 10 o'clock tomorrow morning promptly.

Mr. Grant, St. Louis: I will bring before this Association a question which I think interests every member, and that is the question of mail car service in cities. Some time ago a representative of the Government came to St. Louis and he said to the officers of our company, when we had the subject of mail car service up with him, that if some concerted action was taken by this Association he thought it would be possible for us to get an increase in the compensation now paid, which every one knows, who has to do with the operation of mail cars, is not adequate. I would like to state, at this time, that at this meeting I will offer a resolution that a committee be appointed to confer with the Government officials on the subject of increasing the compensation paid to street railway companies for carrying the mails.

Mr. John I. Beggs, Milwaukee: I would ask what report was made by the special committee, which was appointed by this Association some three or four years ago, and of which the present postmaster general was a member, on this particular question. I would like to know whether the committee ever made a report. If not, I ask whether it would not be well to address a communication to the postmaster general, as a member of that committee, for a report on that subject.

The Secretary: The committee never made any final report. I heard from one member of the committee who said it was impossible to do anything. He said that some effort had been made to secure the increased compensation, but nothing had come from it.

Mr. Grant: Some officials who were at St. Louis stated that Mr. Payne, having been a street railroad official at one time, would realize the necessity for this increase more than any one else and now is an opportune time to take this matter up. That is why I bring it up at this time. I will say for ourselves that if this Association does not take any action we will give notice to the Government, after the first day of July next, we will not carry the mail any longer unless we are paid an adequate compensation. I think if united action is taken by the Association there is a possibility of getting an increase.

Mr. L. E. Myers, Peoria, Ill.: The subject which Mr. Grant refers to is one which has been upon my mind for some time. It is something we must take action upon. The rate which the Government pays street railroad companies for the transportation of mail is totally inadequate, not only for the service performed, but the risk incurred. I do not think it will be quite the thing for us to appoint a committee which would report twelve months hence—that would be wholly unsatisfactory; and I want to add an amendment that some arrangement be made, something in keeping with our by-laws, to enable the committee to report before a year from now. Personally, I have had quite enough of performing duties for the Government for inadequate compensation, and in some cases wholly without compensation. I have notified the Government that after the first of October no carriers will be carried at reduced rates, and no more mail will be carried, unless we are reasonably preferred. It is very important that some action should be taken on this matter and certainly if any committee is to be appointed it should make its report before the expiration of thirteen months. I have no fixed plan as to how we can get the report sooner, but I have no doubt that the secretary can help us out.

Mr. Grant: If any action is to be taken, it must be taken right away, because we will have to go to the postmaster general and go before the committee on appropriations, before congress meets. Unless we do that we cannot get any more money. A certain amount of money is appropriated for this service, and unless the appropriation is increased there can be no increase in the compensation. The committee's work would have to be done before congress meets, whether congress meets in October in special session or not; but the business relating to the subject of appropriations for mail service will be taken up in December, and the committee work must be done between now and December. The only thing the committee can do is to appear before the proper authorities and seek to secure an in-

crease in the compensation which is allowed per car mile for the carrying of the mail for the Government. The committee should be appointed and go ahead, and then it can report what has been done at the next session.

The Chair: The motion of Mr. Grant is that the chair appoint a committee of three to take up the subject of the compensation to be paid by the National Government to the street railway companies for carrying the mail, the committee to immediately enter upon the discharge of its duties and report at the next annual meeting.

Mr. Beggs: Does Mr. Grant contemplate the compensation allowed for rural delivery, or does his motion only contemplate the city service?

Mr. Grant: Only the city service.

Mr. Beggs: I would broaden it, because the Government is seeking, almost importuning, the interurban and suburban lines to carry mails at a rate which is wholly inadequate, as they desire to broaden the service in all of the cities. I decline to accept a proposition to carry the mail for rural delivery within thirty days, because of the inadequate rate. I would like to have Mr. Grant broaden his motion.

Mr. Grant: I have no objection to that.

The Chair: Mr. Grant consents to broaden the scope of his resolution. Before putting this resolution, the chair in the kindest spirit, desires to call the attention of the members to the rules reported by the executive committee, one of which requires resolutions to be committed to writing and subscribed by the name of the proposer; and I ask your kind forbearance when I say to you that it seems necessary, and only right and proper, that this rule should be hereafter enforced; and if it is the sense of the convention that the rules shall be enforced, I shall be glad to enforce them, especially that rule, which comports with the dignity and speedy transaction of the business of the convention. Certainly any resolution worthy of being presented here is worthy of being committed to writing, and the practice is consistent with the practice of bodies of this nature; and the chair desires it to be particularly understood that it is furthest from his thought to convey a rebuke or anything of the kind to the proposer of the resolution, or any one, and merely takes this opportunity of calling attention to the rules that were adopted.

Mr. Grant: I was giving notice that I would at this meeting of the Association, perhaps tomorrow or Friday, propose such a resolution.

The Chair: If the gentleman was giving notice he was quite in order.

Mr. Grant: I am giving notice, so that the members can think about it.

The Chair: The chair treated the motion in his remarks as if it were before the house, and the chair so considered it. If the gentleman is willing to make the motion, the chair is willing to reconsider the ruling just made, and believes the convention is, and the motion can come up now for consideration and be acted upon.

Mr. Grant: I make the motion.

Mr. Myers: As I understand the motion now, the amendment I offered has been lost sight of in the discussion. What is the use of appointing a committee now to report twelve months hence? We are to instruct the committee to do something, which they will undoubtedly attend to; but how shall we learn what they do? We shall probably go on making contracts, perhaps at a small advance over the present rate, because the agents of the Government do have some jurisdiction as to rates. It seems to me there is not a uniform service, or a uniform compensation, except for mail cars on city tracks. In our city we have three kinds of rates for all kinds of service. I have three different kinds of contracts on my road. I certainly do not want to wait thirteen months before being put in possession of report of this committee.

The Chair: The chair suggests that the resolution be committed to writing, and so amended that it will provide that, as soon as the committee has finished its work, it shall file a report with the secretary of the Association, who shall forthwith communicate it to all the members of the Association for their guidance. The chair will request Mr. Grant to frame such a resolution and present it at his convenience.

The meeting then adjourned until 10 o'clock Thursday morning.



A. A. Hilton, vice-president and manager of the Chicago Car Wheel & Foundry Co., is in attendance at the convention.

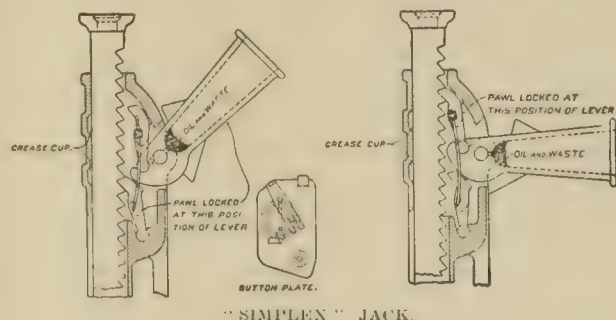
Harold P. Brown is making a daily exhibit of "Brillium" fuel under one of the boilers of the Grand Union Hotel. This fuel is claimed to be very economical, at the same time doubling the capacity of the boiler.



THE "SIMPLEX" CAR JACKS.

The "Simplex" car jacks, sectional views of which are shown in the accompanying illustration, are designed especially for electric railway use. They are made by Templeton, Kenly & Co., Ltd., Rookery Bldg., Chicago.

These jacks possess many meritorious features, some of the advantages claimed for them being the positive interlocking of pawls, the shortness of leverage, fewness of parts, and lubrication through the lever socket. By referring to the illustration it will be seen that when the lever is up the locking of the lower pawl, which would naturally fall into position by gravity, is made doubly certain by the action of the straight wire spring that is attached to both pawls. With the lever horizontal the upper pawl becomes locked, the lower pawl being released as soon as the pressure is removed. It will be noticed that even if



there were no spring attachment, the upper pawl is bound to become locked because of the shape of the standard, and for the same reason the pawl is held securely in place when it is locked. To further insure the positive engagement of the upper pawl on the full surface of the teeth, however, an interlocking spring may be attached to the standard casting in such a way as to constantly press the pawl against the rack bar. The pawls are interchangeable, also.

The back of the standard is molded to provide two grease cups for keeping the rack bar thoroughly lubricated to insure ease of action and reduce friction. In the bottom of the lever socket oil and waste are packed and oil runs through a channel to the bearing. Once packed, all that is necessary when more oil is needed is to force the oil through the waste with the small end of the lever. The "Simplex" jack has a handle by which it may be easily carried. These jacks are made in two sizes, of 10 and 15 tons capacity, and weigh 60 and 85 lb. Each is composed of 10 pieces only.



By an unfortunate delay in transportation the exhibit of the Root Track Scraper Co., of Kalamazoo, Mich., which was shipped August 20th, had not arrived up to last night, much to the disappointment of F. N. Root, manager of the company, and of many callers who are interested in the company's devices.

F. A. Barbey, of Boston, who is associated with the American Brake, Shoe & Foundry Co., Templeton, Kenly & Co., Ltd., and other street railway supply houses, called at the "Review" booth yesterday.

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 Italy, Milan—Ulrico Hoepli, Libreria Della Real Casa.
 New South Wales, Sydney—Turner & Henderson, 16 and 18 Hunter Street.
 Queensland (South), Brisbane—Gordon & Cotch.
 Victoria, Melbourne—Gordon & Cotch, Limited, Queen Street.

THE DAILY STREET RAILWAY REVIEW is published each year on the occasion of the meetings of the American Street Railway Association, the Street Railway Accountants' Association of America, and the American Railway Mechanical and Electrical Association, and contains the convention reports. This publication is separate from the *Street Railway Review*, published monthly at Chicago, Ill., but is in its nature supplementary thereto.

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Application made for entry as second class matter.

5TH YEAR | Thursday, Sept. 3, 1903. SERIAL NO. | VOL. XIII
 No. 2 | No. 8 B

The American Railway Mechanical & Electrical Association adjourned yesterday afternoon to attend in a body the opening session of the American Street Railway Association. They then devoted the rest of the afternoon to examining the exhibits.

SECRETARY PENINGTON.

Owing to the entirely new conditions as regards the character of city, nature of exhibition facilities, arrangement of entertainments, etc., under which the convention meets this year, the duties falling upon Secretary Penington have been especially arduous. But Mr. Penington likes hard work and he has been equal to every demand. The secretary and treasurer's report to the convention shows the affairs of the Association to be in highly satisfactory shape as regards membership, financial status and general condition.

VICE-PRESIDENT ELY'S ADDRESS.

It is seldom the members of a technical association have the privilege of listening to an address so able, so broad in scope and manifesting so thorough a grasp of the details of the subject matter treated as the opening address of Vice-President Ely before the American Street Railway Association at its first session yesterday. The address in point of interest and value forms one of the chief contributions the Association has ever had the privilege of recording in its transactions.

SECRETARY BROCKWAY.

It is needless to say W. B. Brockway is one of the busy ones these days. Mr. Brockway is of the kind that sees no use in doing things by halves, and especially when it is anything in connection with the Accountants' Association. If he stops long enough to "retrospect" in the whirl of convention time it must be some satisfaction to him to take a general view of the Association, its work and its achievements, and be able to say to himself "I helped."

Mr. Brockway is now with Isadore Newman & Sons, the well-known bankers, formerly of New Orleans, now of New York city, and has general charge and supervision of the accounting departments for the several electric railway properties controlled in whole or in part by the firm of Isadore Newman & Sons.

PROGRAMS

AMERICAN STREET RAILWAY ASSOCIATION.

THURSDAY, SEPT. 3, 1903.

Morning: Second Session at 10 a. m.

Afternoon, 1:00 p. m.: Excursion to Schenectady as guests of the General Electric Co. Lunch will be served on the train or at the company's works.

FRIDAY, SEPT. 4, 1903.

Morning: Third Session at 10 a. m.

Afternoon, 1:00 p. m.: Excursion to Lake George as guests of the Hudson Valley Railway Co., returning at 6:00 p. m.

Evening, 8:00 p. m.: Annual Banquet and installation of officers-elect.

The papers to be presented before the association are as follows:

"Steam Turbines," W. L. R. Emmett, General Electric Co.

"Electric Welded Joints," Worcester Consolidated Street Railway Co., by William Pestell, superintendent of motive power and chief engineer.

"The Evils of Maintenance and Champerty in Personal Injury Cases," Detroit United Ry., by Michael Brennan, attorney.

"Train Orders and Train Signals on Interurban Roads," International Railway Co., of Buffalo, by C. A. Coons, superintendent of transportation.

"Freight and Express on Electric Railways," Birmingham Railway, Light & Power Co., by J. B. McClary, manager railway department.

"The Manufacture and Distribution of Alternating Currents for City Systems," Chicago City Ry., by Richard McCulloch, assistant general manager.

"Comparative Merits of Single and Double Truck Cars for City Service," Milwaukee Electric Railway & Light Co.

"The Right of Way," Interurban Street Railway Co., by H. H. Vreeland, president.

STREET RAILWAY ACCOUNTANTS' ASSOCIATION.

THURSDAY, SEPT. 3, 1903, 10 A. M.

Paper: "Car Maintenance Records," by S. C. Stivers, New Jersey & Hudson River Railway Co., Edgewater, N. J.

Paper or address by a representative of the United States Census Bureau.

Report of the Committee on a Standard Form of Report for Electric Railways, Chairman, William F. Ham, comptroller Washington Railway & Electric Co., Washington, D. C.

Replies to questions.

FRIDAY, SEPT. 4, 1903, 10. A. M.

Paper: "Advantages and Disadvantages of Bag or Envelope System and of the Cashier System of Receiving Conductors' Deposits," by F. R. Henry, auditor St. Louis Transit Co., St. Louis, Mo.

Comparison of the Municipal Tramways Association of Great Britain proposed "Standard Classification and Form of Report" with the American Standard, by C. N. Duffy, secretary Chicago City Railway Co., Chicago, Ill., chairman Committee on Standard Classification.

Replies to questions.

Report of Committee on Resolutions.

Report of Committee on Nominations.

Election and Installation of Officers.

Adjournment.

MECHANICAL AND ELECTRICAL ASSOCIATION.

THURSDAY, SEPTEMBER 24, 10:30 a. m.

"Use and Abuse of Controlling Mechanism." D. F. Carver, chief engineer, Public Service Corporation of New Jersey, Newark, N. J.

Presentation and Discussion of Technical Papers.
Report of Committee on Nominations.
Election of Officers.



THE SCHENECTADY EXCURSION.

All who wish to go on the trip to Schenectady and the General Electric Works this afternoon and who have not yet registered at the General Electric booth are requested to leave their names before noon today as arrangements for the entertainment of the visitors must be made in advance.

The party is scheduled to leave from the D. & H. depot by special train promptly at 1 o'clock. The train will proceed directly to the works of the General Electric Co. at Schenectady where lunch will be served. The trip through the works will then be made under the supervision of competent guides. The return trip will be made so as to reach Saratoga in ample time for supper.



J. G. BRILL CO.

The Brill exhibit is near the registration booth at Grand Union Hotel. Models of the Brill 27, 27 G, maximum traction and 21 E trucks are shown, and circulars describing the Brill convertible and semi-convertible cars, as well as all the trucks are distributed. The company is represented by S. M. Curwen, William H. Heulings, Jr., Geo. M. Haskell, Geo. H. Tontrup, J. E. W. Brill and C. K. Pickles.



CROCKER-WHEELER CO.

The Crocker-Wheeler Co., of Ampere, N. J., is distributing a special convention bulletin describing the Crocker-Wheeler generators for railway service. Match safes are presented for souvenirs. The company is represented by Charles W. Startzman, of the sales department, Ampere; Francis B. De Gress, manager New York office; Samuel Russell, Jr., manager Philadelphia office; R. N. C. Barnes, manager Boston office, and H. J. Sage, manager Pittsburg office.



J. M. Gallagher of the Mayer & Englund Co. is in attendance.

The Dearborn Drug & Chemical Works have a snap and are calling to let everybody in on it. Ask the man.

John S. Speer, general manager Speer Carbon Co., has a small but interesting exhibit in the lobby of the Grand Union Hotel. Mr. Speer is distributing tasteful remembrances in the form of a deck of fine cards to the ladies, and cuff buttons to the gentlemen.

William J. Clark, general manager foreign department, General Electric Co., is in attendance.

Otto W. Uthoff of Watts & Uthoff of St. Louis, is here. This company is general western agent for the Ohio Brass Co., the Banner Electric Co. and the American Circular Loom Co.

Rosa Taylor is attending in the interests of the American Ventilating Co. of New York.

G. J. Smith is helping to represent the St. Louis Car Co.

Chas. N. Wood is here for the Frank Riddon Co., of Boston.

J. M. Griffin, M. D., president of the Wheel Tracing Brake Shoe Co., is explaining the good points of the "Truening" shoe and "concentric" truer.

John J. Lane, editor The Street Railway Bulletin, has space near the entrance to the main meeting hall. The "Bulletin" is the official paper of the New England Street Railway Club. Sample copies may be had on application to Mr. Lane.

W. T. Jackson, representing G. M. Gest, general contractor, of Cincinnati, attended.

One of the early arrivals was Cloyd Marshall, superintendent of electrical machinery, department of electricity of the St. Louis Fair.



BALDWIN LOCOMOTIVE WORKS.

The Baldwin Locomotive Works are showing a sample of the truck furnished to the Interborough Rapid Transit Co. The design of this truck is worthy of careful study by those who are interested in heavy, high speed, electric railway work.



ELMER P. MORRIS CO.

Elmer P. Morris is representing the company bearing his name, and is showing a full line of the goods for which it is agent. The Elmer P. Morris Co. makes a specialty of acting as purchasing engineer for foreign tramways for all classes of materials at the lowest market price, and it is now acting in this capacity for some of the leading foreign corporations. Mr. Morris has had 25 years' experience in the electric railway industry and is peculiarly well qualified for this class of work.



MAYER & ENGLUND CO.

The exhibit of this company this year consists chiefly of "Protected" rail bonds, together with special hydraulic tools for applying the bonds both to girder and to T rails. An interesting part of the display is a group of full size rail sections such as are being used by the Interborough Rapid Transit Co. in the New York subway, and by the Scioto Valley Traction Co., showing the exact appearance of the rail and the bond on heavy railway work of this nature. The Mayer & Englund Co. is also showing Keystone third-rail insulators and third-rail cable terminals. Messrs. Charles J. Mayer, A. H. Englund, W. A. Cockley, William Armstrong, Jr., J. M. Gallagher, J. F. McCarthy, H. G. Lunis, Ed. Hammett and D. L. Crawford are in attendance. As a souvenir the company is distributing a neat match safe, attached to the cover of which are surfaces for scratching both parlor and safety matches.



JOSEPH DIXON CRUCIBLE CO.

The interests of this concern are well cared for by H. A. Nealley of the paint department. Mr. Nealley can be found on the exhibit grounds or in the lobby of the Grand Union and will be glad to answer questions and give full information concerning the varied products of the Dixon company. He is distributing a valuable folder on the subject of "Paint Specifications for Steel and Iron Work;" and also one on Dixon's graphited wood grease and other graphite products for electric railways. As souvenirs the company is distributing Dixon lead pencils—than which there are none better made.



STANDARD VITRIFIED CONDUIT.

The Standard Vitrified Conduit Co.'s sign is conspicuous in all parts of the exhibition grounds. The exhibit displays a great variety of single and multiple underground clay conduit and third-rail insulators. B. S. Barnard, president of the company, was in attendance the first day, but was called to New York and his son, W. H. Barnard, takes charge and will act in his behalf the remaining time of the convention.



Elmer P. Morris is distributing a useful foot rule made from celluloid.

The Standard Varnish Works have a beautiful souvenir in the form of a silk and gold watch fob. Mr. John Dolph is doing the honors for the company.

ATLAS RAILWAY SUPPLY CO.

The Atlas Railway Supply Co., of Chicago, is exhibiting Atlas rail joints, braces and tie plates, and Atlas primers, surfaces and paints, the exhibit being in charge of J. G. McMichael, president of the company, assisted by R. B. Kent, secretary, and C. D. Porterfield, eastern representative.



INTERNATIONAL REGISTER CO.

The International Register Co., of Chicago, has an attractive exhibit, which includes standard types of International and New Haven registers, as well as ticket punches, badges, trolley cord, rod and cord fittings, etc. An interesting feature of this exhibit are the original drawings of the series of very attractive advertisements which have appeared in the street railway papers during the past year. The pictures are handsomely framed and advantageously displayed on the wall. The company officials in attendance are: A. H. Woodward, president; John Benham, vice-president; W. H. Brown, secretary; F. B. Hall, master mechanic.

W. H. Brown, secretary of the International Register Co., came from Cleveland, O., in his automobile, and is affording his friends considerable pleasure by taking them to ride through Saratoga and its environs.



OHIO BRASS CO.

The Ohio Brass Co., of Mansfield, O., usually exhibits a full line of materials made by it, but this year its space is given over to reception purposes. It is one of the most attractive booths at the convention, being enclosed by brass railing, with pretty rugs on the floor, a portion of the space being reserved for lady visitors. Potted plants and ferns form the decorative features, and on a blue silk banner, in silver letters, is shown the company's title with the trade mark in the center. A novelty which serves to attract a great many callers comprises two automatic photograph machines before which visitors pose, look pleasant and press a button, the result being an instantaneous photograph, which is framed in gilt, the frame bearing the inscription, "Ohio Brass Co., 1903, Saratoga." Late arrivals of the company's representatives are Max A. Berg, of Porter & Berg, and Ed Mason, of Chicago, and O. W. Uthoff, of St. Louis.



STAR BRASS WORKS.

The exhibit of the Star Brass Works did not arrive until yesterday forenoon, owing to delay in transportation. It consists of "Kalamazoo" trolley wheels and harps, which are said to be in use on 75 per cent of the trolley roads of the country. O. P. Johnson, the secretary and treasurer, represents the company here and states that the "Kalamazoo" products are growing in popularity right along. He points to the record of 67,726 miles accredited to one "Kalamazoo" trolley wheel, which he avers is only one of many extraordinary performances of these wheels.



STERLING VARNISH CO.

The Sterling Varnish Co., of Pittsburg, is showing samples of its pure Sterling extra insulating varnish, and also armature coils which have been insulated by its products. The Sterling pure varnish is very elastic and will stand over 10,000 volts puncture test, it is stated. The company is represented at the convention by H. Lee Bragg, general sales agent, and S. C. Schenck, eastern sales agent. They present customers a very desirable souvenir.



ST. LOUIS CAR CO.

The St. Louis Car Co. is exhibiting a new reversible seat, which has just been patented. It is so designed that the connecting rods under the seat are offset, instead of being close together, thereby permitting the use of the rods as foot rests, and providing space under the seat for a heater, or a sand

box. A 17 in. cushion is used, which allows 16½ in. of seating room without reducing the distance between seat centers, this being a feature of all the reversible seats made by this company. There is also shown a new type of Interurban car seat, with a movable foot rest. In its construction a wall bracket and single-column leg is used, which gives more room and makes it easier to sweep under the seat. The exhibit is in charge of T. E. Huntress, eastern sales agent, assisted by G. J. Smith, superintendent.



TEST OF ECLIPSE FENDERS

In the presence of several hundred spectators the scheduled tests of the Eclipse car fenders were made yesterday. Tests were made with the car moving at 6, 8, 12 and 18 miles per hour and several different men were picked up at these speeds. The demonstrations will be repeated at the same place and hour today—Hamilton street near the Hudson Valley R. R. station, at 12:05 noon and 5:05 p. m.



STUART-HOWLAND CO.

The Stuart-Howland Co. is entertaining in parlor 201 of the Grand Union Hotel. The room is on the first floor just over the lobby. H. W. Smith from the Boston office and H. De Steese from the New York office are doing the honors. The company is making the most comprehensive showing it has ever attempted at a street railway convention, the display of material including 36 types of cars, 3 rib trolley wheels, overhead line suspensions, overhead line brackets in six varieties, Ham Sand Box Co's. trolley catchers and retrievers, Ham swivel trolley harps, etc. The parlor is crowded most of the time.



P. & B. PRODUCTS.

The Standard Paint Co. is keeping open house at its exhibit space opposite the cottages facing the Grand Union court. Samples of the well known P. & B. products are exhibited there, including electrical compounds, insulating tape, armature and field varnish, "Rubberoid" cloth, etc.

The company is calling especial attention to an effective way of insulating and protecting motor leads, and car wires and cables in general. The wires are first wrapped with "Rubberoid" motor cloth and then wound with P. & B. insulating tape. This has been found to afford very efficient protection against moisture and all consequent short circuits with their attending complications.

From a late pamphlet issued by the company concerning P. & B. insulating tape we quote as follows:

"The P. & B. tape has been in use in all parts of the world, under all climates, and has convinced practical electricians everywhere that for durability, economy and general insulative efficiency there is nothing that approaches it. Approved and adopted by expert electricians for many years.

"Its specific advantages are that it always retains its flexibility and it does not dry out.

"Its flexibility ensures first, permanent resistance against mechanical damages; second, ease of application in difficult places, and third, the use of the material over and over again.

"Its non-drying out qualities ensure storing without risk of deterioration, and lasting insulation power.

"The reason it retains its pliability is that it does not dry out; and the reason that it does not dry out is that it is thoroughly saturated with our well-known Compound, which withstands exposure to the weather, resists the drying-out effect of air or gases, and, unlike materials which contain rubber or similar substances, does not vulcanize. It never loses its adhesiveness, but hugs closely and leaves no loose ends. Its waterproof and acidproof qualities make it invaluable for use in underground or submerged work, since it can be depended upon to stay where it is put."

Messrs. Chas. Earnshaw, F. F. Vande Water and N. D. King are in attendance. Electric railway men are presented with a fine combined pocket book, card case and note book.

MUSICAL ANALYSIS

Camden N J W E Harrington Cam-
 den & Sussex Ry Co
 Detroit Mich Thomas Farmer Walter
 H. & T. Ford United Ry Co
 Detroit Mich W W Anshelm
 E. J. Keady Ry Co
 Jersey City N J J M Young P. C.
 & C. Public Service Corporation of N J
 Louisville Ky T. H. Minata, I. H.
 Mather Louisville Ry Co
 Milwaukee Wis Edwin W. Olds, The
 Milwaukee & Lake Ry & Lk Co
 Mobile Ind H J Lucke, Munch, Hart-
 ford & Fort Wayne Ry Co
 Providence R I W D Wright The
 Rhode Island Co
 Rochester N Y Alfred Green, Roches-
 ter Ry. Co.
 Schenectady N Y E. F. Peck, C. F.
 Lewis, John G. Bankut, Schenectady
 Ry Co
 Scranton Pa P J Mullen, Scranton
 Ry Co
 St. Louis, Mo W. O. Mundy, St. Louis
 Transit Co
 Williamsport, Pa Charles T. Herriek,
 Williamsport Passenger Ry Co
 Worcester, Mass William Pestell,
 Worcester Cons. St. Ry Co

The following were also registered at this convention:

Daniel Royle, Street Railway Review, Chicago.
C. R. Fairchild, Jr., Street Railway Review, New York.
T. C. Martin, Electrical World & Engineer, New York.
J. B. O'Hara, Street Railway Journal, New York.
J. R. Cravath, Street Railway Journal, New York.
George S. Davis, Street Railway Journal, New York.
W. G. Thomas, Street Railway Review, Chicago.
W. E. Goldsborough, World's Fair, St. Louis.
W. H. Golde, National Elec. Co., New York.
J. C. Calisch, General Elec. Co., New York.
F. Dubois, Benjamin T. Smith & Company, Gould Martin, Electrical World & Engineer, New York.
R. N. Barry, Street Railway Journal, New York.
W. Karanetoff, St. Petersburg, Russia.

REPRESENTATIVES OF NON-MEMBERS.

Anniston, Ala. — H. W. Sexton, Anniston Elc. & Gas Co.
Atlantic City, N. J. — Benjamin T. Smith,
West Jersey St. Ry. Co.
Bangor, Me. — W. H. Snow, Bangor St. Ry. Co.
Birmingham, Ala. — E. E. Larrabee, Birmingham & Hoosier Valley Railway.
Boston & Mass. — E. T. Millar, Boston & Maine Railway.
Brisbane, Australia — J. S. Badger, Brisbane Tramways.
Burlington, Vt. — Thos. B. Jones, Burlington Traction Co.
Butler, Pa. — William H. Pape, Butler Passenger Railway Co.
Chicago, Ill. — J. W. Cook, West Shore Railroad; B. I. Budd, Metropolitan West Side Elevated Railway.
Chicago, Ill. — J. F. Morrison, South Side Elc. R. R.
Columbus, O. — N. R. Jones, Columbus, London & Springfield Railway.
Eaton, Ind. — H. J. Lake, Muncie, Hartford & Fort Wayne Railway.
Fitchburg, Mass. — W. W. Sargent, Fitchburg & Leominster Street Railway.
Glens Falls, N. Y. — G. B. Adsit, Hudson Valley Railway.
Glens Falls, N. Y. — H. La Barr, Hudson Valley Railway.
Gloversville, N. Y. — H. A. Rockwell, W. H. Collins, Fonda, Johnstown & Gloversville Railroad.
Hudson, N. Y. — R. P. Leavitt, Albany & Hudson, R. R.
Ithaca, N. Y. — Lee H. Parker, Ithaca & Auburn Railway.
Lacoula, N. H. — L. S. Pierce, Lacoula Street Railway.
Middleboro, Mass. — Charles H. Cox, Middleboro, Wareham & Buzzard's Bay Street Railway Co.
Norfolk, Va. — E. S. Ely, Norfolk, Portsmouth & Newport News Railway.
Norfolk, Va. — E. A. Langmuir, Norfolk, Portsmouth & Newport News.
Rutland, Vt. — David Fox, Jr., Rutland Street Railway.
San Diego, Cal. — Homer McNutt, San Diego Railway Co.
Schenectady, N. Y. — Elmer H. Schwarz, General Elc. Railway.
Selma, Ala. — John F. Knowlen, Selma Street Railway.
Springfield, O. — F. O. Nourse, Columbus, London & Springfield Railway.
Stillwater, N. Y. — A. T. Hoyle, Hudson Valley Railway Co.
Stillwater, N. Y. — E. H. Barr, Hudson Valley Railway Co.
Syracuse, N. Y. — W. B. Rockwell, Syracuse, Lakeside & Baldwinsville Ry.
Yonkers, N. Y. — O. Godfrey Morgan, Yonkers, Sharon & New Castle Railway.

Alden, C. A., The Penn. Steel Co., Steel
 ton, Pa.
 Alford, H. H., Rossett Mfg. Co., New
 York, N. Y.
 Ashby, F. L., Hudson River Water Power
 Co., Glens Falls, N. Y.
 Archbold, Wm. K., Archbold Brady Co.,
 Syracuse, N. Y.
 Armstrong, D. K., Ayco & Morrison Brake
 Shoe Mfg. Co., Chicago, Ill.
 Arnold Ward S. Babbler Elec. Mfg. Co.,
 Cincinnati, O.
 Allen, R. L., Archbold Brady Co., Syra-
 cuse, N. Y.
 Allen, J. A., Continuous Rail Joint Co.,
 Newark, N. J.
 Aspinwall, E. M., Westinghouse Elec. &
 Mfg. Co., Pittsburg, Pa.
 Abbott, H. B., Street Ry. Journal, New
 York, N. Y.
 Aldern, Thomas, Chicago Pneumatic Tool
 Co., New York.
 Andrews, J. M., General Elec. Co., Schen-
 ectady, N. Y.
 Angerer, Victor, Wm. Wharton, Jr. & Co.,
 Inc., Philadelphia, Pa.
 Atkin, G. H., Elec. Storage Battery Co.,
 Chicago, Ill.
 Atkinson, J. M., J. M. Atkinson & Co.,
 Chicago, Ill.
 Armstrong, Wm. A., Jr., The Mayer &
 England Co., Philadelphia, Pa.
 Archibald, E. B., Berry Bros. Ltd., De-
 troit, Mich.
 Brainer, R. J., Continuous Rail Joint Co.,
 Newark, N. J.
 Brainer, L. F., Continuous Rail Joint Co.,
 Newark, N. J.
 Berzental, V. W., American Automatic
 Switch & Signal Co., Chicago, Ill.
 Baker, C. H., American Automatic Switch
 & Signal Co., Chicago, Ill.
 Belknap, R. Ernest, The Penn. Steel Co.,
 Chicago, Ill.
 Brown, Wylie, Bridgeport Brass Co., New
 York, N. Y.
 Bates, C. F., National Ticket Co., Cleve-
 land, O.
 Beard, W. K., Street Ry. Journal, Phila-
 delphia, Pa.
 Barret, John W., Hepwood Barret Fender
 Co., Boston, Mass.
 Babson, A. D., General Elec. Co., New
 York, N. Y.
 Brumder, John R., Universal Brake, Lan-
 caster, Pa.
 Brumder, John F., Universal Brake, Lan-
 caster, Pa.
 Best, Geo., Traction Equipment Co., Brook-
 lyn, N. Y.
 Ballard, Charles A., Magnetic Equipment
 Co., Chicago, Ill.
 Bonham W. R., Jandus Elec. Co., Cleve-
 land, O.
 Bonham, W. R., Buckeye Elec. Co., Cleve-
 land, O.
 Burgess, Chas. L., Safety Car Strap Co.,
 New York, N. Y.
 Bonham, W. R., Street Ry. Blue Book,
 Chicago, Ill.
 Borthurst, W. C., Elec. Engineer, Brook-
 lyn, N. Y.
 Bruce, H. P., Dumara Elec. Co., George-
 town, British Gulana.
 Brady, C. A., Archbold Brady Co., Syra-
 cuse, N. Y.
 Bitholmer, F. B., Kinnear Mfg. Co., Col-
 umbus, O.
 Barnes, G. A., Street Ry. Review, Chi-
 cago, Ill.
 Baker, Frank B., American Elec. Works,
 Philadelphia, Pa.
 Bates, Putnam, A., Cracker-Wheeler Co.,
 Amherst, N. Y.
 Barnes, R. N. C., Cracker-Wheeler Co.,
 Boston, Mass.
 Batterfield, J. L., St. Louis Car Wheel
 Co., St. Louis, Mo.
 Bloomingdale, Frank, Keefer Car Switch
 Co., Albany, N. Y.
 Barry, Charles E., General Elec. Co.,
 Schenectady, N. Y.
 Remis, Geo. A., Ohio Brass Co., Mans-
 field, O.
 Ribbard, Chas., Elec. Storage Battery Co.,
 Philadelphia, Pa.
 Barry, J. G., General Elec. Co., Schen-
 ectady, N. Y.
 Barnard, B. S., Standard Vit-Condukt Co.,
 New York.
 Brand, L. F., Continuous Rail Joint Co.,
 Newark, N. J.
 Berry, Bertram, Heywood Bros. & Wake-
 field Co., New York.
 Berg, Max A., Porter & Berg, Chicago, Ill.
 Barr, B. M., Continuous Rail Joint Co.,
 Newark, N. J.
 Brown, Harold P., Self, New York.
 Burton, Chas. G., National Electric Co.,
 Chicago, Ill.
 Babstrie, C. A., Street Railway Journal,
 New York, N. Y.
 Bruck, J. N., Bruck Solidified Oil Co., Bos-
 ton, Mass.
 Berry, R. N., Street Railway Journal, New
 York, N. Y.
 Brad, P. M., Lorain Steel Co., Lorain, O.
 Brad, L. I., Pittsburg Insulating Co.,
 Pittsburg, Pa.
 Bragg, H. Lee, Sterling Varnish Co., Pitts-
 burg, Pa.
 Brinkman, Harry, Eclipse Car Fender Co.,
 Cleveland, O.
 Bony, J. G., General Elec. Co., Schenec-
 tady, N. Y.

Bushnell, W. G., General Elec. Co., New Haven, Conn.
 Bailey, T. P., General Elec. Co., Chicago, Ill.
 Barbour, I. F., General Elec. Co., San Francisco, Cal.
 Bigelow, Harry, Hale & Kilburn, Chicago, Ill.
 Basker, Edwin H., Galeum Signal Oil Co., Franklin, Pa.
 Bell, W. H., Le Valley Vitae Carbon Brush Co., New York, N. Y.
 Burwell, J. H., Edward Smith & Co., New York, N. Y.
 Batdorf, C. S., National C. Machine Co., New York, N. Y.
 Batdorf, J. W., National C. Machine Co., New York, N. Y.
 Bradfield, H. S., American Brake Shoe & Foundry Co., New York, N. Y.
 Barrett, F. S., Durkin & Barret Mfg. Co., Scranton, Pa.
 Barry, L. W., The Sherwin-Williams Co., Boston, Mass.
 Bonenfant, D., Consolidated Car Fender Co., Providence, R. I.
 Baldwin, C. K., Robins Conveying Mt. Co., New York, N. Y.
 Blakesley, J. E., American Automatic Switch & Signal Co., Chicago, Ill.
 Bradley, F. J., Continuous Roll Joint Co., Newark, N. J.
 Bucknabster, Geo. H., Pettlingill Andrews Co., Boston, Mass.
 Bingham, H. S., Vt. State Railroad Co., Bennington, Vt.
 Benham, John, The International Register Co., Chicago, Ill.
 Bailey, Theo. P., General Elec. Co., Chicago, Ill.
 Barnard, W. H., Standard Vitrified Conduit Co., New York.
 Bar, James C., Weber Ry. Joint Mfg. Co., New York.
 Beach, H. E., Sterling Meaker, Newark, N. J.
 Belknap, R. E., Penn. Steel Co., Chicago, Ill.
 Benzel, Arthur, National Lead Co., St. Louis, Mo.
 Bigelow, Geo. S., Chicago Varnish Co., Chicago, Ill.
 Bigelow, H. T., Hale & Kilburn Mfg. Co., Chicago, Ill.
 Blewett, Scott H., Am. Car & Foundry Co., St. Louis, Mo.
 Bilzard, Chas., Elec. Storage Battery Co., Philadelphia, Pa.
 Boyer, W. L., Peckham Mfg. Co., Kingston, N. Y.
 Brotherhood, Fred., Ry. Appliance Co., Chicago and New York.
 Brown, W. H., International Register Co., Chicago, Ill.
 Brown, W. Scott, Lorain Steel Co., Lorain, O.
 Bittenheim, Harold S., Street Ry. Journal, New York.
 Blackinton, A. D., Howe Mfg. Co., Scranton, Pa.
 Bernard, E. G., E. G. Bernard Co., Troy, N. Y.
 Blake, Henry W., Street Ry. Journal, New York, N. Y.
 Beatty, Ed., The Elec. Motor & Equipment Co., Newark, N. J.
 Cahill, Frank, Gold Car & Lighting Co., New York, N. Y.
 Church, T. V., Boston Car Wheel Co., Boston, Mass.
 Chapman, Wm. A., Continuous Roll Joint Co. of America, Boston, Mass.
 Clarke, J. Brooks, Westinghouse Traction Brake Co., Cincinnati, O.
 Conant, E. W., Testing Instruments, Cambridge, Mass.
 Concer, G. V. A., The Franklin Rolling Mill & Foundry Co., Franklin, Pa.
 Cornell, Geo. B., Traction Equipment Co., Brooklyn, N. Y.
 Creaghead, Thos. J., The Creaghead Engineering Co., Cincinnati, O.
 Crote J. Maxwell, Harold P. Brown, New York, N. Y.
 Cannon, George, Harold P. Brown, New York, N. Y.
 Cooke, W. J., McGuire Mfg. Co., Chicago, Ill.
 Chamberlain, E. G., Standard Pole & Tie Co., New York, N. Y.
 Compto, A. E., Rossiter, MacGovern & Co., New York, N. Y.
 Canfield, M. C., Stanley Electric Mfg. Co., Weymouth, Mass.
 Callach, J. C., General Elec. Co., Buffalo, N. Y.
 Clark, W. J., General Elec. Co., London, England.
 Corbin, M. M., General Elec. Co., Cincinnati, O.
 Creshe, W. C., The Celluloid Co., New York, N. Y.
 Cunningham, J. T., National Elec. Co., New York, N. Y.
 Clarke, J. V., Le Valley Vitae Carbon Brush Co., New York, N. Y.
 Carey, W. G., General Elec. Co., Schenectady, N. Y.
 Crowell, H. H., General Elec. Co., Syracuse, N. Y.
 Clark, W. E., Continuous Roll Joint Co., Newark, N. J.
 Cockley, W. A., The Mayer & England Co., Philadelphia, Pa.
 Coakley, F. J., Samson Cordage Works, Boston, Mass.

- Curwen, Samuel M., J. G. Brill Co., Philadelphia, Pa.
 Curran, Charles S., Penn. Steel Co., Boston, Mass.
 Cuzak, Wm. C., Penn. Steel Co., Philadelphia, Pa.
 Collins, R. V., American Automatic Switch Co., New York, N. Y.
 Clark, C. H., C. S. Knowles, Boston, Mass.
 Clark, Wm. S., General Elec. Co., Schenectady, N. Y.
 Clossy, Frank, Clark, Standard Under-ground Cable Co., Boston, Mass.
 Coady, Safford K., Pittsburgh Reduction Co., New York, N. Y.
 Clark, Charles S., Penn. Steel Co., Boston, Mass.
 Clark, D. W., Flood & Conklin Co., New York, N. Y.
 Condit, E. J., Continuous Rail Joint Co., Troy, N. Y.
 Crary, Thos. F., John Stephenson Co., Boston, Mass.
 Cuskey, John, Chicago Pneumatic Tool Co., New York.
 Casile, Charles C., Hildreth Varnish Co., New York.
 Christensen, N. A., Milwaukee, Wis.
 Collins, W. F., Western Electrician, Chicago, Ill.
 Coleman, Chas. E., Eugene Munsell Co. and Mica Insulator Co., Chicago, Ill.
 Corbin, M. M., General Elec. Co., Cincinnati, O.
 Cook, J. W., West Shore Ry., Chicago, Ill.
 Cooke, W. J., McGuire Mfg. Co., Chicago, Ill.
 Crawford, D. D., Mayer & England Co., Philadelphia, Pa.
 Clitz, Randolph, Lorain Steel Co., Lorain, O.
 Chur, Walter, American Ry. Supply Co., New York, N. Y.
 Campbell, R. M., Western Elec. Co., New York, N. Y.
 Davis, O. S., Hepwood Barrett Fender Co., Boston, Mass.
 DeLoe, Archibald B., Detroit Trolley & Mfg. Co., New York, N. Y.
 Dick, H. C., Flood & Conklin Co., Newark, N. J.
 Dool, John C., Standard Varnish Works, New York, N. Y.
 Dool, Wm., Universal Brake, Lancaster, Pa.
 Dool, Samuel T., Stanley Elec. Mfg. Co., Pittsfield, Mass.
 Draffen, E. L., Gould Storage Battery Co., Chicago, Ill.
 De Witt, De Witt Sand Box Co., Troy, N. Y.
 De Stoeck, Harry, Stuart Howland Co., New York, N. Y.
 Davis, Rossiter, MacGovern & Co., New York, N. Y.
 Davis, Geo. S., Street Ry. Journal, Cleveland, O.
 DeLoe, E. J., Lorain Steel Co., New York, N. Y.
 Doehdter, H. W., The Doehdter Winder, Watertown, N. Y.
 Dixon, J. E., Jr., National Elec. Co., New York, N. Y.
 Denton, J. H., National Elec. Co., New York, N. Y.
 Duclon, Louis O., Mass. Chemical Co., Boston, Mass.
 Decker, John C., John C. Decker, Chicago, Ill.
 Donecker, H. E., Security Register Co., St. Louis, Mo.
 Duane, Morgan A., Archibald Brady Co., Syracuse, N. Y.
 Davidson, W. T., Magnetic Equipment Co., Chicago, Ill.
 Jones, James L., American Car & Foundry Co., Chicago, Ill.
 Durkin, John P., Scranton St. Ry. Co., Scranton, Pa.
 Davidson, W. T., Magnetic Equipment Co., Chicago, Ill.
 Dutton, W. A., Van Dorn Dutton Co., Cleveland, O.
 De Gress, Francis B., Crocker Wheeler Co., New York, N. Y.
 Downs, John H., Chimney Fence Post Co., New York, N. Y.
 Davis, Walter R., Pittsburgh Reduction Co., New York, N. Y.
 Decker, M., Gold Car Heating Co., New York, N. Y.
 Decker, W. L., Dayton Automobile Co., New York.
 Decker, Edward, Chas. H. De Witt & Co., Saratoga, N. Y.
 Decker, Richard E., Pipe Supply Co., Cleveland, O.
 Decker, H. J., J. G. White & Co., New York, N. Y.
 Decker, Geo. E., The Elec. Arc Motor & Lamp Co., Newark, N. J.
 Decker, J. W., Philadelphia, Pa.
 Decker, G. Van, Hart & Co., New York, N. Y.
 Decker, Philip S., Electrical Review, New York, N. Y.
 Decker, J. R., Albert & J. M. Anderson, Pittsfield, Mass.
 Decker, Geo. C., Self, Boston, Mass.
 Elliott, W. H., The Elliott Bros. Elec. Co., Cleveland, O.
 Elliott, Wm. C., Globe Elec. Mfg. Co., Cleveland, O.
 Elliott, H. C., Lorain Steel Co., New York, N. Y.
 Elliott, George A., The Duff Mfg. Co., Pittsburg, Pa.
 Edwards, O. M., O. M. Edwards Co., Syracuse, N. Y.
 Eckert, Harry A., Ohmer Fare Register Co., Dayton, O.
 Eckert, G. P., The Safety Ins. Wire & Cable Co., New York, N. Y.
 Elbaum, E. A., The Sherwin Williams, Cleveland, O.
 Elliott, George W., Electrical World & Engineer, New York, N. Y.
 Elliott, J. N., Van Dorn & Elliott Elec. Co., Cleveland, O.
 Estep, F. A., R. D. Nuttall Co., Pittsburg, Pa.
 Everett, John O., Peckham Mfg. Co., New York, N. Y.
 Erishaw, Chas., Standard Paint Co., Boston, Mass.
 Eldred, John E. Jr., N. A. Christensen, Milwaukee, Wis.
 Ellis, S. P. S., Lorain Steel Co., Pittsburg, Pa.
 Evans, D. J., Lorain Steel Co., Lorain, O.
 Eckert, W. S., The National Conduit & Cable Co., New York, N. Y.
 Englund, A. H., The Mayer & Englund Co., Philadelphia, Pa.
 Ebers, Karl F., Westinghouse Elec. & Mfg. Co., Pittsburg, Pa.
 Foster, James A., The Adams & Westlake Co., Philadelphia, Pa.
 East, Robert K., Trolley Supply Co., Canton, O.
 Farmer, Thos., American Machine & Elec. Assn., Detroit, Mich.
 Fairchild, C. B., Jr., Street Ry. Review, New York, N. Y.
 Foote, Wm. A. E., Bullock Elec. Mfg. Co., Cincinnati, O.
 Foster, Geo. F., Bullock Elec. Mfg. Co., Chicago, Ill.
 Fryling, G. P., Speer Carbon Co., St. Marys, Pa.
 Forsyth, W. H., The Curtain Supply Co., Chicago, Ill.
 Forward, Chauncey B., Eclipse Car Fender Co., Cleveland, O.
 Fleming, A. E., Werner Lamp Co., Pittsburg, Pa.
 Fuller, John, Robins C. Belt Co., New York, N. Y.
 Fowler, H. W., American Car & Foundry Co., Chicago, Ill.
 Fowler, William H., American Car & Foundry Co., Chicago, Ill.
 Fulton, Geo. C., Neal Duplex Brake, Everett, Mass.
 Fitzpatrick, Joseph, The Penn. Steel Co., Boston, Mass.
 Fowler, George, Master Car Builder, Car Dept., Briggs Co., Amesbury, Mass.
 Fowler, W. F., Westinghouse Elec. & Mfg. Co., Baltimore, Md.
 Finney, John H., Pittsburgh Reduction Co., Washington, D. C.
 Flood, Patrick, Taylor Elec. Truck, Albany, N. Y.
 Field, Wm. W., Barbour-Stockwell Co., Cambridge, Mass.
 Fitch, W. H., Walter Macleod Co., Cincinnati, O.
 Foster, Geo. B., Bullock Elec. Mfg. Co., Chicago, Ill.
 French, Henry W., Consolidated Engine Stop Co., New York.
 Fitch, Dan J., Security Register Co., St. Louis, Mo.
 Farr, Eugene H., The Farr & Foster Co., Chicago, Ill.
 Fode, E. J., Bullock Elec. Cincinnati, O.
 Frost, Harry W., Berry Bros., Ltd., Detroit, Mich.
 Falk, Otto H., The Falk Co., Milwaukee, Wis.
 Green, James A., The Weber Ry. Joint Mfg. Co., New York, N. Y.
 Gayley, W. F., Taylor Elec. Truck Co., Troy, N. Y.
 Gendemer, Arthur, American Brake Shoe & Foundry Co., Columbus, O.
 Garrett, Frank W., Stanley Elec. & Mfg. Co., Pittsfield, Mass.
 Goble, W. H., National Elec. Co., Philadelphia, Pa.
 Gruesee, E. W., Galena Signal Oil Co., Franklin, Pa.
 Green, E. C., Mass. Chemical Co., Boston, Mass.
 Goldborough, W. E., St. Louis World's Fair, Chief Dept. Electricity.
 Goddard, Walter, Archibald Brady Co., Worcester, Mass.
 Green, G. D. B., General Elec. Co., Schenectady, N. Y.
 Gough, S. P. M., Continuous Rail Joint Co., Chicago, Ill.
 Green, Francis C., Con. Car Heat Co., Albany, N. Y.
 Gay, H. B., Elec. Storage Battery Co., Cleveland, O.
 Gordon, J. R., Westinghouse Elec. & Mfg. Co., Atlanta, Ga.
 Garton, W. R., The W. R. Garton Co., Chicago, Ill.
 Gale, F. H., General Elec. Co. Schenectady, N. Y.
 Gold, Edward E., Gold Car Heating & Lighting Co., New York, N. Y.
 Galtzger, J. M., The Mayer & Englund Co., Philadelphia, Pa.
 Gowing, J. P., Pratt & Lambert, Chicago, Ill.
 Gorching, Chas. E., Sterling-Meaker Co., Newark, N. J.
 Garrett, B. A., General Elec. Co. Schenectady, N. Y.
 Heulings, W. H., Jr., J. G. Brill Co., Philadelphia, Pa.
 Henry, Fred. H., Heywood Bros. & Wakefield Co., Boston, Mass.
 Hubbard, Harry M., Beckwith Chandler Co., New York, N. Y.
 Hepwood, George, Hepwood Barrett Fender Co., Boston, Mass.
 High, John M., Fantasote Co., New York, N. Y.
 Ham Sand Box Co., Troy, N. Y.
 Hamlin, J. S., National Elec. Co., Chicago, Ill.
 Hawley, Cornell S., Consolidated Car Heating Co., New York, N. Y.
 Hann, J. A., Peckham Mfg. Co., Cleveland, O.
 Harrington, C. J., Self, New York, N. Y.
 Howe, E., Chase Shawmut Co., Boston, Mass.
 Hilton, A. H., Chicago Car Wheel & Foundry Co., Chicago, Ill.
 Henry, Alex. S., Railway Steel Spring Co., New York, N. Y.
 Hollywood, James, Harold P. Brown, New York, N. Y.
 Hastings, G. S., George S. Hastings & Co., Cleveland, O.
 Hinman, Walter, Ohmer Fare Register Co., Dayton, O.
 Hamlin, W. R., Stanley Elec. Mfg. Co., Pittsfield, Mass.
 Huntley, Charles R., Cataract Power & Conduit Co., Buffalo, N. Y.
 Hequemour, K. D., Consolidated Car Heating Co., Chicago, Ill.
 Handlin, J. S., National Elec. Co., Chicago, Ill.
 Hutchinson, F. L., National Elec. Co., Milwaukee, Wis.
 Hall, F. B., The International Register Co., Chicago, Ill.
 Hayes, J. M., The Recording Fare Register Co., New Haven, Conn.
 Hollingsworth, Geo., Consolidated Car Fender Co., New York, N. Y.
 Hall, E. C., Consolidated Car Fender Co., New York, N. Y.
 Ham, Dick, Dick Ham, Stockport, N. Y.
 Hamlin, W. E., Ohmer Fare Register Co., Dayton, O.
 Hoyt, Dank, National Lark Washer Co., Newark, N. J.
 Harten, P. H., Elec. Ry. Equipment Co., Cincinnati, O.
 Hall, W. A., Archibald Brady Co., Syracuse, N. Y.
 Haldinshaw, W. M., I. R. & G. P. Ins. Co., Yonkers, N. Y.
 Honey, B. H., Magnetic Equipment Co., Chicago, Ill.
 Helstedt, E. H., Chicago Mica Co., Valparaiso, Ind.
 Harris, C. M., Pittsburgh Reduction Co., Cleveland, O.
 Hart, Orlando W., Hart Signal Co., Fall River, Mass.
 Hour, E. P., Chase-Shawmut Co., Boston, Mass.
 Haskell, G. M., J. G. Brill Co., Philadelphia, Pa.
 Hafner, Jno. A., Jno. A. Hafner, Pittsburg, Pa.
 Harwood, Geo. A., Maunfield, O.
 Hall, Harold, Chas. H. De Witt & Co., New York, N. Y.
 Harten, Phil. F., Elec. Ry. Equipment Co., Cincinnati, O.
 Hills, A. F., Crouse-Hinds Elec. Co., Syracuse, N. Y.
 Hinman, E. D., Sterling-Meaker Co., Newark, N. J.
 Hodges, Percy, Pittsburgh Reduction Co., Boston, Mass.
 Hoerl, John, Milwaukee, Wis.
 Holbrook, Percy, Weber Ry. Joint Mfg. Co., New York.
 Holloway, H. C., Weber Ry. Joint Mfg. Co., Chicago, Ill.
 Hopewell, Chas. F., Union Signal Co., Boston, Mass.
 Hopewell, F. R., L. C. Chase & Co., Boston, Mass.
 Hughes, T. E., Standard Underground Cable Co., Philadelphia, Pa.
 Humphreys, James, H. W. Johns Manville Co., Boston, Mass.
 Huntress, F. E., St. Louis Car Co., Boston, Mass.
 Harper, R. H., Western Elec. Co., Philadelphia, Pa.
 Hoopes, Wm., The Pittsburg Reduction Co., Pittsburg, Pa.
 Harpence, E. L., Empire Wire Co., New York, N. Y.
 Hennan, J. B., National Conduit & Cable Co., New York, N. Y.
 Johnson, O. W., Johnson Miking Frog Co., Cleveland, O.
 Johnson, F. H., The Ohio Brass Co., Mansfield, O.
 Jerkins, H. S., Hopwood Barrett Fender Co., Boston, Mass.
 Jenkins, B. B., Removing Sander Co., Toronto, Can.
 Johnston, A. R., Clarence Brooks & Co., Newark, N. J.
 Johnson, O. P., Star Brass Works, Kalamazoo, Mich.
 Jay, John C., Jr., The Penn. Steel Co., New York, N. Y.
 Johnson, Wm. T., Dearborn Drug & Chemical Works, Philadelphia, Pa.
 Jackson, W. T., G. M. Geat, New York and Cincinnati.

- Kays, S. B., Consolidated Car Heating Co., New York, N. Y.
 Kays, C. P., Brady Brass Co., Jersey City, N. J.
 Ketch, H. E., Federal Mfg. Co., Cleveland, O.
 Knight, Charles D., National Elec. Co., Milwaukee, Wis.
 King, C. K., The Ohio Brass Co., Mass., Ind., O.
 Kirschner, W. R., Columbia Machine Works & Malleable Iron Co., Brooklyn, N. Y.
 King, Henry E., Brady Brass Co., Jersey City, N. J.
 Ketterman, Chas., Ohmer Fare Register Co., Dayton, O.
 Kennedy, Frank R., The Recording Fare Register Co., New Haven, Conn.
 Keenan, W. J., Pottingell Andrews Co., Boston, Mass.
 Keshanoff, Basil G., Benjamin Lee Mfg. Co., Chicago, Ill.
 Kneibell, H. J., Street Railway Review, New York, N. Y.
 Knott, Henderson W., Elmer P. Morris Co., New York, N. Y.
 Kurapetoff, Vladimir, Polytechnic Institute, St. Petersburg, Russia.
 Kent, R. B., Atlas Railway Supply Co., Chicago, Ill.
 Knight, C. S., Jr., American Steel & Wire Co., Chicago, Ill.
 Knickerbocker, C. K., Griffin Wheel Co., Chicago, Ill.
 Kiefer, J. W., Kiefer Car Switch Co., Albany, N. Y.
 Kenfield, F. S., Street Railway Review, Chicago, Ill.
 Kulas, A. T., Railway Appliances Co., Chicago, Ill.
 Keenan, N. C., Wabash Ry., Chicago, Ill.
 Keenan, L., Chicago, Ill.
 Kenfield, Fred. S., Street Ry. Review, Chicago, Ill.
 Kimball, H. P., Stand. Underground Cable Co., New York.
 Kingston, Wm. W., Lorain Steel Co., Atlanta, Ga.
 Kirkpatrick, E. E., Melroy Clay Works, Chicago, Ill.
 Kleinschmidt, H. F. A., Lorain Steel Co., Johnstown, Pa.
 King, S. D., Standard Paint Co., New York, N. Y.
 Kolseth, T. T., Westinghouse Air Brake Co., Boston, Mass.
 Ketchum, F. O., E. L. Post & Co., New York, N. Y.
 Kidder, S. J., Westinghouse Air Brake Co., St. Louis, Mo.
 Kappella, N. S., General Elec. Co., Schenectady, N. Y.
 Kennedy, F. B., Electric Storage Battery Co., Philadelphia, Pa.
 Lawless, E. J., John Stephenson Co., Elizabeth, N. J.
 Levy, I., Universal Brake, Lancaster, Pa.
 Luther, Charles E., The Adjustable Passenger Strap, Pawtucket, R. I.
 Littlejohn, Chas. F., Recording Fare Register Co., New Haven, Conn.
 Ludlow, W. E., Ludlow Supply Co., Cleveland, O.
 Ludlow, J. B., Ludlow Supply Co., Cleveland, O.
 Ludlow, E. S., Federal Mfg. Co., Cleveland, O.
 Lingham, John, C. J., Harrington, New York, N. Y.
 Lozier, R. T., Bullock Elec. Mfg. Co., Cincinnati, O.
 Long, Robert, National Elec. Co., New York, N. Y.
 Lovejoy, J. R., General Electric Co., Schenectady, N. Y.
 Lane, John J., Street Railway Bulletin, Boston, Mass.
 Long, Robt., National Elec. Co., Buffalo, N. Y.
 Leet, Chas. N., National Elec. Co., Cleveland, O.
 Locke, Fred. M., The Locke Insular Mfg. Co., Victor, N. Y.
 Lovell, Ray, Columbus Steel Rolling Shutter Co., Columbus, O.
 Lev, Benjamin, Eclipse Car Fender Co., Cleveland, O.
 Linn, J. B., General Elec. Co., Springfield, O.
 Locke, F. M., Locke Insulator Mfg. Co., Archbold-Brady Co., Victor, N. Y.
 Luther, H. R., Harbour Stockwell, Cambridgeport, Mass.
 Lapp, John S., C. S. Knowles, Boston, Mass.
 Laxton, Fred. M., General Elec. Co., Atlanta, Ga.
 Lockwood, Jas. E., Bullock Elec. Mfg. Co., Elec. Storage Battery Co., Detroit, Mich.
 Liddenger, Joseph, Dayton Mfg. Co., Dayton, O.
 Liddenger, Peter, Dayton Mfg. Co., Dayton, O.
 Lyons, James W., Allis-Chalmers Co., Chicago, Ill.
 Lucas, George C., The Cleveland Frog & Crossing Co., Cleveland, O.
 Lyman, James, General Elec. Co., Chicago, Ill.
 Long, E. G., Peckham Mfg. Co., New York, N. Y.
 Lovell, W. W., Westinghouse Elec. & Mfg. Co., Cleveland, O.
 Meek, J. E., H. W. Johns-Manville Co., New York.
 Mond, George A., The Ohio Brass Co., Mass., Ind., O.
 Mickey, R. K., National Carbon Co., Cleveland, O.
 Morse, I. R., The A. B. Co., Boston, Mass.
 Morrison, Frank, D. Chase-Shawmut Co., Boston, Mass.
 Morton, Fred L., Standard Pole & Tie Co., New York.
 Martin, R. C., Electrical World & Engineer, New York.
 Mersberg, C. F., Eclipse Car Fender Co., Cleveland, O.
 Mahoney, J. J., General Elec. Co., New York.
 Moore, R. E., General Elec. Co., Philadelphia, Pa.
 Mullin, E. H., General Elec. Co., New York.
 Mullin, M., Taylor Elec. Trust Co., Troy, N. Y.
 Moore, J. Arch, Consolidated Car Heating Co., Albany, N. Y.
 Maguire, J. D., National Elec. Co., New York.
 McD, C. H., The Bates Car Truck Co., New York.
 Miller, Louis H., United States Steel Co., West Chester, Mass.
 Mohr, David, American Car Seat Co., Brooklyn, N. Y.
 Marsh, J. C., Westinghouse Elec. & Mfg. Co., Cincinnati, O.
 Markham, L. L., G. S. Hastings & Co., Cleveland, O.
 Murray, M. S., Robins Conveying Belt Co., New York.
 Morris, D. E., Elmer P. Morris Co., New York.
 Morris, Elmer P., Elmer P. Morris Co., New York.
 Morris, W. E., Pa. Steel Co., Pittsburgh, Pa.
 Munford, Irving H., Flood & Conklin Co., Newark, N. J.
 Miller, J. G., Penna. Steel Co., St. Louis, Mo.
 Meador, H. E., Penna. Steel Co., Philadelphia, Pa.
 Morrow, E. E., Hudson River Water Power Co., Glens Falls, N. Y.
 McManmon, P. J., Elec. Bureau, New York.
 McInley, Thomas A., Duff Mfg. Co., Pittsburgh, Pa.
 McGill, T. O., American Brake Shoe & Foundry Co., Chicago, Ill.
 McVicker, M. B., Dearborn Drug & Chemical Works, New York.
 McGuire, W. A., McGuire Mfg. Co., Chicago, Ill.
 MacGovern, Frank, Rossiter MacGovern, New York.
 McDonald, Rossiter MacGovern & Co., New York.
 MacKenzie, E., Renoving Sander Co., Toronto, Can.
 McLevee, Frederick C., Railway Steel Spring Co., New York.
 McClellan, The Curtain Supply Co., Chicago, Ill.
 McDonald, W. S., Detroit Trolley & Mfg. Co., Ltd., Detroit, Mich.
 McGraw, James H., Street Ry. Journal, New York.
 McIntyre, J. R., Archbold-Brady Co., Syracuse, N. Y.
 McCarthy, Joseph F., The Mayer & England Co., Philadelphia, Pa.
 Machen, J. W., Pittsburgh Reduction Co., Pittsburgh, Pa.
 Mahoney, J. E., Louis Pfingst, Boston, Mass.
 Moore, Harry P., Chase-Shawmut Co., Boston, Mass.
 McMichael, J. G., Atlas Ry. Supply Co., Chicago, Ill.
 McCollum, F. E., Momentum Brake Co., Toronto, Can.
 Morgan, George E., Merritt & Co., Philadelphia, Pa.
 Manson, D. E., Westinghouse Elec. & Mfg. Co., Boston, Mass.
 Meach, Charles E., Wilmarth & Norman Co., Grand Rapids, Mich.
 Myers, J. Harry, Safety Car Strap Co., New York.
 Marsh, C. J., Standard Underground Cable Co., New York.
 Medbury, Charles F., Westinghouse Elec. & Mfg. Co., Detroit, Mich.
 McCarty, Norman, Am. Diesel Engine Co., New York.
 McGough, S. P., Continuous Rail Joint Co., Chicago, Ill.
 McKee, J. R., General Elec. Co., Schenectady, N. Y.
 Magann, G. T., G. T. Magann Air Brake Co., Detroit, Mich.
 Main, C. N., G. T. Magann Air Brake Co., Detroit, Mich.
 Marshall, Cloyd, Louisiana Purchase Exposition, St. Louis, Mo.
 Mathias, Robert, Frank Riddon Co., Boston, Mass.
 Maycock, J., Pratt & Lambert, New York.
 Metzger, A. H., Knell Air Brake Co., Battle Creek, Mich.
 Morrison, J. B., G. T. Magann Air Brake Co., Detroit, Mich.
 Horse, G. T., Rochester Car Wheel Works, New York.
 Morse, Chas. H., Union Signal Co., Cambridge, Mass.
 Metcalf, A. E., H. F. Sawville, Philadelphia, Pa.
 McHugh, Wm., Standard Underground Cable Co., Pittsburgh, Pa.
 Murphy, R. B., C. J. Field, New York, N. Y.
 Marchbanks, E., Allis-Chalmers Co., Chicago, Ill.
 Mayer, Chas. J., Mayer & England Co., Philadelphia, Pa.
 Meritt, Fred L., Standard Pole & Tie Co., New York, N. Y.
 Merrill, Robert, John Manville Co., New York, N. Y.
 Mason, Geo. T., The Okonite Co., New York, N. Y.
 Matson, John L., I. I. T. Co., Anderson, Ind.
 Noyes, G. G., O. M. Edwards Co., Saratoga, N. Y.
 Norwood, J. E., Baltimore Ry. Spec. Co., Baltimore, Md.
 Nichol, Frank M., Taylor Electric Truck Co., Troy, N. Y.
 Nealley, H. A., Joseph Dixon Crucible Co., Jersey City, N. J.
 Newcomb, F. H., F. H. Newcomb, Brooklyn, N. Y.
 Neff, J. J., National Electric Co., Chicago, Ill.
 Nickerson, James H., U. S. Electric Signal Co., Newton, Mass.
 Netherland, Edgar S., Edge Iron Works, Chicago, Ill.
 Nel, Joe B., National Electric Co., Chicago, Ill.
 Noyes, Ernest H., Pittsburgh Reduction Co., Chicago, Ill.
 Ochtmann, H. C., Printers Union, Saratoga, N. Y.
 Ornick, W. K., G. T. Magann Air Brake Co., Detroit, Mich.
 Overstreet, H. E., Climax Fence Post Co., Chicago, Ill.
 Overstreet, H. M., Climax Fence Post Co., Chicago, Ill.
 Ohmer, John F., Ohmer Fare Reg. Co., Dayton, O.
 Old, A. F., Hale & Kilburn, New York.
 Oberg, Chas. C., Oberg & Co., Boston, Mass.
 Olliphant, C. D., John Stephenson Co., New York.
 Olson, James B., India Rubber & Gutta Percha Ins. Co., New York, N. Y.
 Padgett, Wm., Street Railway Review, Chicago, Ill.
 Parmenter, Geo. A., Parmenter Fender & Wheel Guard Co., Boston, Mass.
 Parrish, J. H., Ball & Wood Co., Chicago, Ill.
 Parr, Joseph, Chf. Pneumatic Tool Co., New York.
 Partridge, Arthur T., Street Ry. Supplies, St. Louis, Mo.
 Phillips, F. Y., G. T. Magann Air Brake Co., Detroit, Mich.
 Pierson, F. B., National Lead Co., Detroit, Mich.
 Pietzcker, E. J., Stand. Underground Cable Co., Chicago, Ill.
 Post, L. A., Weber Ry. Joint Mfg. Co., Chicago, Ill.
 Poorman, Warren M., Boston, Mass.
 Pierson, William J., The Adams & Westlake Co., Chicago, Ill.
 Porter, J. W., Porter & Berg, Chicago, Ill.
 Porterfield, C. D., Atlas Ry. Supply Co., Chicago, Ill.
 Potter, W. B., General Elec. Co., Schenectady, N. Y.
 Pierce, C. C., General Elec. Co., Boston, Mass.
 Page, A. D., General Elec. Co., Harrison, N. J.
 Palmer, R. W., General Elec. Co., Cincinnati, O.
 Porter, C. E., E. W. Bliss Co., Brooklyn, N. Y.
 Power, W. W., National Elec. Co., Philadelphia, Pa.
 Perry, James W., H. W. Johns-Manville Co., New York.
 Proal, A. B., Robins Conveying Belt Co., New York.
 Pratt, G. E., Star Brass Works, Kalamazoo, Mich.
 Pratt, Mason D., Penn. Steel Co., Steelton, Pa.
 Parsons, G. W., Penn. Steel Co., Steelton, Pa.
 Proudfoot, W. R., Elec. Storage Battery Co., Philadelphia, Pa.
 Perry, Frank L., Western Electrician, Chicago, Ill.
 Pfingst, Louis, Louis Pfingst, Boston, Mass.
 Pennock, J. H., American Aut. Switch Co., New York.
 Preston, Robert K., Chicago Truck Co., Valparaiso, Ind.
 Parks, C. W., De Witt Sand Box Co., Troy, N. Y.
 Pevear, J. S., General Elec. Co., Schenectady, N. Y.
 Palmer, R. W., General Elec. Co., Cincinnati, O.
 Paine, F. B. H., Westinghouse Elec. & Mfg. Co., New York.
 Prescott, W. S., P. N. Bruck, Saratoga, N. Y.
 Pope, W. C., Globe Ticket Co., Philadelphia, Pa.
 Powell, C. W., Powell & Lunn T. Co., Troy, N. Y.
 Parsons, Geo. W., The Penn. Steel Co., Steelton, Pa.

Sargent, F. W., American Brake Shoe & Lacy Co., New York.
Scheidt, Louis, American Brake Shoe & Lacy Co., New York.
Seidman, J. H., Ohmer Fare Reg. Co., Dayton, O.
Shepard, A. B., General Elec. Co., Cleveland, O.
Singer, B. W., E. W. Bliss Co., Brooklyn, N. Y.
Siscocks, W. S., The Celluloid Co., New York.
Sisson, George H., Platt & Washburn Reg. Co., New York.
Sukow, Gus., Vose Spring Co., New York.
Surgent, George H., Railway Appliances Co., Chicago, Ill.
Sprague, C. E., General Electric Co., Boston, Mass.
Schenck, S. C., Sterling Varnish Co., Pittsburgh, Pa.
Smith, G. J., St. Louis Car Co., St. Louis, Mo.
Stockwell, Fred E., Harbour Stockwell Co., Cambridge, Mass.
Stone, Burton R., Railway Journal Lumbering Co., Chicago, Ill.
Silver, W. S., W. S. Silver & Co., New York.
Snaville, H. F., U. S. Curtain Co. A & J. M. Anderson Co., Stmonds Mfg. Co., Wadark Wine Co., Philadelphia, Pa.
Smith, James, Archbold Ready Co., Syracuse, N. Y.
Scott, D. K. C., Johnson Wrecking Frog Co., Cleveland, O.
Schnore, J. H., Rochester, N. Y.
Swartz, B. F., Lehigh Car Wheels & Axle Works, Catonsville, Pa.
Silver, W. S., W. S. Silver & Co., New York, N. Y.
Startsman, Charles W., Crocker Wheeler Co., Ampere, N. J.
Sage, Henry J., Crocker-Wheeler Co., Pittsburgh, Pa.
Sachs, Joseph, Johns Print Co., Hartford, Conn.
Swan, G. W., John A. Roebling's Sons Co., New York.
Slaughter, J. D., The Pittsburg Reduction Co., Pittsburg, Pa.
Slack, Barker E., Positive Railway Sander Co., Lancaster, Pa.
Stokes, W. H., Gold Car Heating & Lighting Co., Chicago, Ill.
Schneiman, F., Homestead Valve Mfg. Co., Pittsburg, Pa.
Schindman, W. R., Homestead Valve Mfg. Co., Pittsburg, Pa.
Sisson, Willard S., D. & W. Fuse Co., Providence, R. I.
Standish, Robert M., Street Railway Review, New York.
Savage, E. T., Hiddeth Varnish Co., New York.
Scott, Emmett, B. M. Bruck, Saratoga, N. Y.
Stiles, Jas., Robin Belt Conveying Co., Saratoga, N. Y.
Stearns, Arthur B., General Elec. Co., Cleveland, O.
Stoner, N. W., Westinghouse Elec. & Mfg. Co., Pittsburg, Pa.
Seely, Frederick, Baldwin Locomotive Works, Boston, Mass.
Trowen, S. W., General Electric Co., Atlanta, Ga.
Tonting, George H., American Car Co., St. Louis, Mo.
Tingler, Clydes, G. J. A. Roebling's Sons Co., Tronton, N. J.
Taylor, Ross, American Ventilating Co., New York.
Temple, William, Harold P. Brown, New York.
Thomas, W. H., The Indianapolis Switch & Lrog Co., Springfield, O.
Taylor, John, Taylor Electric Truck Co., Troy, N. Y.
Thorne, Thomas, Taylor Electric Truck Co., Troy, N. Y.
Tupper, G. A., Taylor Electric Truck Co., Troy, N. Y.
Taylor, Walter, Taylor Electric Truck Co., Troy, N. Y.
Taler, H., Ohmer Fare Reg. Co., Dayton, O.
Thompson, F. P., Weber Ry. Joint Mfg. Co., New York.
Toll, R. P., National Electric Co., Milwaukee, Wis.
Tyler, H., Ohmer Fare Reg. Co., Dayton, O.
Thomas, R. L., National Lock Washer Co., Newark, N. J.
Thorn, W. G., Street Railway Review, Chicago, Ill.
Taylor, Albert, Electric Storage Battery Co., New York, N. Y.
Tate, H. F., National Conduit & Cable Co., Chicago, Ill.
Taylor, Albert, Electric Storage Battery Co., New York.
Templeton, W. B., Templeton, Keedy & Co., Ltd., Chicago, Ill.
Thomas, Edward G., Rail Bonds, Boston, Mass.
Ting, J. V. E., Garton Daniels Co., Kenok, Ia.
Trimbach, Ang. F., Mlen Insulator Co., Schenectady, N. Y.
Van Deventer, C., Bulback Elec. Mfg. Co., Chubbuck, O.

Valentine, Rossiter, MacGovern & Co., New York.
Vachas, Howard M., H. W. Johns Manville Co., New York.
Van Dorn, W. L. W. I. Van Dorn Co., Chicago, Ill.
Van Dusen, L. L., Diamond State Steel Co., Wilmington, Del.
Van de Water, L. F., Standard Paint Co., New York.
Woffman, L. C., The Ohio Brass Co., Mansfield, O.
W. Johnson, Ernest, Ayer & J. M. Anderson Mfg. Co., Boston, Mass.
Warren, J. C. Jr., Ohio Brass Co., Mansfield, O.
Waters, Perl, The Ohio Brass Co., Mansfield, O.
Wilkinson, A. L., The Ohio Brass Co., Mansfield, O.
Wetbos, R. L., National Lead Co., New York.
Whall, F. R., C. H. Whall & Co., Boston, Mass.
Wharton, W. Rodman, Wm. Wharton, Jr. & Co., Inc., Philadelphia, Pa.
Whipple, A. L., The Canton Supply Co., New York.
Weeks, Shirley, National Elec. Co., New York.
Walker, S. A., Hale & Kilburn, New York.
Whalen, J. A., Galena Signal Oil Co., Franklin, Pa.
Wesol, Wm. P., Jr., Galena Signal Oil Co., Franklin, Pa.
Watts, S. C., National Elec. Co., Cincinnati, O.
Wilson, Hugh M., The Railway Age, Chicago, Ill.
Williams, J. P., Bryan Marsh Co., New York.
Whitcomb, F. L., Griffin Wheel Co., Chicago, Ill.
Watson, William Thomas, Newark, N. J.
Wail, Nelson W., The Recording Fare Reg. Co., New Haven, Conn.
Whitmore, B., Carlisle Water Supply Co., New York.
William, E. M., The Sherwin-Williams Co., Cleveland, O.
White, S. M., Eclipse Car Fender Co., Cleveland, O.
Warr, A. C., Eclipse Car Fender Co., Cleveland, O.
Wood, M. M., General Elec. Co., Schenectady, N. Y.
Wessel, J. P., General Elec. Co., Baltimore, Md.
Wampler, William, Peckham Mfg. Co., New York.
Wakeman, J. M., Street Railway Journal, New York.
Watson, W. J., American Elec. Works, Providence, R. I.
Walker, W. B., The Federal Supply Co., Chicago, Ill.
Wilson, F. C., Adam Cook's Sons, New York.
Wather, W. J., C. S. Knowles, Boston, Mass.
Williams, B. A., Chas. H. DeWitt & Co., New York, N. Y.
Williams, J. I., Ingersoll Con. Co., Pittsburgh, Pa.
Weathermon, C. J., Van Dorn & Elliott Elec. Co., Cleveland, O.
Ward, John E., Gold Car Heating & Lighting Co., New York, N. Y.
Wickware, E. F., Ohio Brass Co., Mansfield, O.
Wakelee, D. B., Geo. W. Knowlton Rubber Co., Boston, Mass.
Walden, Wm., L. C. Chase & Co., Boston, Mass.
Wattles, James F., Rand Avery Supply Co., Boston, Mass.
Wharton, Wm. Jr., Wm. Wharton, Jr. & Co., Inc., Philadelphia, Pa.
White, J. G., J. G. White & Co., New York.
Wilson, Harold R., Stanley Elec. Mfg. Co., Chicago, Ill.
Wood, Chas. N., Frank Ridlon Co., Boston, Mass.
Woodward, A. H., International Register Co., Chicago, Ill.
White, W. H., Forest City Elec. Co., Cleveland, O.
Wharton, Wm., The Elec. Motor & Equipment Co., Newark, N. J.
William, Guy A., Bryan Marsh Co., New York, N. Y.
Woodbridge, J. Lester, The Elec. Storage Battery Co., Philadelphia, Pa.
Yates, M. De Forest, The Recording Fare Reg. Co., New Haven, Conn.
Yates, Charles S., The Recording Fare Reg. Co., New Haven, Conn.
Yonker, C. V., Hun Sand Box Co., Troy, N. Y.
Yerley, John, Howard, Keystone Car Wheel Co., Philadelphia, Pa.
Yethell, O. W., Ohio Brass Co., Mansfield, O.

L. ALLEN

Mrs. Victor Angerer, Philadelphia, Pa.
Mrs. E. L. Ashley, Glens Falls, N. Y.
Mrs. C. A. Alden, Steelton, Pa.
Mr. Barber, Chicago, Ill.
Miss Braywood, Chicago, Ill.
Miss Rachel Berry, New York.
Mrs. Sarah H. Blawie, St. Louis, Mo.
Mrs. Chas. G. Burton, Chicago, Ill.

FIRST REGULAR ANNUAL MEETING

American Railway Mechanical and Electrical Association

Saratoga, N. Y.—Sept. 1—4, 1903.

WEDNESDAY, SEPT. 2, 1903.

President Farmer called the convention to order at 10:30 a. m., and said: "I think the first thing will be the reading of a paper, 'Car Shop Practices,' by Alfred Green, master mechanic of the Rochester Railway Company, Rochester, N. Y. [For Mr. Green's paper, see page 595.]

DISCUSSION ON MR. GREEN'S PAPER.

Mr. William Postell: I would like to ask Mr. Green what his experience has been with the air hoist, whether he has any trouble with it slipping at all when he gets the load on it?

Mr. Green: For putting armature in the lathe we don't use the straight hoist. We use the Chisolm & Moore air lift, one of the finest little tools ever put in a shop, and you can put your load anywhere and have it there as long as you want it. With the straight hoist we cannot use it to put an armature in the lathe or anything of that description. It will drop its lead.

Mr. W. O. Mundy: Have you had any experience with the balance hoist, using air on both sides? I am using that for handling armatures and I find you can place it just about as carefully as you can with chain and block.

Mr. Green: No, I haven't had any experience with that.

Mr. Lake: I will say I am using the same thing with satisfactory result.

Mr. Postell: Do you find that holds the load in any position? For the information of the members I will say that with the company I am connected with, in our shops we have handled over 30,000 trucks and we have all those hoists. We have arranged a little runway to near where those trucks are placed and it is probably 500 ft. from where we start to where we drop it and we hoist our truck and can push it along on this little trolley until they come to the cross-track where they are removed and we have no trouble in carrying it that distance. We do not have the one long hose. We have a short hose at each end and pass it along that way.

Mr. Lindall: We use in our shops a straight lift pneumatic hoist of from 3,000 to 6,000 lb. capacity and we have no trouble in putting the wheels on the lathe centers with a straight lift hoist. We also have a pneumatic gear hoist.

Mr. Olds: In Milwaukee we also use the straight lift in putting the armature in the lathe and in doing that hoisting we have no trouble to speak of. Once in a while in the handling of trucks or wheels or holding motors suspended for a time, it will give down a little but generally speaking there is no trouble in that respect. The hoist that we use for putting armatures in the lathe has a small valve on it so that the air goes into it very slowly and you don't get the jerk that you would otherwise.

Mr. Postell: I would like to ask if anyone else has had experience with the cross transfer table in taking trucks out of double truck cars?

Mr. Green: We are building a 300-ft. car house on one of our divisions and we are putting a transfer table in that car house for that purpose alone.

Mr. Bagelow: In our shipping department equipment shop we have a straight air hoist that works very satisfactory in loading the cars with the material we wish to ship.

Mr. Olds: I note by Mr. Green's paper that he does all of the work in the pit. I presume that means more particularly in the single truck cars. With us, our double truck work is all done after the truck is removed from under the car. We have found it more satisfactory than doing it in the pit.

Mr. Mundy: We are doing a good deal of the repairing from overhead and intend to do it all; but this brings us into a situation which has been quite a puzzle to me and if there is anybody else who has had any experience in that line it would be a great deal of help. I have installed a motor-driven mechanical hoist which from the time the car enters the shop until it is in the air ready to allow the truck to run out, is less than one minute. With a 4-motor car we have at least 16 leads to disconnect. With the ordinary method of connecting these leads it takes a pretty good man at least two minutes; in other words it will take longer to disconnect the motors than it will to hoist the car. I am looking for and trying to get up some very rapid method of connecting the motor leads which will be thoroughly efficient. At the present time I will acknowledge I have not struck it. I have asked the General Electric Co. and the Westinghouse Company to solve this problem but they both say they have had no experience in this particular field and they do not appear to be very enthusiastic in being able to hit it. Now if anybody anywhere around the country has had any experience along that line and can give me any information it will help me considerable because I will surely need it. It means dollars to us.

Mr. Green: I would like to say in answer to Mr. Olds that we do not jack a body of any description or lift a body off the trucks under any consideration unless the car is going through the shops for general repairs.

Mr. Lake: I would like to ask Mr. Mundy what kind of motor connection he uses, what kind of a joint?

Mr. Mundy: At the present time I am using a 2 A connector with screws; it is a General Electric connection.

Mr. Lake: The Westinghouse broken connection is much more convenient to handle, quicker to operate and by using a piece of hose instead of tape at the joint, I find they can be connected and disconnected very quickly and the hose slips on and off readily.

Mr. Mundy: The Westinghouse connector, if I remember correctly, is better proportioned for a large size wire. You are probably using that on your Interurban cars. When you get on cars of 20-h. p., and even up to 40-h. p., the connector is a small piece of apparatus. To be thoroughly satisfactory it must be so that you can put it into the motor cable and pull it through the insulation bushing in the motor. We do not want to have to solder or do any other connection of that kind after the lead is in the motor. Especially is this true of the brush holder leads and before adopting anything at all I am still hunting around with the hopes of striking something that will be small enough to go through the opening in the motor and yet can be thoroughly insulated. The use of hose or tape either, I think, is objectionable, if it can be overcome. At the present time I do not know how it is going to be done so I do not know it can be.

Mr. Wright: I will say for Mr. Mundy's information that we use the same covering for the larger connectors but for the small sized connector it saves the time of handling the tape. The connector is soldered to the motor lead and two screws are used at the other end for fastening the lead to the car body and then we use a piece of hard fibre tube to cover that connector and there are two holes for the screws in the tube. Then we use a piece of soft rubber tube to cover the screws which has a tendency to keep the screws tight and at the same time insulate them. It is also easily slipped away so that you can get at the screws. Of course, with the jack-knife connector, as I call it, that Mr. Lake referred to, we have no

screw to hold it and you have got to either tape it at one end or use a soft rubber sleeve at the side to retain it in place.

Mr. Mundy: Did I understand Mr. Wright to say he soldered these ends onto the flexible?

Mr. Lake: Motor head yes. That gives you a small connector that will slide right through any run.

Mr. Lindall: On our Elevated motor we use the Westinghouse double joint connector and we appreciate the value of having some easy way of disconnecting them on account of having to take the trucks out every two weeks. We use over the connectors a piece of rubber hose of circular form and each side of the connector we have a little cleat that takes the four leads so that the leads and the insulation for the connector are held in place by these cleats; the cleats are held by one bolt in each. It takes a man about two minutes to disconnect the motor, that is, including the work of taking up the traps and so forth.

Mr. Morgan: I would like to ask Mr. Green if he has any figures. I notice he made the statement that he never removes the car body from the trucks unless it is for general repairs. I would like to know if he has any figures or general statement which shows the economy of taking the truck out to remove the armatures or of removing the armatures from below which he would have to do if he did not take the truck out?

Mr. Green: I couldn't give the exact figures now. At one shop we have eight men. At State St. car house we have 12 men who assist on light repairs and of these with the transfer table at the State St. car house we had more work at the shops with eight men than I can possibly do at the transfer table, taking the trucks out sidewise. I couldn't give you the exact figures unless you come to Rochester.

Mr. Morgan: There seems to be some doubt as to which is the easier way to handle trucks—whether to take them out. Personally I should imagine that the thorough inspection of a truck after being taken out from under a car is of such value that it would be better to take the trucks out. That is our custom. We take the trucks out and get an examination and we run a high-speed road—not a phenomenal speed—about 45 to 50 miles an hour in parts of our road and we think that the taking out of the trucks and the mechanical department being able to give them a very thorough examination, materially decreases our liability of loose bolts and other things which cause annoyance and accidents.

Mr. Baker: How often do you take these trucks out?

Mr. Morgan: When the armature gets low on the bearings we take them out.

Mr. Baker: How do you find that out?

Mr. Morgan: From below, by inspection done from below and we have gauges. I guess it is an almost universal custom for testing the armature; and if we find the armature low we take it out and replace the bearings and then examine the truck. We can do that easily with jacks although we are at present equipping our shops with a large motor-driven hoist which is being manufactured especially for us which will take the entire car, trucks and all up in the air if we want to do it.

Mr. Baker: Do you make any other inspection under the car?

Mr. Morgan: All our daily general inspection is made under the car.

Mr. Lake: This matter in car inspection I would like to inquire about for information, more than anything else, how often or what method the most of you use in this general overhauling. My method has always been to give a car a general overhauling and general inspection after it has made, say, 20,000 miles. Taking a number of cars that will vary, say, from twenty to thirty thousand miles before you can get around, but I have my cars inspected from underneath thoroughly every day or every other day. They don't get an inspection every day because as a general thing during the week days they only run every other day, that is, in cool weather. If the days are warm I change them off in the middle of the day when we change crews and going on our road, the length of it, and the number of trips we are making, the car makes from 375 to 390 miles a day if it runs the full day; and Saturdays and Sundays our cars are all in service, which are eight in number, and we run half hour service Saturdays and Sundays but of course these two days the cars are not inspected any more than the regular running inspection that

every car gets as it goes by the car house. That is a matter that quite a number have brought up to me, why I do it and especially my car inspector. He says it takes a good deal of time to run out and inspect a car every time it goes through. He says "We never find anything wrong." I said "You do once in a while." He said "Oh, yes, once in a great while." I said "That will pay all it will cost for a number of days inspection." So I think the inspection, the travelling inspection, is a good idea.

Mr. Ballard: I would like to ask in the inspection of these cars or any cars, what experience you have had with the Conant testing machine or any other device for determining weak fields when your armatures are giving trouble, to locate whether it is a weak field or what the trouble is. We are using a device made by Mr. Conant called the Conant testing device for testing weak fields and we have had great success with it.

Mr. Lake: My experience with that device has been very satisfactory although with the equipment that we have I have not been troubled very much in that respect with weak fields, that is, thus far.

Mr. Mundy: Referring first to the inspection of the car by the mileage, I think that undoubtedly this is the only way that we will eventually get thorough success for in my own case during the rush hours we are operating about from 875 to 900 cars but during the middle of the day that number is dropped to about 425 to 450, meaning that in the morning and evening we run out a number of trippers, that in a great many cases don't make more than one trip, hence a single car in a month may make from six to seven thousand miles and its mate may not make over a thousand miles. If we try to go by the time basis, the one car might destroy its apparatus while the other one has hardly commenced to show any signs of wear. Taking this into consideration, I considered that the mileage basis was the only one on which I could work and I have since the first of this year been keeping the individual mileage of every car. But when you get into that, especially in city service, you find a great many difficulties that you did not anticipate. I find that on our different lines—and we have some thirty-two or thirty-three—that the same motor will run a different mileage on the different lines. Another thing, the same motor will run a different mileage when mounted on different trucks. The method of mounting, the vibration which the truck has, makes just as much difference on the wear that the bearings will stand as the inspection and care the men give it. I have had armatures that would not stay out 3,000 miles. Another armature on a similar car will run ten or twelve thousand miles. When I say 3,000 miles, it seems very low. I am almost ashamed to acknowledge it but it is a condition that we have to meet. We have dirt of the worst kind and some of the trucks are shaped so that they do shake the motor up the worst in the world and all give you mean conditions to meet. Now if we can get the basis down correctly and work on the mileage basis I think it is undoubtedly the only one which will give thorough satisfaction.

Referring again to the testing of fields, it is a subject in which I have had a great deal of trouble because we have small motors that are doing more work than they were ever intended to do; as you all know, that means baking out the insulation and weakening the fields in a short time. I have experimented with different methods of testing these fields. I have the Conant coil testing machine; I can go out and work it myself but when I give it to the shop men I find I might just as well give him a stick of wood to play with. He does not know anything about it. As far as checking fields up by resistance, there is a difference between summer and winter weather of 15 to 16 per cent and the temperature of the motor will make that such. When you drop the resistance of a field off that amount, it commences to show too and so the resistance method is a poor thing. The only method that I know of at the present time that really gives any accurate results is the transformer test; but with that you have to have two conditions. You cannot have a coil in a brass form; you have to have a mummy field. Another thing, you have to have it out of the motor because the frame of the motor will become red hot before you can tell anything in measuring the field. I have

checked up a great many fields taken out of the motors with the transformer but we do not meet the conditions that we want to meet. The field may be all right when it is put on a transformer test and may be all wrong when it is put in the motor because, in the motor, after it is heated up, naturally the copper swells in size and occupies more space and then again it is under pressure from the pole tips. You want that coil held tightly so it won't shake around so you must have a certain amount of pressure there. You may have layers in the coils which if the coil is left without pressure, putting them in the motor and pulling down the pole piece will pull them together and short-circuit your turns. We have spent probably two or three months trying to devise a scheme of measuring the fields in the motor. I thought at one time I had it but at the present time I am going back to the woods. It is a serious point. The weakening of a field necessarily affects your apparatus all the way back burning out the armature and that in turn the rheostats, thus blowing up the controller; and when a controller blows up with us we have a few passengers perhaps jumping off the car while it is running at full speed and then a few damage suits on our hands. So those motor fields cause as much trouble as anything, but how to measure, where we ought to measure, is a question I have not as yet solved.

Mr. Postell: Mr. Mundy says he can work the Conant test himself and I cannot see any reason why he cannot educate somebody else to do it. I don't expect every car-house employe to work the Conant test but it seems to me the St. Louis Transit Co. can afford to have a man educated to use that machine and keep him going around and finding the measurements of all motor fields. A motor field does not usually get short-circuited in one day. It is usually a question of some little run and if those cars were gone over periodically it seems the trouble would be reduced and I believe we can afford to have a man really that does little else but test fields if the road is large enough. We can surely find some one man there to work the coil testing device.

Mr. Baker: We have a similar road in Boston and we have some eight, ten or twelve coil testing machines and we have had no trouble in educating our men to use them. We have got about thirty car-house foremen and not one foreman knew how to use them but a good many other men knew how to use them and what I want to see is that this association go into our car houses where they should get a list of our car-house foremen and carry it to the members of this association and I have no doubt they would test the fields almost as well as Mr. Conant.

Mr. Mundy: I have always heard that the Boston Elevated could be heard a few miles around in Boston and under the circumstances I am quite surprised to hear Mr. Baker state that that instrument is satisfactory, because when I want to work that instrument myself I want to get out in the woods, clear away.

Mr. Green: We use the bridge, Wheatstone bridge. All of our men, that is our leaders, what we call our leaders in the pit, are held responsible for heating up the fields of the equipment as they pull in. Of course, cars going through general repairs, the entire fields of all motors are read up by that time. In rewinding or reinsulating your fields you find it is actually necessary to keep a record of every field that is rewound, because if you are not careful and give them an opportunity to stretch that wire and later it is cut off and you have trouble. So we read every field before it goes into stock and it is marked. If that field doesn't read short it ought to, says the boy.

Now, getting away from that, I would like to take up the question of car inspection. That is one of the most important things that a road has to contend with today on a system of any size. Our conditions are such that we cannot do in Rochester what Mr. Baker would do in Boston or probably Mr. Mundy in St. Louis. We have taken into consideration the idea of having inspectors out on the lines giving so many lines to each one to take care of and inspect and report on each day. We have tried that. If you could hire a foreman to stand with each inspector you might get a better report. It runs all right for a little while and then you are in trouble. You can-

not find your inspector or he is not getting out his reports as they ought to be. They bring their cars into the car barn; we operate 80 per cent of our rolling stock every day, which gives the master mechanic an opportunity to put two cars in shape a week. It is important to us because we have to do our inspection at night. If you can possibly get away from night inspection it will be a good thing because it is one of the poorest things ever thought of. In the first place you get your men out in the early part of the evening and there are very few cars in the car houses and the consequence is you are losing time. Your cars go out early in the morning and you have your men there and paying them for so many hours' work and the consequence is you are losing time again, so you are not getting results out of money expended for car inspection and if there is anyone here operating a road under the same conditions I would like to have him tell me what he does to get results.

Mr. Olds: Regarding the operating of cars, I would say this: in Milwaukee we are practically a double-truck four-motor system. All our regular cars are of that class. When our lines are all full with double-trucks we have three extra cars to keep the system up. Our extras are single trucks which the boys have all called "dinkies" and as a matter of course they turn in their double-truck car and get a dinkie and there is at once a kick not only from the motorman but from the transportation department. For the past year we have been unable to give our cars the attention that they should have. Our rule and practice has been that a car shall not be in regular service to exceed four months before it shall come to the shop for general overhauling. We have been obliged to leave them out as long as eight months before they have come in. It is not good practice. I think the cars should come in on a certain mileage. As we use all of our cars all the time the monthly proposition works out practically the same. We hope sometime to have enough cars that we can hold in and use them as extras, about one-third of our equipment. By so doing, they can receive a daily inspection and then the night inspection will be but very little. Our night inspection is very unsatisfactory as our friend Mr. Green states—there is but very little done. The men cannot work at night and get the results that they do in daytime. So, as I said before, we hope to see the time that our cars will get a day inspection at least every third day. By so doing I believe we will reduce our expenses very greatly.

Mr. Bigelow: Showing the necessity of a rigid inspection and also the power lost in tight brakes, a case that came under my observation recently might be interesting. We were making tests on some cars. We had a 25-ft. box-car loaded so as to weight about 36,000 lbs., equipped with four motors and it had hand brakes. We had run the car through the early evening slowly, making numerous stops and everything had worked all right. The brakes appeared to be loose, if anything. We started on a speed run and the brakes appeared to be tight. At the end of the run we examined and found the brake shoes and wheels very warm. On further examination we found the trouble to be the large link at the end of the brake chain had become jammed into the hook at the end of the brake rod in such a manner as to shorten the chain and jammed in so tight it took several blows of the hammer to lessen it. On making the second trip, made under the same conditions and same direction the results were quite interesting. The length of the run was five miles and we made the first trip with tight shoes making fifteen stops of about 10 seconds duration in 23 minutes and 45 seconds. The second trip, same conditions and same direction, was made in 21 minutes and 3 seconds, a difference of 12 per cent in running time. One less stop was made and the correction has been made for this stop. But the difference in power consumption is still more interesting. We took 10-second readings of amperes and volts. The power consumption of the first trip was 216 watt-hours per ton-mile and the second run, 140, a difference of 54 per cent in power consumption, this difference being caused simply from tight brake shoes. I think that will show we have an unsuspected loss in power consumption, being caused by tight brake shoes and also I believe one of the papers speaks of controlling the speed of cars by not shutting off the power but by using the brake. I believe that would give a very high loss

Mr. Hile: It has been my business to look after the overhead line. Perhaps you will not see the connection between car inspection and what I am going to say but I would like to inquire if any of you have any method in regard to inspection of overhead poles, trolley bases and trolley harps and sills. We are having a good many lines coming in over our line and I can see poles bent in every direction and that necessarily leads to considerable trouble on the overhead line and it strikes me that there are a great many that don't give much attention to that and so many things can occur about a trolley post or harp that will lead to the pulling down of the wire, making stopping of traffic and perhaps accident. I have not heard anything bearing on that matter. It may be too small from your point of view to deserve consideration but it strikes me that it is nevertheless deserving of some thought as to whether you have a method of keeping a certain tension on the wire and what attention is paid to a motorman or conductor reporting that his trolley is coming off. You may say it is the fault of the overhead line and he goes out again and pretty nearly every corner his trolley is flying off and it may mean an accident and does mean inconvenience. When you take a wheel off or run along until a wheel splits and then run along on the bearing, that means they are liable to pull down the trolley. And the same with a pole that is badly bent; then the base may get out. You know a car standing around, there may be little hitch and when it comes to a crotch it leaves the wire. The switchman or the street inspector calls out the car. It is the overhead wire and they come and cannot see anything wrong and they watch car after car go over, maybe one hundred or fifty cars, and nothing happens and this car comes along and goes off and every time it goes over the line somebody reports it up, and these things are vitally interesting.

Mr. Baker: I will say a word in answer to Mr. Hile. I don't think he told quite all the story. Mr. Hile does not tell us sometime he goes out and finds a crossing worn out so that it pulls our trolley pole off the car.

Mr. Mundy: Replying to Mr. Hile, we try to maintain a uniform pressure on our trolleys. I tried to have my own inspectors inspect those trolley bases but I do not listen much to the other fellow. A little story to illustrate: Some years ago I was connected with the Louisville Railway and I got the idea I could get up a better trolley base than the other fellow. We built fourteen of these. Almost immediately we started a new line which required fifteen cars and as we had these new bases in stock, we put fourteen of them on these cars and one of the old T. H. bases for the old original type of long body. It had been a mule-car line and we used the old drivers for a new motorman. As you can imagine they did not handle the cars in the most artistic way, especially at crossings and we had all sorts of trouble with trolley bases and trolley poles. One night I was going home from the shop and we stopped at a transfer point by which this line ran. There had been a block on the line for half an hour when we got there. We asked the transfer agent what was the trouble. "Oh, one of these new trolley bases pulled off and came down through the head and came near killing a man." "What number is that car," said I. He said "224." No. 224 was the only car out of the fifteen that had the T. H. base on.

Mr. Bigelow: I would like to ask if any one has had experience in running four G. E. 800 motors? I understand Mr. Mundy has been running four G. E. 800 motors.

Mr. Mundy: I have four G. E. 800 motors running under cars but they are too heavy for them. The repair account is a little high but outside of that they are giving thorough satisfaction and they run thoroughly good provided I do not get them on our country lines. There where our voltages are a little high the bands don't stay on and they come in and I have a bird cage. Outside of that they are all right.

Mr. Green: What is the weight of the body?

Mr. Mundy: The cars on which we have had them installed weigh 18 tons. That is too heavy a car for these motors and we are figuring on putting them on cars that will weigh 26,000 or 27,000 lb. That, of course, means the total car body, trucks, motors and all.

President Farmer: I think you are getting a little off the subject of the discussion of Mr. Green's paper. There is nothing in his paper about some of the things that have been discussed and it will only lengthen the session to a point where we will get tired. I would suggest that if the discussions are confined to the subject in hand it will be a great deal better and we will make better progress. After we get through all the discussion on the paper, then we can take up what was termed a heart to heart talk at the last meeting.

Mr. Hile: I would like to inquire from some parties here as between the different practices in shops, as between the use of shafting and belt gear and the motor-driven machinery, whether in the new shops they are changing over. That strikes me as rather an interesting question in regard to shop practice and by this time, it appears to me, there ought to be some experience or something to show whether it is good practice to follow one or the other or what may be the plan of carrying out such method of equipping your shop. I would like to hear something along that line.

Mr. Pestell: In regard to that we have just had finished a small shop—our shops are not very large—and we have subdivided things to some extent in using separate motors for different departments. The blacksmith shop is driven by one motor. That shop takes in the forges, power hammer and the bolt cutter, the idea being that with the power driven blower and power hammer one of the blacksmith's helpers would usually be more or less idle and he could do all the bolt cutting that would be necessary. Then our machine shop is driven by a separate motor from the blacksmith shop. In addition to that in our winding shop, which is directly over the machine shop, we use a separate driving coil tape machines and that seems to work out well in our case. Unless a road is very large the shops will not assume very great proportions and I should not think that it is policy to make individual drive for different tools. I believe shops can be divided up into departments which can be driven by separate motors and shafting and belting, although when a shop is very large, the larger tools will profitably perhaps be driven by separate motors. I think Mr. Wright, of Providence, could give us a little information on that subject. He has a new shop.

Mr. Wright: I would say we purchased tools for this shop about two years and a half ago and there were not as many motor-driven pieces of machinery on the market at that time as we find today. We have no tool in the shop or no machine that is direct motor-driven with the motor built on a part of the frame. In the carpenter shop most all of the machines are driven with the individual motors, the motor being right on the floor and being boxed up and the belt running to the machine. In the iron shop, of course in iron working machines you have to have different speeds and unless you have a variable speed motor you must necessarily use the cones and there we have a section of shafting for three or four machines and perhaps a section of shafting for a dozen more somewhere else, so I think our practice is more to divide up the machinery into groups and handle the group with the motor except in the carpenter shop, principally, where it is individual driving.

Mr. Bigelow: There is no question in my mind but what for a large shop the motor driving of it used for the larger machines and then by taking the smaller tools and driving them in groups, would be more economical. We have one of our large shops, an old shop, driven by a motor and the loss in driving the shafting is a very large per cent of the power used. We have another shop which Mr. Lindall can tell you more about than I can, in which the large machines are driven by separate motors. There we have one group of smaller machines driven by a separate motor and the results of power consumption there would show up much better than they would in the shop if driven entirely by a motor, or any other source of power, as far as that is concerned.

Mr. Olds: I see Mr. O'Brien of the Chicago City here. They have new shops that have only been in use a short time. We would be pleased to hear from him.

Mr. O'Brien: Mr. President, I would say that we have the machinery divided up in groups and driving it with separate shafts. In the machine shop we have three motors. I have a

line shaft divided in three parts, driving each line shaft with separate motors and the same plan is carried out throughout all the other shops. It is my opinion it is the most practicable way in street car work. We tried to look into the matter very thoroughly when we were laying out the machines for the new shop and we came to that conclusion.

President Farmer: The next in order is the paper by Mr. Mundy on "Type M Control."

[For Mr. Mundy's Paper, see page 599.]

Mr. Mundy read the paper and said: I called upon the Westinghouse company on the 15th of July to get some information that I could embody in this paper. Mr. Westinghouse at that time was on the other side of the ocean and did not wish any information given out. The company has its apparatus on exhibition here today. I have not had the opportunity of looking into it as yet, but it is on exhibition now and I think it would be a good thing for all the members to look into it.

I spent Monday at the General Electric Works and you will see if you go down there tomorrow that they are installing this apparatus on very heavy locomotives, particularly those for the Baltimore & Ohio at Baltimore; the locomotives there that combined weigh 160 tons, each locomotive itself being an 80-ton locomotive. If you take this size of apparatus and try to handle it with anything outside of train control, you would have to have something more than a man, a mule and a boy to do it. I also find that the railway companies are doing something that seems almost foolish in some of their installations. The apparatus, you will readily appreciate, is much more expensive than the series parallel controller and some roads have gone to the expense of buying this more expensive apparatus and they have tried to make up for it by throwing it at the car instead of installing it properly. If anyone of us took a series parallel control and did that we would be ashamed of ourselves and some people doing this with the train control are going to have the same trouble.

Mr. Green: Mr. President, I would have liked to have had Mr. Mundy go into the relative cost or the difference in cost of construction or maintenance and where would you draw the line with a Type M control? Where would you start and where would you finish and where would that series parallel control come in and what conditions would you have to operate under in order to use the Type M control, for instance, with single truck cars, using other cars as travel increased and operating them as a train? There is a great deal that could be gone into on that subject because I am one who knows nothing about it.

Mr. Mundy: To be able to draw a line where you should start to use train control, and stop at the series parallel control is of course a very much disputed point and one which I do not believe anyone could reach. They are installing the apparatus on equipments as small as four 40-h. p. motors. They have also apparatus made, I believe, that is to handle two 40-h. p. The difference in expense, of course, varies materially with the size of the apparatus. Roughly speaking though, I should say that the difference between an equipment fitted with K-6 controllers which you all probably know and with the train control is somewhere in the neighborhood of eight to nine hundred dollars. This is an item. I may be mistaken in that and I am only getting at it by guess work. Therefore the question of a road equipping with the train control means materially greater cost. It is a very satisfactory apparatus in the sense that as far as the burnt tips are concerned, the repairs are almost nothing. From quite a lot of experience with these contact tips that have run from nine to twelve months, they do not show much more wear with the use of current than they do if you simply make them all the same number of contacts without current. This is demonstrated more particularly in the factory where we have run one idle and the other with current breaking arcs showing that the small are I spoke of is not a destructive arc. The use of the apparatus on the single truck cars is of course, more a question of the operation of the road. You must have, of course, some space for the apparatus and in cars of that kind it is almost impossible to get under the floor and you might have to resort to the scheme which the Schenectady Railway has adopted on some of its cars in placing it up over the entrance to the door right in the hood of

the car. They have them in boxes up there but just as to what the field would be for it I think it is more a question of development that we will all have to wait and see and cannot predict just where it will start and stop.

Mr. Olds: Regarding the use of the M control on single cars we now have it on 25 of our interurban cars. It has only been in use a short time and has proven very satisfactory. The motors that they are on are 60 h. p., it being a new machine got out by the General Electric Co., which is numbered 74 and it will also be on exhibition at the Schenectady works. The control has been found very satisfactory with us. I understand there has been some trouble by those that operate it during the winter on account of the contactor sticking. We have had two stick thus far but they didn't cause any trouble as the circuit was open and the minute that it was again thrown in it was like putting the trolley on with the controller turned on full; the motorman knew it and got out and examined and by simply touching the contactor it opened. The mechanism is more or less complicated, more so than I wish it were. There are a great many wires underneath the car and the contactors, of course being under the car, is, I think, a very important matter. It takes the fireworks off the front platform. In Milwaukee our people ride on the front platform as well as the rear platform and we get a fireworks once in a while on a 4 motor equipment that we did not get on the single truck 2-motor equipment, caused by the larger amount of current. On the wearing of the contactors or burning of them, I would like very much to hear from some that are using them, some who have had them in service for sometime. I find that they do burn somewhat and really more than I expected. Just what has caused it I do not know but it certainly works very nicely. We do not use our cars in trains except pulling the trailer and as I stated before it is on a 4 motor equipment with a speed of 45 miles per hour and the cars run into the city so that we get the slow service, a greater number of stops and it has been found very satisfactory.

Mr. Lindall made remarks upon the subject of Mr. Mundy's paper and Mr. John A. Beller of the Denver Tramway Company being present, was invited to add his views. Mr. Beller stated that for a short while, about thirty days, their freight cars had been equipped with Type M control, but that they had had no opportunity as yet to use them in trains, but as far as they had used them they had found them satisfactory.

Mr. Mundy and Mr. O'Brien then followed with closing remarks upon the subject, after which the meeting adjourned to meet at 2:30 p. m.

AFTERNOON.

The meeting was called to order at 2:30 p. m., but on motion adjourned in order that the members might inspect the exhibits.



COST OF ELECTRIC HEATING.

The Consolidated Car Heating Co. presents the following interesting article on the cost of heating cars by electric heaters:

"Assuming the cost of fuel for generating one kilowatt-hour is one-third of a cent; that the drop at the end of the line is 20 per cent, — an average of 10 per cent — the cost of fuel per kilowatt hour on the line would be .0323 cents, making the average cost 1.2813 cents per car per hour for the heating season. For city service, or on interurban roads in a moderate climate the cost would be much below these figures. The statistics on cost of power as given were derived from a large amount of data published at various times during the first few years in the columns of the "Street Railway Review" and other technical papers, and are believed to be reasonable and a fair average of the results obtained on a majority of the electric roads of this country.

"The convenience, perfect regulation and cleanliness of electric heaters, and the fact that no valuable space is taken by them, should of course be considered in deciding whether to adopt electric or hot water equipments. There is also a difference in insurance rates in favor of electric heaters."

The only item to be considered in comparing the cost of electric with hot water heating, should be the cost of fuel required to generate the extra current. No other items could properly be considered in a comparison where the cost of coal is the only item charged to the hot water equipments. The cost of coal for generating one kilowatt-hour is from one-third to one-half of a cent, and in some localities, the cost is but one-quarter of a cent.

"The average current consumption of an electric heating equipment for the heating season should not be more than one-half the maximum for which it is arranged, and considerably less than one-half the maximum where regulating switches are carefully inspected and kept on the first or second point during moderate weather.

"For a vestibuled car, 30 ft. inside, 40 ft. over all, an equipment arranged for a maximum consumption of from 14 to 16 amperes at 500 volts (7 to 8 kw.) has been found sufficient on interurban roads in a severe climate. A fair average consumption of such an equipment for the heating season would not be more than 32½ kilowatt-hours.

THE DUFF MANUFACTURING CO.

The Duff Manufacturing Co., of Allegheny, Pa., exhibits a full line of its well-known Barrett jacks, two of which, No. 2 and



NO. 2 BARRETT JACK.

No. 38, are shown in the accompanying illustrations. About 50 different styles of these jacks are being exhibited and these include four or five new sizes which have been brought out within the past year. The No. 2 and No. 19 standard street railway jacks are among those which invite inspection, these jacks hav-



BARRETT ARMATURE LIFT.

ing been adopted by a large number of the street railways throughout the country. A feature of this part of the exhibit is a special jack which was designed for the Pittsburg Railways Co., in accord with the contract to equip each of its cars with a Barrett jack. This jack is known as the No. 22 Barrett jack.

The company also exhibits two new sizes of journal jacks—No. 28, of 10 tons capacity and No. 38, of 20 tons capacity—

and a third size, new style journal jack, known as Barrett jack No. 48, which has a lifting capacity of 15 tons. This No. 48 jack



NO. 38 BARRETT JACK.

is considered one of the best journal jacks made, on account of its single-acting feature and ease of operation. The Barrett motor armature lift is also exhibited. This motor lift has met with great success since it was exhibited last year at Detroit for the first time. It also is illustrated herewith. A sample of the Barrett automobile jack and of the Barrett pipe-forcing jack are on hand, also, and will be shown to anyone who is interested. The company is working on four new sizes of Barrett jacks which will appear by next spring, but which, unfortunately, were not ready to be exhibited at this convention.

The treasurer of the company, T. A. McGinley, is in attendance to receive callers and afford facilities for the inspection of the exhibit.

FEDERAL MANUFACTURING CO.

The Federal Manufacturing Co., of Cleveland, has a small but none the less interesting exhibit comprising Keeler curtains and curtain fixtures, of which H. E. Keeler, of New York, is the patentee. The principal feature of the exhibit is the Keeler "eccentric" car curtain fixture, which is absolutely self-aligning by reason of eccentrically pivoted rolls which are mounted at the end of the rod shoes and are forced into the grooves in the window frames by means of a spring in the tube. This fixture has no pinch handles, cables or other adjusting or retaining devices; it is worth inspection. Beside Mr. Keeler, the company is represented by E. S. Ludlow.

BULLOCK MANUFACTURING CO.

The Bullock Manufacturing Co., of Cincinnati, exhibits in booth No. 96 a 400-kw. rotary converter, of 500 revolutions, 375-volt pressure and three-phase, it being an exceedingly interesting apparatus to look at. The company is represented by the following gentlemen: Ward S. Leonard, manager railway department; R. T. Lozler, manager sales department; George B. Foster, of the Chicago office; C. Van Deventer and B. F. Foote.

G. C. Lucas, representing the Cleveland (O.) Frog & Crossing Co., was an interested visitor at the convention yesterday.

B. S. McClellan, formerly western manager of the O. M. Edwards Co., has been appointed western representative of the Curtain Supply Co., with headquarters at Chicago.

Newton Root, son of F. N. Root, manager of the Root Track Scraper Co., is to assume the superintendency of the company in order that his father may devote his entire attention to the sales department.

SEVENTH REGULAR ANNUAL MEETING STREET RAILWAY ACCOUNTANTS' ASSOCIATION

Saratoga, N. Y.—Sept. 2—4, 1903.

WEDNESDAY.

President Davies called the convention to order at 10:20 a. m., Sept. 2, 1903.

The reading of the minutes of the previous meeting was, on motion, dispensed with, the proceedings having been issued in printed form.

The President's address, as well as that of the Secretary were read, and the report of the Executive Committee was deferred until a later session.

PRESIDENT'S ADDRESS.

As I was not present at last year's meeting, I did not have an opportunity to express my appreciation of the honor you then conferred upon me in electing me to the highest office within the gift of the association; and I wish, first of all to-day, to give you my heart-felt thanks for that evidence of your confidence. It was the more complimentary, and the more appreciated, because it came to me after an absence of several years from the street railroad business.

The Street Railway Accountants' Association has grown within the past year in membership, in wealth and in influence. Notwithstanding the numerous consolidations of street-railroad companies, there has been an increase of sixteen in our membership. The treasurer's report, to be presented this morning, shows a balance in the treasury of about \$2,400. When we remember that, in 1899, the association called upon the members represented at the meeting in Chicago for voluntary contributions to wipe out a deficit, the present condition of the treasury is very gratifying. It is due mainly to the unflagging interest, zeal and activity, in this as in all association matters, of our able secretary and treasurer, Mr. Brockway. The increasing influence of the association is shown in the adoption by the United States Census Bureau, and by various state bodies having to do with street railway statistics, of its recommendations as to the classification of construction and expense accounts, and as to blanks and forms of reports. The Railroad Commissioners of several states have adopted our classification of accounts, and the National Association of Railroad Commissioners, at its annual meeting six or seven weeks ago, approved, with slight changes, the form of report recommended at our Detroit meeting. I think it safe to say that the work of this association has been more widely adopted and applied, with fewer modifications or criticisms, than any work of any similar organization in any line of business, anywhere.

The standard system of street railway accounting is so simple and logical, and the definitions and explanations which accompany the association's classification of accounts and form of report are so clear and minute, that a street railway accountant whose company used a different system may, without difficulty, make a report for any period for his company in accordance with the standard system, and so obtain a valuable comparison of its business with that of any company using our system.

Valuable as the work of the association has been, however, much useful work remains to be done. It is not necessary nor perhaps very important that a standard method of shop cost keeping, of storeroom accounting, or of time keeping, or a standard form of conductor's report, for example, be adopted by the association, but these subjects are of interest to all our members. We all want to find the surest and shortest ways to results.

One of the most beneficial features of our annual meetings is the exchange of ideas in conversations among ourselves outside of the regular meetings. Improvements in methods of accounting come to us every year from constant study and effort on our own part, and from the relation of the experience of fellow-workers in the same line. Other subjects for consideration at future meetings may be the use of the kilowatt-hour as a unit (although this may not extend beyond statistics regarding the operation of the power plant), the best form of inventory of buildings, fixtures, track, machinery, cars, material and supplies, and a further discussion of a standard unit of measurement and comparison. The rapid development of the transportation business will bring new problems from year to year, and give the association good reason for continued existence.

A topic that has been touched upon at nearly every meeting of the association, but never discussed, and which has always seemed to me of vital importance to every company, is that of accounting for depreciation in the value of the company's property, or providing a reserve fund from which to pay for renewals and betterments of the property. I know it has been said, in our meetings and elsewhere, that it is not the province of a street railway auditor to say whether depreciation shall be included in his accounting, or if included, the rate at which it shall be calculated; that that is the business of the board of directors or the managing officers of the company. Of course it is the business of the directors. So is the question of whether more cars shall be purchased, of whether track shall be renewed, of whether wages shall be increased or decreased. But it is the duty of the manager to report to the board the need of additional cars, of renewal of track, and to recommend an increase or decrease, if occasion calls for a change, in rate of wages. And so it is the duty of the accountant to keep the managing officers and the directors informed, not only as to the gross earnings, operating expenses and net earnings of the road, but as to its real financial condition, which involves a statement or account of the actual value—not merely the first cost, but the actual present value—of the company's property. His books should show, not alone the cost of things and the expense of their maintenance, but their value at all times; and their value cannot be stated without taking into consideration the effect upon them of constant use—of wear and tear and waste. Street railway companies in these days employ experts as accountants, and pay them the compensation of experts; and accountants do not perform their full duty to their employers unless they point out to them (if they lack knowledge on the subject) that the value of a thing after years of use is not its original cost; that the difference between gross receipts and the cost of operation is neither surplus nor net income; that as track, cars and machinery wear out if the company makes use of them, the wear should be accounted for from year to year or month to month as it occurs; that the payment of interest upon bonds is not a discharge of the principal, but that the obligation will mature in time, and that, to provide for it, a fund should be accumulated from year to year, or month to month, out of earnings; that, while growth of population may add to the value of franchises, and this added value may offset for a time depreciation in the value of the company's tangible property, yet, as franchises approach their expiration, they depreciate in value, notwithstanding continued increase in the population of the territory served; and that financial embarrassment, if not ruin is likely to result from constant disregard for these considerations. It may be said that these are

matters of common knowledge, and that it is not necessary for an accountant to speak of them. But the accounting methods of street railway companies indicate that the knowledge has not been generally applied. Promoters and directors of many street railway enterprises have been either ignorant of the first principles of accounting, or guilty of an attempt to deceive their stockholders and the investing public as to the dividend earning possibilities of their properties, and it seems to me eminently proper for this association, or some one for it, to point out the effect of such misleading practices in accounting. I have never been an advocate of the publishing of detailed statements of the business of street railway companies, but, if their accounts were properly kept, and had been so kept from the beginning of the street railway business in America, with a proper appreciation of depreciation, and of the obligation to return borrowed money, it would not be so hard to convince the people of our cities that they have not been robbed so extensively as they suppose; that franchises are not as valuable as the capital stocks of railroad companies indicate, and that it may not be profitable nor practicable for a municipality, whose officers ought, of course, to provide for its citizens efficient street railway facilities at the lowest reasonable fare per ride, to itself construct and operate lines of street railway, and furnish as good accommodations as are now furnished by private corporations, at a rate of fare lower than that now almost universally charged in American cities. Roads are built with borrowed money—from the proceeds of the sale of bonds at less than par, with a stock bonus. If well located, they are operated, even in the first year of their existence, at an apparent profit, no account being taken of depreciation, and no provision made for the accumulation of a fund to pay the bonds or renew track and equipment. From the gross earnings, operating expenses and interest on bonds are deducted, and the remainder is called net income, or surplus applicable to the payment of dividends. If dividends are not actually paid, representations are made that they have been earned. The promoters list their bonds and stock on the local stock exchange, and dispose of part or all of their holdings to people unfamiliar with street railway operation, and still less familiar with promotion accounting. Then things wear out, and must be renewed; more money is borrowed for this purpose, or the company is "reorganized;" the vision of dividends recedes; the troubles are charged to political agitation, rather than to false accounting; and the process begins again. This is an extreme case, perhaps, but, although the capital stocks of most companies represent an actual investment much in excess of the bonded debts of the companies, the practice has not been uncommon. All companies have been affected and injured by it. Whether this method has been practised with a design to deceive, or through ignorance of the principles of accounting, the effect has been to mislead the public as to the amount of profit in legitimate street railway business, and to create or confirm the impression that an unjust and unconscionable contract was made between the company and the people's representatives. Unreasonable contracts do, doubtless, exist. That is not the point. I am not arguing that all profits are reasonable, or all contracts just; I am pleading for honest accounting. The effect of improper accounting in one notable case was most forcibly stated by Mr. T. S. Williams of Brooklyn, in a paper read by him at our meeting two years ago.

Honest accounting—I am not blaming the accountants; put the responsibility on the directors—they say it is their business, and not ours—honest accounting from the beginning of the business might have prevented many of the efforts now making by municipalities to reduce fares and to increase the taxes of street railway companies. The profits to the promoters from the sale of their stocks would not have been so great, but the legitimate earnings of those investors who actually put their money into the property would not have been less, and their investments would be in better condition to withstand some of the unreasoning assaults now made upon them. Publicity in accounting will not be so injurious to street railway investors as the false methods of accounting heretofore prevalent. Past methods, in many cases—in nearly all cases—have been deceptive to stockholders and to the public. If the deception has come from ignor-

ance, it is inexcusable; if from design, it is dishonest. Whether it is dishonest, or whether it only deceives, it is bad policy. Let us be honest.

Some of us, in late years, have been trying to offset the neglect of depreciation by charging the cost of renewal of track and equipment to operating expenses. There is precedent for this in steam railroad practice, and it was recently defended by the Wall Street Journal, in an article on "Capitalization," in the following words: "In a general way capital accounts or capital assets represent permanent investment, and are in antithesis to quick assets. When an item is capitalized, it usually means that the money has been sunk once for all in some kind of property that it is not expected to sell or convert. If we could imagine a railroad completely finished and in perfect condition, its capital accounts would be finally closed, and its expenditures would all be charged to operating account." But, however honestly meant, this is only another mode of deception. It is not the truthful method. To charge against earnings the cost of renewals, is to make one month, or one year, bear an undue proportion of expense or depreciation. The effect will be clearly apparent if we imagine all franchises terminated, and the business of a company at an end. Under such circumstances the property of the company would stand on the books at its original cost,—a valuation which, unless the road had just been entirely renewed and re-equipped, would be fictitious.

These suggestions are not new; they have been made by former presidents and others who have addressed the association. The subjects of depreciation and of sinking and reserve funds are treated in every book on accounting. The only justification for their repetition here is the fact that improper methods still prevail.

The relation between the accounting and managing departments of our street railroad companies is much closer than it used to be, and the work of the accountant, which has come to be more and more appreciated by the manager, has become more useful to the company. All receipts and expenditures coming under his eye, he can be a most valuable aid to the manager in the operation of the road; and his usefulness in this capacity is as great as in that of recording the company's transactions for the information of its directors and stockholders. Systematic and intelligent accounting saves more than it costs. The accounting department is not a direct producer of revenue; its province is to keep tab on all income and on every item of expenditure; to compare the results of one period of operation with those of another, the receipts of expenditures, per unit of measurement or comparison, of one route with those of another, the business of one company with that of another; to ascertain why receipts are lower, or expenditures higher, on one line, or at one station, than at another; to show clearly and concisely the true financial condition of the company, and the value of its property at all times; to throw a calcium light upon all the details of management, so that the experience of the past and present may be constantly before the eyes of the officers and directors of the company as a guide for the future. The value of figures is not mainly in their numbers. A single fact succinctly stated is usually more effective than a volume of figures. But the figures should be behind the statement to verify it if questioned. It is more effective, for instance, to say that the number of passengers or transfers on a given line increased in the past month more than upon any other line of the system, to give the percentage of increase, and, if possible, to point out the probable reason for the change, than to give to the management a detailed statement of figures showing the number of cash fares, number of ticket-fares, number of transfers, fares and transfers per trip or per car-mile, upon each of fifteen or twenty lines of railway, from which the manager must pick the facts that will enable him so to change his schedules as to produce a like increase in business on the other lines; first, because the manager has not time at command for the study of these statistics, and secondly, because he has not usually an accountant's love of the study of figures. Of course, the detailed statements should be prepared, and should be within the manager's reach, but the accountant will be more valuable to his company if, when he makes up his figures, he selects and makes a brief and pointed report of the most striking and important facts.

Your executive committee met at Cleveland in April, with eight of the nine members in attendance. Several matters were considered and discussed, as will appear in the secretary's report of the proceedings. The most important was an invitation from the Association of Tramway Managers of Great Britain to attend a meeting of that body in Glasgow on July 10th, at which a paper on standardization of tramway accounting was to be read. The invitation came to us through correspondence between Mr. C. M. Duffy, the secretary and auditor of the Chicago City Railway Co., and Mr. James Dalrymple, chief accountant of the Glasgow Corporation Tramways, on the subject of the differences between the methods of accounting of our association and those of the city of Glasgow. In view of Mr. Duffy's careful study of the Glasgow Tramway accounts, his extensive correspondence with Mr. Dalrymple, and his intimate familiarity with this association's work, the committee requested him to attend the Glasgow Convention as the representative of the association, and at its expense. Mr. Duffy expected until within a few days of the meeting to go to Scotland to represent us, but the franchise situation in Chicago made it impossible for him to leave. A copy of Mr. Dalrymple's paper has reached us, and Mr. Duffy will give us the benefit of his study of it and of the discussion which followed its presentation.

One other committee, the committee on standard form of report, has been active in the year. A majority of its members attended at Boston a conference of the committee of the National Association of Railroad Commissioners on the same subject, and represented us at the annual meeting of that association at Portland, Maine, last July. Messrs. W. F. Ham, of Washington, and E. M. White, of Hartford, will present a report for the committee.



REPORT OF THE SECRETARY AND TREASURER.

It is pleasant to again report to you that we have prospered, that we have more members and more money than last year and that if we were a stock company we would declare a dividend without cramping the business.

We have added since my last report the following companies:

Atlantic Coast Electric Railway, Asbury Park, N. J.
 North Western Elevated R. R., Chicago, Ill.
 Lynchburg Traction & Light Co., Lynchburg, Va.
 Rockford & Interurban Ry., Rockford, Ill.
 Nashville Railway & Light Co., Nashville, Tenn.
 Santa Barbara Consolidated Ry., Santa Barbara, Cal.
 Cleveland & South Western Traction Co., Cleveland, Ohio.
 Hoosac Valley Street Ry., North Adams, Mass.
 Evansville Electric Ry., Evansville, Ind.
 Geneva Electric Tramways Co., Geneva, Switzerland.
 Asheville Electric Co., Asheville, No. Caro.
 Beaumont Street Ry., Beaumont, Tex.
 Monterey & Pacific Grove Ry., Monterey, Cal.
 Metropolitan Railway Co., Oklahoma City, Okla.
 Pittsburg, McKeesport & Connettsville St. Ry., Pittsburg, Pa.
 Little Rock Railway & Elec. Co., Little Rock, Ark.
 Spokane Traction Co., Spokane, Wash.
 Stark Electric R. R., Alliance, Ohio.
 Columbus, London & Springfield Ry., Columbus, Ohio.
 Conneaut & Erie Traction Co., Girard, Pa.
 Sheffield Co., Sheffield, Ohio.
 Cedar Rapids & Iowa City Railway & Light Co., Cedar Rapids, Iowa.
 Northern Illinois Elec. Railway, Dixon, Ill.
 Sanford & Cape Porpoise Railway, Sanford, Me.
 DeKalb & Sycamore Electric Co., DeKalb, Ill.
 Canton, Akron Railway Co., Canton, Ohio.
 Fairmont & Clarksburg Traction Co., Fairmont, W. Va.
 New Orleans Railways Co., New Orleans, La. (Consolidated)
 Worcester & Connecticut Eastern Ry., Worcester, Mass. (Consolidated)
 Virginia Passenger & Power Co., Richmond, Va. (Consolidated)

Total 30, of which 27 are new and 3 consolidations.

There have been dropped from our lists:

Tiffin, Fostoria & Eastern Ry., Tiffin, Ohio. (Expelled for non-payment of dues.)

Merida Tramways Co., Merida, Mex. (Expelled for non payment of dues.)

Erie Transit Co., Erie, Pa. (Resigned.)

Indianapolis & Greenfield Rapid Transit Co., Greenfield, Ind. (Resigned.)

St. Louis, Belleville & Suburban Ry., Belleville, Ill. (Resigned.)

Natchez Elec. Ry. Light & Power Co., Natchez, Miss. (Resigned.)

Citizens Electric Co., Eureka Springs, Ark. (Resigned.)

Central Rapid Transit Co., Pittsburg, Pa. (Consolidated.)

Consolidated Traction Co., Pittsburg, Pa. (Consolidated.)

New Orleans City Ry., New Orleans, La. (Consolidated.)

New Orleans & Carroll Ry., Light & Power Co., New Orleans, La. (Consolidated.)

Peoples Tramway Co., Putnam, Conn. (Consolidated.)

Richmond Traction Co., Richmond, Va. (Consolidated.)

Richmond Passenger & Power Co., Richmond, Va. (Consolidated.)

Total 14, of which 2 were expelled for non-payment of dues, 5 resigned, and 7 were consolidated. This makes a net gain of 16 for the year.

The record of membership since the organization of the association is:

| Year. | Admitted. | Withdrawn. | Balance. |
|--------------------|-----------|------------|----------|
| Organization | 25 | .... | .... |
| 1897 | 12 | 1 | 36 |
| 1898 | 32 | .... | 68 |
| 1899 | 34 | 2 | 100 |
| 1900 | 21 | 25 | 96 |
| 1901 | 25 | 11 | 110 |
| 1902 | 19 | 7 | 122 |
| 1903 | 30 | 14 | 138 |
| | 198 | 60 | 138 |

The finances are summarized as follows:

| | |
|---|------------------|
| Brought forward from Oct. 3, 1902 | \$1640.93 |
| Received this year from | |
| New Members, 27 at \$20. | \$540.00 |
| 1901 Dues | 20.00 |
| 1902 " | 120.00 |
| 1903 " | 2120.00 |
| Interest on Deposits | 53.06 |
| | <u>\$4493.99</u> |

Payments have been made this year for

| | |
|---------------------------------------|----------------|
| Salaries, secretary's office | \$600.00 |
| Expenses secretary's office | 118.61 |
| Traveling expenses, office | 99.49 |
| Traveling expenses, committees | 424.61 |
| Account of Detroit Convention | 51.26 |
| Stenographer Detroit Convention | 110.00 |
| Printing report of Convention | 300.55 |
| Printing and stationery | 278.78 |
| Miscellaneous | 111.20 |
| | <u>2094.50</u> |

On Deposit Home Savings Bank, Toledo, O. . . \$1058.11
 On Deposit Van Norden Trust Co., New York . . . 1341.38

\$4493.99

There is open on the books for unpaid dues

| | |
|--|-----------------|
| Owensboro City Ry., Owensboro | \$40.00 |
| Ottawa Railway Limited Traction Co., Ottawa, Ill. | 40.00 |
| Chicago Electric Traction Co., Chicago, Ill. | 20.00 |
| Springfield & Xenia Traction Co., Springfield, O. . . | 20.00 |
| Trans-St. Marys Traction Co., Sault St. Marie, Mich. . . | 20.00 |
| | <u>\$140.00</u> |

There are no unpaid rendered bills.

No blanks have been added to the collection exhibited this year for the reason that it is considered better to make a new set soon rather than have it partially up to date. The collection is now four years old in its present form but some parts of it are a year older. In some measure it has been added to each year until now but not to the extent its importance deserves, therefore, to stop adding to this set now and to begin upon another collection which will comprehend these great changes in practice that have been brought about by consolidations and by experience seems to be the best step to take to keep it really useful.

Now and then in the secretary's report there has been mentioned the addition of something to the association's library. This effort has now resulted in a rather substantial collection of magazines and railway commissions reports and some books. So far it has cost nothing but I wish to advise that a certain sum be set aside for the purchase of works upon such subjects as enter into our needs. This accumulation will always be useful and an early start is better than lots of afterthought.

I might consider my duty done by a mere report of the changes in finance and membership during the years as they go by but I cannot refrain from setting before you at this time a rather more comprehensive view of the way some of the association's problems appear to one who is at all times very near to them and who has no period of weeks or months as you have of inaction in association matters but is constantly within hailing distance of its aims and its works during and between the annual conventions. Another reason I would bring forward would be that it is the only time during the year that I can say anything to you verbally and should I limit this report to the mere details I would miss an opportunity to perhaps gain something for the association. When it is remembered that this office has come in contact with every company that is or has been a member since the association was organized it will be readily agreed that some lessons have been seen and learned in that time and so far as I am able I want to have you as the representatives of the members see one or two things as I now see them. It would seem that an association the same as our businesses can only grow by effort and that effort should be in a direction pointed out by self examination.

An association can be organized from two standpoints, one being for entertainment and one being for work, these two can only be combined by the most careful administration and by the members keeping clearly before them where the one leaves off and the other begins. This, I believe, this association has done pretty well if our reputation and our records can be taken for a guide.

There are four things an association must watch carefully if it would truly be a success, its personnel, its finances, its work and its reputation—of these I want to speak of but one, its membership.

Since the organization a constant plea has been made from this office and from the president's for the increase of the membership to its widest possible extent. But it is only fair to you to remind you that outside of a few enthusiastic members this effort has resulted lamely. In other words it has been left largely to the officers to put forth the energy for membership. It may not have occurred to all the members yet one thought stands out clearly to me and I want you to see it too. It is this. This is an association for the mutual benefit of its members and American street railways, what it does to benefit one is to benefit all. Therefore, it is a mutual association and so it follows that all are responsible and all should help toward its advancement. We have withstood the loss of about fifty members through consolidations in the last three years, besides others, and yet we have gained even under those circumstances. I see plainly that we will lose at least ten more the coming year from the same cause and I want to urge you to take up this matter and help to overcome this natural loss.

We thought at first that the smaller companies would not freely join; that the larger ones would be in the majority, but we have seen by experience that it is the smaller ones that gain the most by membership, therefore our efforts should be directed toward any company be it ever so small. There is no

small item in operating expenses that can bring so large a return if properly used as a membership in the railway associations, which is an argument that should be used to every company not now a member with us. Our past is one to show with reasonable pride and the future will be as bright and useful if the present membership keeps awake to its opportunities, which I think it will. The correspondence of this office is filled with queries relating to a great range of subjects in railway accounting, and when these are properly solved by the secretary or by reference to other members, can anyone doubt the usefulness of the association? I hope to see the time when our work will be so large and important that it cannot be handled as it is now; but will have its secretary a regularly salaried officer and devoting his whole time to the work. Those are not idle words, but come from over seven years' intimate contact with the whole situation and with its possibilities plainly understood. When that time comes it may be permissible to let your officers work for the membership, but until that time I cannot help but feel that it is as much the duty of the individual member to be on the lookout for members as it is your officers', and I think you agree with me. We need a large membership, not so much for the finances, although that is important too, but for the broader effect our deliberations will have.

New York, August 31, 1903.

W. B. BROCKWAY,

Secretary and Treasurer.

Secretary Brockway called attention to the fact that the Accountants had a separate registration booth and that it was desirable that all members register there and secure the badges of this Association as well as those of the A. S. R. A., with a view to advertising in that way the Accountants' Association.

The Secretary also read an invitation from the Schenectady Railway Co. to make use of its lines in Schenectady, Albany and Troy, for which purpose the badges of the Association would be honored, together with a schedule furnished by the company of the service on its different lines.

Mr. F. E. Smith, of Chicago, suggested the advisability of considering the question of admitting public certified accountants to membership in the Association with such standing therein as might be decided to be practicable. Several members reported the existence of a demand for the information got out by the Association on the part of the general accountant, and while some members expressed a willingness to enlarge the field of membership in the direction proposed, others doubted the wisdom of such a departure, preferring that the Association be continued exclusively in the interests to which it had been devoted in the past. In view of the fact that the change proposed would involve an amendment of the by-laws, the president was on motion authorized to appoint a committee of three to draft such amendment for submission at the next convention, and he appointed as such committee Messrs. Smith, Magilton and Brockway.

Mr. Irwin Fullerton, general auditor of the Detroit United Railway, then read his paper on "Freight and Express Accounts," which will be found on page 591 of this issue. The paper was discussed at length by the meeting generally, showing a keen interest and desire for information on the part of electric railway accountants as to the best methods for dealing with the question in individual cases. The discussion brought out much valuable information on a variety of details, such as the time and opportunity under varying conditions for making out way bills, statements rendered as to tonnage, commissions paid at the smaller stations to agents, the methods of charging the expenses of the freight and express business and the desirability of establishing a standard on that subject, the rights of companies in the several states of the country under existing charters to engage in this branch of business, the liability to shippers for goods carried, methods of determining the weight of shipments, and in connection with the general subject.

Secretary Brockway then read the following paper, which was submitted as part of the discussion on Mr. Fullerton's paper:

FREIGHT AND EXPRESS ACCOUNTING.

By E. H. Hyman, Auditor Electric Package Co., Cleveland, O.

The Electric Package Co. of Cleveland, Ohio, is the freight and baggage department of the Lake Shore Electric Railway Co., the Cleveland & South-Western Traction Co., the Northern Ohio Traction Co. and the Cleveland, Painesville & Eastern Railway Co., four electric suburban lines running out of Cleveland. Twenty-two freight cars arrive and depart during each day. Wagon service is maintained and package freight, as we call it, is called for and delivered within certain prescribed delivery limits. Baggage is checked to all regular offices where the one-way passenger fare is 25 cents or more. A charge of 25 cents is made on each piece of baggage destined to places where the one-way passenger rate is less than 25 cents, or when baggage is to be put off at a stop number or country cross-road where no regular office is maintained. In checking baggage we follow the rules of the steam lines, charging excess when weight of baggage exceeds 150 lbs. Messengers on cars keep records of all baggage carried, so that it is an easy matter to trace baggage.

I will endeavor to describe the system of accounts used in as clear and concise a manner as I am able. The system is similar in many respects to the one followed by the express companies. All freight is weighed and billed at actual weight and in accordance with marks on shipment. Bills of lading are not signed, filed, nor billing made from them, as in the freight system. Single copies of Way-Bills are made in an impression book and way-bills handed to messenger. We maintain messenger service on all cars. Messengers also accept freight along the lines, and make regular way-bills for it. Messengers record all way-bills carried. After car leaves the office, the messenger checks the way bills, putting his initial opposite each entry, provided shipment corresponds to billing.

Occasionally one of our wagons reaches our depot just as a car is ready to pull out, and freight is put aboard car without any way-bills. When this occurs, the messenger makes out two Over Way-Bills, one of which he delivers with the freight to the receiving office; the other he gives to the office at which he received freight. A regular way-bill is then made by the bill-clerk from the over way-bill and notation put in "Remarks" column "Ahead," giving time and date on which shipment traveled. When the agent at the receiving point receives the regular way-bill, he pins the over way-bill to the regular. When the auditor receives the agent's report, he checks the over way-bill to the regular to see that all shipments on the over way-bill have been regularly way-billed. Over way-bills are abstracted by the messenger in the same manner as regular way-bills, so that the auditor can see that regular way-bills have been issued for all orders.

If the messenger has way bill, but does not carry corresponding shipment, he makes entry on way bill "Short," and immediately sends a Short Way Bill to the auditor, who at once starts an investigation and attempts to locate the shipment.

As soon as freight reaches its destination, the agent or his clerk checks the way-bills against the freight, putting his initial opposite each shipment. He also sees that the shipments are billed at the correct weight and rate. If he discovers an error, he makes an addition or deduction on the way bill, but does not change the original billing.

When the checking of freight is completed, the way bills are written up on Delivery Sheets. Drivers receive these sheets and check them as they load their wagons. The freight is then delivered, signatures being obtained for every shipment. After these sheets have been settled by the drivers they are filed away according to dates. They form a most valuable record and save the payment of numerous claims.

If freight cannot be delivered on account of insufficient address, the statement is transferred to the "On Hand" Book for "Old Hand" Book as it has been nicknamed. The shipper is

notified of the inability to make delivery, and instructions for disposition of shipment are awaited. The charges to collect on the agent's on-hand book remain a credit to him until they are paid, but he does not include them in his reports. To guard against an agent carrying a false credit as on-hand freight, the traveling auditor frequently checks his on-hand book against the actual freight which is on hand.

I have endeavored in the foregoing to follow shipments from the time they are received until delivery has been made. I will next attempt to explain how reports are made and checked. Reports are made by the agents to the auditor once, twice or four times per month according to the volume of business done by the various offices.

Agents list the totals of each way-bill from their impression books on "Abstract of Way-Bills Forwarded." The totals of the abstract are transferred to the "Settlement Sheet" and placed opposite the correct headings. The total prepaid charges on way bills forwarded are a debit to the agent, while the total advanced charges on way-bills forwarded are a credit to him.

"Charges Advanced" are of two kinds, one where charges are paid on shipments to other companies when freight is received; the other is what is termed an "expense." This "expense" is explained as follows: When a shipment which is marked prepaid is billed in error collect, the receiving agent cuts the prepaid mark from shipment and expenses the agent of the forwarding office for the amount of charges, returning the prepaid mark with expense. The receiving agent settles the original way-bill as collect, but receives credit on the settlement sheet for total amount of such expenses. The agent at forwarding office accepts the expense, and obtains the money from the proper source.

Agents total each way-bill received and arrange them in station order. Each station's way-bills are also arranged in date order. The total of each way-bill is listed on a "Statement of Way Bills Received," and totals of the statement are transferred to the settlement sheet. The total charges advanced and charges to collect are debits to agent, as well as the total additions, while the total deductions and total "paid through to other companies" are credits to agent.

Those of our agents who receive a commission in lieu of salary, take credit on the settlement sheet for the proper amounts, sending in receipts for them with their reports. The auditor makes a voucher for the total amount of these receipts attaching them to voucher. The commission is figured on the total charges collect and prepaid on way-bills received and forwarded, but no commission is allowed on charges advanced.

The total amount of credits to agents deducted from total agents' debits shows the amount of cash due the company. The agents of smaller offices send cash with their reports. The agents of large offices make deposits several times a week to the credit of the company in banks designated by the treasurer, and send duplicate deposit slips signed by tellers of the banks to auditor. The auditor can thus keep watch on all such offices very closely. When the report is received by the auditor, he sees that the necessary funds to cover it have been deposited and then makes request for check on the treasurer, who draws and returns it to auditor.

When the auditor receives reports from agents, he verifies the footings of reports and way bills and way bills are sent to the auditor with reports, and checks totals of way bills against the statement of way bills received. If the auditor finds any errors, he marks error on the way-bill and also opposite the statement in blue pencil. When all reports and way bills for the month have been received and statements checked by auditor, all the month's way-bills are sorted in station order and each station's way-bills in date order. Then the auditor checks them against the abstract of way-bills forwarded. Thus every way-bill is checked twice. Errors found on the abstracts are treated in the same manner as those found on the statements. Statements of Correction, with original way-bills, on which errors occurred, attached, are sent to agents, who return them at once, with amount due. If a correction shows credit to agent, a voucher is made and attached to the correction. The agent signs the voucher and takes credit for the

amount of the voucher on his next settlement sheet. When an entry on the abstract remains unchecked, it shows that original way bill has not been settled by the receiving agent. When this occurs, Request for Copy of Way Bill is made on the agent at the issuing office. As soon as Copy of Way Bill is received, Tracer for Unsettled Way Bills is sent to the receiving agent, who must inform the auditor when it will be settled.

All the checking of reports having been completed, the auditor is ready to proceed with his monthly statement.

All C. O. D. shipments must not only be billed C. O. D., but the shipment itself must be marked C. O. D. and amount of C. O. D. given, so that if the shipment arrives without billing or C. O. D. wrapper the agent will see from the marks on shipment that it is C. O. D. Most imperative orders are issued to agents never, under any circumstances, to make delivery of a C. O. D. shipment without first receiving the cash for it. Checks are not accepted in payment for C. O. D. shipments. In other words, we refuse to trust anyone whom the shipper refuses to trust. As soon as C. O. D. shipments are received, they are entered in a C. O. D. Record. When an agent receives payment for C. O. D. shipment, he places the money in C. O. D. wrapper, seals it, marks shipment paid on C. O. D. record, and enters paid C. O. D. in Messenger's Receipt Book. The messenger signs the book, makes entry in his messenger's receipt book, and obtains signature for paid C. O. D. from the receiving agent. Offices which receive numerous C. O. D. shipments should be checked frequently to see that paid C. O. D.'s are returned immediately. A charge according to the amount of C. O. D. is made for the return of the money.

The traveling auditor can obtain a complete balance of the smaller offices in an hour or two, while from half a day to a day is all the time required to check perfectly the larger offices. This proves how simple, yet perfect, our system is.

Mr. Hyman's paper developed some discussion of the methods adopted for checking the collections of agents and preventing thefts. Reverting to the question of separating the expenses of an express and freight department, Mr. Ham thought electric roads might follow the example of the steam roads, which had determined that such differentiation was impracticable and made no effort whatever to keep a distinction between passenger and freight expenses, but that some unit like the car mile or the car hour would admit of determining whether or not a given department was profitable or otherwise. In reply to the president, Mr. Duffy stated that the Committee on Standard Classification of Accounts had not considered the question of freight and express accounting as yet, but he thought it was in line with the work of that committee and that if the convention desired he had no doubt the committee would undertake the work.

The President appointed the following committees:

On Nominations: Messrs. Ross, of Montreal, Pease, of Buffalo, Bartlett, of Boston, Simpson, of Birmingham, and Duffy, of New York.

On Resolutions: Messrs. Mitchell, Rogers, Fullerton, McAssey and Yeatman.

The Question Box was then taken up, with a view to giving opportunity for eliciting information upon matters not covered by the formal program.

Mr. Mackay inquired as to the issuing of stop-overs on interurban roads, on trains where the tickets were issued by conductors.

Mr. Pease of Buffalo stated that his company did not give what was regularly termed stop-overs, but they did have a coupon for each division, allowing the passenger when he reached the end of a division to stop over as long as he pleased and then continue his ride; those tickets were issued by the conductors and credit was allowed for the five cents paid on the original division; the through ticket was sold for that much less and the conductor returned the coupon as five cents, and the station clerk in settling with the conductor at the close of the day allowed the latter five cents on each one turned in. The interurban conductor selling the ticket received from the city passenger either a coupon or a transfer.

The Secretary read the following question which had been sent to the desk in writing:

"What is the customary way of putting up receipts for the banks? It is asked because the banks in my city desire all coin to be wrapped, and I want to do it otherwise if I can." (Laughter.)

Mr. Henry A. Ferrandou, Auditor New Orleans Railways Co., said that they had established a system of receivers at their seven different stations in New Orleans, and with a view of saving in office force they attempted to deposit their earnings as they came in from the receivers direct into the bank. It so happened that his board of directors was composed of presidents of the leading banks of the city, and at the end of two weeks they directed a change in the system on the ground that otherwise the banks would be obliged to hire more help; so he was now putting up the nickels in \$5 packages, dimes in \$10 packages and dollars in \$500 packages. He did not have to roll the packages, however.

Mr. Fullerton said that in Detroit they received a great deal of Canadian money and the banks further insisted that that must be sorted from the American, both silver and bills.

In reply to a question by Mr. Lynn as to what part of the ticket sold on interurban roads or city and interurban combined, was treated as earnings of the day on which it was sold, Mr. Mackay said that in the case of round trips they put it all as earnings because it must all be used on that trip; in the case of return coupons, they were treated as earnings the day they were lifted.

Mr. Mackay added, in reply to Mr. Simpson, that where a general ticket was used it was taken up and credited not only to the line on which it was taken up but to the divisions in that line, and that they carried a ticket account; the going portion of the ticket must be used on the day it was purchased and on the same train, because it was sold on the train only and represented a passage; they had no regular ticket offices.

In reply to a question by Mr. Swift as to the methods employed to get rid of cancelled tickets, Mr. Ham said that after looking into the question of mutilating machines they found that there were machines that worked fairly satisfactorily, but at the same time they had decided that if the burning of the tickets was surrounded by proper safeguards they felt it was preferable. He thought that a macerating machine such as is used in the Treasury Department for the destruction of paper money would be very expensive. There was another scheme for treating the material chemically which took off all the ink, but it was a nasty method.

President Davies stated that his company chipped out triangular pieces from the ends of the tickets and sent them to the furnace to be burned in the building in which the offices were located, but found that in the summer time that this made too much heat.

Mr. Mackay inquired whether it was the general custom to charge injuries and damages to Account 33 as paid or to pass them through a reserve. In their own case they passed them into a reserve. He raised the point that the standard classification made no provision for that, and the question arose whether it was not to that extent misleading.

President Davies replied that his companies passed them into a reserve account, or an accident fund account, charging a percentage of gross receipts in that account and charging to that account the damages as they were paid.

Mr. Brockway said it was customary in his companies to charge it into that reserve fund and a certain proportion of the account into operating expenses each month, but to wipe that account out absolutely at the end of each fiscal year. As to providing for accidents which had occurred during the year and must be paid for later, that offset itself in a measure by having taken into your expenses and into your fund matters which were created prior.

Mr. Mackay stated that the amount which went into expense account with them, for accidents, was an arbitrary figure based upon past experience, a percentage of the gross receipts, and at the present time their injuries and damages reserve fund, instead of being balanced, stood about \$125,000 to the good, to take care of injuries and damages that had occurred and which would have to be paid in the future.

Mr. Duffy thought that damages were only one of many other similar propositions which had to be estimated and apportioned and that it was not necessary that the classification should specify anything on the subject.

Mr. Ford thought that if he had \$125,000 set aside from surplus as a damage fund he would stop there and attempt to close his damage account with each fiscal year, inasmuch as by increasing that fund the company was deprived of the use of that much of its surplus. He thought the experience of Mr. Mackay's company in having a credit balance was the exception; that most railroads had a debit balance.

After some further discussion of the question of a damage fund, and the expression of somewhat conflicting opinions as to the best procedure, an adjournment was taken until Thursday morning at ten o'clock.

The Marginal Protecting Strip.

With the use of asphalt for paving purposes, there was developed a large increase in the cost of street railways of maintaining the paving by reason of the rapid wear and disintegration of the asphalt, which begins to fail in the immediate vicinity of the rails. The most severe test which can be given any kind of street paving is to subject it to the pounding and grinding action from the tires of heavy wagons turning into and out of the tracks. When the wagon wheels are spaced at a different

averaged \$1,250 per mile of single track per annum in 1891 and 1892.

In February, 1902 an iron casting known as the "Marginal Protecting Strip," was laid next the rails on that portion of Third Ave. where the repairs had been most frequently needed and the traffic the heaviest. This showed such good results after a few months' wear that more marginal strips were laid along the route of heavy traffic, and at the present time over $3\frac{1}{2}$ miles of track is equipped with the marginal strips and asphalt between. So far, the repairs to the asphalt paving where the marginal strips are in use have amounted to very little, it having been necessary to repair only four or five yards where some strips were improperly laid, while very extensive repairs have been made twice during the same period north and south of the section protected with the marginal strips.

In the second engraving is presented a section of track on Third Ave. protected by marginal strips, which had been in place one year without repairs of any kind to track or paving.

The marginal protecting strip is made of hard cast iron $1\frac{3}{4}$ in. thick, extreme width $5\frac{1}{2}$ in., in lengths of 7 ft. 6 in., straight or curved, to suit conditions of track, the side away from the rail being made with projections, forming, as it were, a dental course with the asphalt. Toe checks to prevent slipping of horses are cast on the upper surface, while the under face is recessed to



SHOWING DETEIORATION OF ASPHALT. THIRD AVE., NEW YORK



TOP OF PROTECTING STRIP



BOTTOM OF PROTECTING STRIP



ASPHALT PAVING AS PROTECTED

gage with the track, there is a continuous grooving effect alongside the rails which, combined with the crossing wear, soon causes dangerous ruts to form on each side of the rail. These broken places in the asphalt, if not promptly repaired, soon enlarge until the paving is destroyed. Another cause of the failure of asphalt is its cracking, especially in cold weather when it is hard and brittle, by the springing of the rail under the passage of heavy traffic. Frost penetrating these cracks assists in breaking up the pavement.

Various methods have been adopted to overcome this general tendency of asphalt pavement to fail along the lines of the rails, with more or less success. Granite blocks arranged in a dental course on each side of the rail reduce somewhat the destructive effect caused by wagon wheels entering and leaving or crossing the tracks. Hard bricks laid on edge along each side of the rail have the same effect in delaying the wear and reducing the cracking and breaking away of the asphalt. And yet both of these plans have not been successful where there is very heavy traffic.

The experience with asphalt pavement in New York city, where the street traffic is exceptionally heavy, illustrates the difficulties very clearly.

In one of the engravings is shown a section of tracks along Third Ave., New York, where the asphalt was laid close up to the rails. It is estimated that the cost of maintaining this line of track in good condition as regards the asphalt paving

give a good hold on the foundation. Near each end there is a counter bored hole to receive the head of the expansion bolt.

In applying the marginal strip where pavement is already laid, asphalt next the rail of sufficient width to receive the strip is cut out, and holes are drilled in the paving foundation to receive expansion bolts.

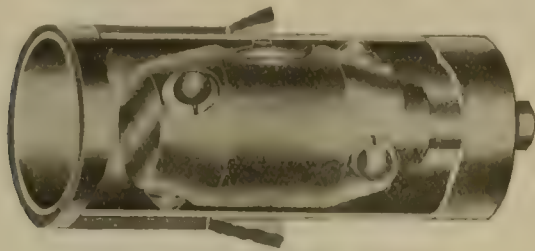
A bed of portland cement is laid to receive the iron, which is securely bolted down before the mortar receives its initial set. Pieces of flat iron $\frac{1}{4}$ in. x 4 in. x 6 in. are placed under the strips at the joints. In laying the strip, care is taken to have an open joint of $\frac{1}{4}$ in. next the rail, leaving room for vertical and horizontal movement of the rails without disturbing the iron strips, and the surface of the strips being even with the rail head makes a smooth, level surface for vehicles. After the strips are laid, the asphalt is repaired. To date, after fourteen months' service, the strips have entirely prevented the breaking up of the asphalt.

The marginal protecting strips are made and sold by the American Brake Shoe & Foundry Co., 170 Broadway, New York. Sample strips may be seen at the booth of the company, Grand Union Hotel, during the convention.

The Spiral Nut Lock Co. will not be represented at the convention the reason given being that the company has all the orders it can attend to at present from steam railroads.

AN IMPROVED BOILER TUBE CLEANER.

The General Specialty Co., 802 808 Seneca Building, Buffalo, N. Y. has just placed on the market the "Torpedo" boiler tube cleaner, which is shown in the accompanying illustration. The principle of this device is that of swiftly oscillating "knocker" driven by steam or air pressure. It consists of a casing, a piston, inlet and exhaust ports, and a double-acting knocker rod, which is firmly secured in the center of the piston itself and is substantially a part of it. The motive fluid is applied in the most direct manner to insure the greatest speed of piston and knocker rod, a speed of upwards of 3,000 strokes per minute being attained during a 30 minute test, at the end of which it was noted that the temperature of the tube was not raised sufficiently to prevent its being handled easily without gloves.



THE "TORPEDO" TUBE CLEANER.

The travel of the knocker rod is limited so that, although it is capable of exerting a powerful blow, it cannot puncture or otherwise injure the tube, because even if the tube walls were not present to stop the motion of the rod, it would not travel beyond that limitation. This construction makes it possible to safely operate the machine at boiler pressure. The body of the device has to be considerably smaller than the inside diameter of the tube, of course, consequently the machine is maintained in the axis of the tube by two sets of centering lugs, one in front of the piston and one back of it, the lugs being forced out against the inner surface of the tube by steam pressure.

The "Torpedo" cleaner is made for all diameters of tubes from 2 to 6 in., inclusive.

* * *

NEW REGISTER ROD HANDLE.

C. O. Oberg & Co., of Boston, recently placed on the market an improved register rod handle which will be sure to appeal to electric railway managers as possessing meritorious features. Two types of the new handle are shown in the accompanying illustration. This handle may be put on or removed without disconnecting the rod from the register, or from its bearings, and none of the other handles has to be removed; neither is the operation of the register disturbed. The handle cannot get loose, it is stated, even if worked both ways, on account of its



having a powerful grip because of a hardened steel key which is set in the composition and which is pressed into the steel rod when the bolt is tightened. In present practice, when it becomes necessary to replace a handle which has worked loose, all the handles have to be loosened and the rod removed from its bearings and register connections. The new handles are said to cost about the same as the old style, being much cheaper than square rod handles, and are made in any desired shape.

POSITION WANTED.

Wanted, position as General Manager or Superintendent of Electric Lighting Plant; 16 years' experience as Manager and Superintendent. Best of references. Address X, C/o Street Railway Review, 39 Cortlandt St., N. Y. City.

WILLIAM WHARTON, JR., & CO., INC.

This company has, as usual, a nicely arranged exhibit of its special track work, embodying a number of novelties. For one thing, there is shown a 9 in. guard rail made of "Manganese" steel, 20 ft. long, and curved to quite a sharp radius. The Wharton company is now furnishing curves made entirely of these rails for use in places where traffic is very heavy, or other conditions exist which would cause ordinary bessemer steel rails to wear out very quickly. A curved T-rail of "Manganese" steel is shown, also, as a sample of the kind furnished to the Boston Elevated Railway Co., which have given excellent results. There is also exhibited a large photograph of a "Manganese" steel frog which was placed in the Philadelphia terminal of the Pennsylvania R. R. This frog was the first of its kind which the Pennsylvania R. R. put down in a place that presented such extreme conditions of wear that frogs made of ordinary rails did not last more than three months, while this "Manganese" steel frog has been in the tracks more than three years and is still in good condition. The Wharton company states that since this first frog it has sold more than 2,000 "Manganese" steel frogs to the Pennsylvania road alone. A sample of this style of frog, such as the company usually furnishes to steam or elevated roads, is shown at its exhibit; also a photograph of "Manganese" steel frogs in one solid casting, constituting some cross-lugs on the Boston Elevated system.

There are also exhibited samples of solid cast "Manganese" frogs, mates, etc., for electric surface railways laid with T-rail, such as the Wharton company regularly furnishes to such roads on calls for first class work. The company is also prepared to furnish regular girder rail switches, mates and frogs cast solidly of "Manganese" steel where the increased expense would be warranted; but no samples of these are being exhibited. A worn-out frog is shown, however, on which the entire head of the rail part is worn away, while the "Manganese" steel center is still in serviceable condition. Samples of regular girder rail "Manganese" steel center work are exhibited, and also the "unbroken main line work" for street railways. The latter has undergone considerable improvement during the past year, all parts that are subjected to the stress of wagon traffic being made of cast steel, instead of cast iron, and the movable tongue is provided with an adjustable device for holding the pivot and taking up the wear of the same. Through the use of cast steel the amount of metal exposed on the street surface has also been considerably reduced.

Attached to the regular "Manganese" steel girder rail tongue switch is shown a novel spring throwing device for the tongue, known as the Dunham spring throw for tongue switches. By it the tongue can be turned by means of an ordinary switching iron, and in either position it will act as a spring tongue, the spring at the same time locking the tongue in position so that it cannot be thrown between wheels or trucks.

The Nichols protected heel tongue switch is included in the exhibit, as well as various photographs of work and drawings which testify to the diversity of the Wharton company's special track work. The company is also distributing its new general catalog, which is attractively gotten up.

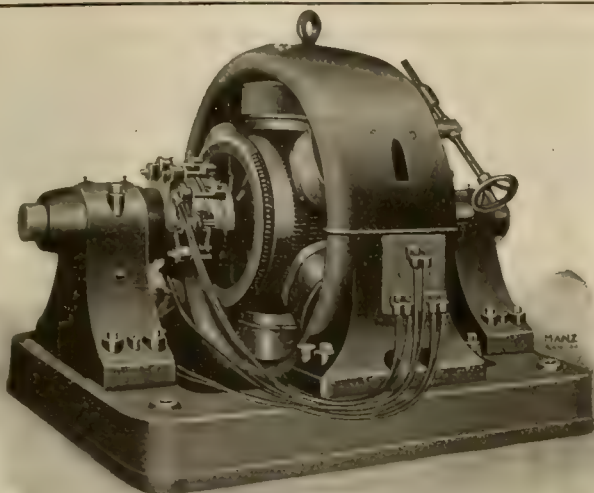
The company's representatives at the convention are: William Wharton, Jr., pres.; Victor Angerer, vice-pres.; W. Rodman Wharton, J. C. Robinson, Arthur S. Partridge and W. McLain.

* * *

W. H. Mullins, of Salem, O., manufacturer of architectural sheet metal work and statuary, has just issued a handsome catalog of his specialties, prominent among which are metal boats, which Mr. Mullins states, will very likely supersede the old-style wooden boats. The demand for boats has been phenomenal, he states, making it difficult to keep up with the orders. A copy of the new catalog will be sent upon application to Mr. Mullins.

POSITION WANTED.

A master mechanic of 20 years' experience — both mechanical and electrical work. Can furnish good references. Apply at Street Railway Review Booth, or address Street Railway Review, Chicago, Ill.



250 K. W. Bullock Railway Rotary

**BULLOCK
ELECTRIC MFG. CO.**

CINCINNATI, OHIO

We have a 400 K. W. Rotary on Exhibition at the
Saratoga Convention, Booth 96.

A FARE EXCHANGE.

One afternoon as I started to get on No. 89's car, two pick-pocket-looking men got off and as soon as they reached the ground they proceeded to prophesy to him various and sundry evils that would happen when they met again, the prophecy being interjected with uncomplimentary remarks in regard to his personal appearance and with grave forebodings as to the temperature of his hereafter.

"What is the rumpus?" I asked of No. 89, who had stood back in the vestibule with a pleased grin on his face and an alert switch-bar in his hand all the while that his horoscope was being read.

"Oh, nothin' much. Them two fellows thought they'd be sharp an' they was sharp—too sharp—an' they cut 'emselves an' I guess it stings!"

"Come, Mat, no conundrums! Tell me what happened."

"Well, you see someone worked off a bad silver dollar on me this morning—just look at it!"

"Pretty poor specimen!"

"Poor! Why my mind must be gettin' feeble when I take coin like that! A woman got it off on me an' I ought 'a' known better but 'twas on the shopping rush-trip an' a big crowd was gettin' on an' off an' I had to make change pretty lively. These women all come down of a Monday mornin' with the bills they've swiped out their men-folks clothes an' expect us conductors to change 'em first thing!"

"Well, what has that got to do with the row you had with these two men?"

"I'm comin' to that. Them two sharps got on back here a

piece an' as there wasn't no other passengers aboard I wasn't in any hurry to collect their fares, but stood leanin' against the door an' that dollar bein' in my mind I took it out an' had another look at it an' cussed myself a bit more. Then I went in an' asked 'em for their fares an' one on 'em says,

"'Fares? Why I paid you for both of us when we got on, gave you a silver dollar an' here's the change you gave me,' an' he held out a lot of small silver in his hand.

"'Gave me a silver dollar?' says I—just that way.

"'Yes,' says he, 'an' I noticed you didn't ring up the fares,' he says.

"I looked him square in the eye an' I seen it was a beat game so I didn't waste no time arguin', I pulls out the dollar an' says again:

"'You say you gave me this dollar?'

"'Sure,' he says.

"'Well,' says I, 'I'm glad I found out who give it to me,' an' I went back in the vestibule an' I hadn't more'n got there afore he hollers out:

"'Why?'

"'Cause its counterfeit an' I'm goin' to hall the first cop I see an' give you in charge for shovin' the queer,' says I.

"Well, sir, I'd sized them chaps up pretty well, they was crooks for fair an' when I says 'cop' they just turns fairly green in the face an' makes a break for the door. But I'd got ready for 'em. I slid the door closed all but about three inches an' jammed it with my foot an' I swung that switchbar up where they could see it an' I says,

"'Not in such a hurry gents—wait 'till the car stops!' an' I give the motorman four bells. — quick an' —"

"What does 'four bells' mean?"

ALUMINUM RAILWAY FEEDERS

AND ALL KINDS OF

ELECTRICAL CONDUCTORS

Aluminum feeders are less than one-half the weight of copper feeders and are of equal conductivity and strength.

If insulated wire or cable is required high grade insulation is guaranteed.

Prices with full information
furnished on application.....

The Pittsburgh Reduction Company
PITTSBURGH, PA.

WHICH IS SIMPLER AND CHEAPER?



THE OLD WAY

Of Replacing Handles on Register Rods

The present practice is to have an eye or hole at one end of the handle through which the rod passes. The rod and handle are held in rigid relation by means of a set screw. The fact is that the eye stretches and the set screw becomes worn or broken from continued tightening, and of course in less than a minute of holding the handle rigid on the bar. This necessitates the providing of a new handle, and the removal of the old one. The only way to get a new one on is to loosen all the handles on the bar, and remove the rod from its bearings and connections with the register. This of course involves considerable trouble, material loss of time, and a great expense, as it takes two mechanics five hours to do the job.

THE NEW WAY

Take a Wrench and an Oberg Handle and the job is done almost instantly.

C. O. OBERG & CO.

100 Purchase St., Boston, Mass.



Hardened Steel Key. Better than Ten Set Screws.

"Get t'ell outer here an' don't stop fer nothin' till you see a cop or a inspector—well the motorman looked back an' seen there was some sort of a muss on, an' he didn't pay no 'tention to them fellows ringin' but just plugged it to her an' we went on a sailin'. Then I says to them two fellers:

"You hand a dollar through that crack to me an' you can get off," says I, "if you don't I'll carry you clean up to the Police Station." When I said this, one on 'em made a grab at the edge o' th' door an' I hit close by his hand with the switch-bar an' he let go mighty sudden. Then they looked at the windows but they seen 't would be dangerous gettin' out o' them at the speed we was goin' an' they looked at the front door an' seen that the motorman was a watchin' on 'em. I seen they was weakenin' an' so I says, 'We're gettin' close to th' Station, what are you gents goin' to do?' an' one on 'em pulls out some silver an' hands it through the crack an' cusses me an' I says,

"No sir," I says, "no more pewter thank you, Uncle Sam's long green's the stuff I want, an' I want *two* o' them now, one for the dollar an' one for cussin' me!"

"Well, sir, they seen it was no go—I had 'em cinched an' they probably had some queer money on 'em or else they was 'wanted,' so the *one* as hadn't said anything fishes out a roll o' money an' peels off two bills an' hands 'em through. I took 'em careful an' sized 'em up with my fingers an' one eye while I kept the other eye cocked on them an' I seen that the money was good and got it into my clothes quick. Then I gives the motorman three bells—that's the signal to stop sudden *any* time—an' I backs off into the corner with my switch-bar ready in case they wanted trouble—an' you saw an' heard the rest!"

"Won't they try to 'do you up?'"

"Them? They'll take the first train outer town, 'cause they'll know I'll put the other conductors onto them an' it'll soon get to the cops. No sir, I ain't afraid o' such as them!"

"And now I suppose you will ring up that dollar and ninety cents with a great deal of joy, won't you?"

"What! Ring up that money? Ring up nothin'! Half of that goes to the motorman an' he can ring that up if he wants to—an' I don't think he'll want to! No sir, that dollar'n ninety cents is 'spoils o' war,' as old Johnnie (our president in th' old hoss-car days), useter say when he took the 'overs,' an' neither th' comp'ny nor my wife'll see my share of it! Lemme see—that'll buy um-um-um—that'll keep me in beer an' seegars for a week an' I got th' old pewter dollar to the good! This here's your street, sir."



The Tucson Street Railway Co., of Tucson, Ariz., which operates a 5-mile horse railroad, contemplates the conversion of its system to electricity, and the principal matter for consideration at the annual meeting, which was called by the secretary, Charles F. Hoff, for September 2d, is the proposed issuance of \$100,000 bonds for the purpose. The other objects of the meeting were stated in the call to be the election of a new board of directors and to act upon the proposal to increase the capital to \$200,000.

CURTAIN FIXTURES



The Keeler "Eccentric" Fixture has no cables, adjusting or retaining devices. Its only bearing points are pivoted eccentric rolls.

The Keeler "Pinch Handle" Fixture is superior in action to other fixtures of this type.

FEDERAL MANUFACTURING CO.
Railway Equipment Dept.
Cleveland, Ohio.

EASTERN AGENT—H. E. HEELER
26 Cortlandt St. New York.

NEW CARS FOR STONE AND WEBSTER LINES.

These orders for car-bodies have been placed by the Stone & Webster management of Boston to increase the rolling stock of its various lines: With the St. Louis Car Co. for fifteen 20-ft. closed car-bodies for the Dallas (Tex.) Consolidated Electric Railway Co., and six 26-ft. closed car-bodies for the Metropolitan Street Railway Co. of the same city; with the Chicago Car & Locomotive Company for ten flat freight-cars for the Tacoma (Wash.) Railway & Power Co.; with the American Car Co. for two open-10-bench-car-bodies, for the El Paso (Tex.) Electric Railway Co.; with the Ottawa Car Co. for three 20-ft. car-bodies for the Cape Breton Electric Company, Ltd., of Sydney, N. S., and two 20-ft. car-bodies for the Glace Bay Railway Co., Ltd., of Sydney.

DAILY STREET RAILWAY REVIEW

5TH YEAR :
No. 3

SEPTEMBER 4, 1903

SERIAL NO. | VOL. XIII
| No. 8 C

Census Statistics and the Standard Form of Electric Railway Accounting.

By William M. Steuart, Chief Statistician for Manufactures Bureau of the Census Office.

Presented before the Street Railway Accountants' Association, Sept. 3, 1903.

There are many obstacles to the compilation of accurate statistics concerning industrial enterprises, but the two we are particularly concerned with are the absence of standardization in accounting and the disinclination of individual owners, companies, and corporations, to furnish information. Both of these impediments to good statistical work have been met and, in a measure, overcome in gathering and compiling the statistics for street and electric railways, contained in Bulletin No. 3, recently published by the United States Census Office. This bulletin will be followed at an early date, by a report which will contain an elaborate discussion of the statistics, a history of the industry tracing the development of the modern street railway system, the features peculiar to the interurban lines, and, in fact, will present every phase of the industry that is pertinent to a statistical discussion. I presume you have studied the Bulletin and that you will give some attention to the final report.

The Bulletin is certainly the most complete presentation of the street railway interests that has ever been published. The conditions prevailing in the industry are entirely different from those that existed at the time of the Eleventh Census, 1890. The electric road was then just being introduced, its possibilities were not realized, in fact, we are now just beginning to appreciate them. There could, therefore, be no more opportune time for taking a census of the industry than the year selected. In another decade, the industry will have assumed much graver responsibilities and the conditions will again be radically different. The changes that have occurred and the advances made during the past ten years are astounding, but they have by no means reached their limit. The changes in ownership and management were so rapid during the six months that the canvass was in progress that it was almost impossible in some cases to catch the right man to make the report. He had sold out, consolidated, reconsolidated, made a new issue of stock, or was remodeling the entire system. In some cases, a week or more was consumed in locating the party who could make the report. Every road appears to come out of the general mix up in better condition so far as the physical equipment is concerned, but the finances of some are rather distressing.

The census of 1902 caught the industry in the fullness of its youth but because of its vigor, it was difficult to control it in a cool and dignified statistical style. It would not stand still long enough to be measured. I am in hopes that the next enumeration will catch it when it is nearer maturity and when it will be more tractable and reliable figures can be obtained for its most minute details. The census reports give you a complete picture of the street and electric railway industry as it existed during the year. This is the first time we have ever had the opportunity of studying, in such a convenient form, the finances of the roads in each section of the country and of examining the physical equipment of each individual system. It is only by making a careful analysis of the conditions prevailing in each company, that you can devise a system of accounting that is capable of practical application to all. Each of you has, no doubt, a thorough knowledge of the physical equipment and finances of the road with which you are connected and possibly have the facilities for comparing these conditions with the conditions ex-

isting in a limited number of other companies, but the census reports give you an opportunity for extended comparison and analysis. They enable you to become acquainted with conditions existing in the industry in all sections of the country. They show where it predominates, the magnitude of its financial operations, the number of people it supports, its peculiarities in different localities, the reasons for peculiar features, the character of equipment and service, the extent of its patronage by the public, the advantages derived by the public, and the possibilities of its extension. The reports are a storehouse of information and they could be made of great service as books of reference for investigations, and form the basis for researches that must be made in order to become thoroughly posted in every detail of the industry.

While it is not my purpose to discuss the statistics, I feel that some reference to them, especially to peculiar features, is necessary in this connection and, in fact, is indispensable in order to appreciate the difficulties attending a uniform application of your system of accounts. With the exception of the food, clothing, wood working, and iron and steel industries, there is none of more importance and that is more conducive to our happiness and prosperity than the transportation facilities. For statistical purposes, these industries are divided into three groups, steam railroads, street or electric railways, and transportation by water. While the steam railroads form by far the most important group, the urban population of the country is more thoroughly dependent upon the electric roads for their immediate necessities. If these roads were abolished and no other means of rapid transportation substituted, I imagine that New York city would, for all practical purposes, very quickly divide itself into three distinct cities, and that a similar sub-division would occur in Chicago, Philadelphia, Boston, and all of our large cities. The suburbs would be about as inaccessible as the rural districts and would disappear or dissolve into separate cities. Not only have these roads become necessities, but I believe a larger proportion of the population depend upon them for their amusement and health than on any other line of diversion. The extent to which they are patronized is indicated by the fact that more than 5,800,000,000 passengers of all kinds were carried during the year. This is sufficient to give more than 200 rides to each inhabitant of the cities and towns having a population of 4,000 or over at the census of 1900. They give employment to an army of 140,000 persons, thus making at least 500,000 dependent upon them for their support. The salaries and wages paid annually to their operatives amount to more than \$88,000,000. The average annual wages per operative compare favorably with those in other lines of industry, and there are very few that give constant employment to a larger force or have a larger pay roll.

The financial transactions of the companies are rapidly approaching proportions which will outclass those of our largest industries. The authorized capitalization in 1902 amounted to \$2,870,629,316, while the gross earnings from operation were \$217,563,229 and the net income after deducting all expenses, both operating and fixed charges, was \$30,596,977. The statistics for the physical equipment of the roads indicate the great diversity of industries that are, in a measure, dependent upon them for their prosperity. The construction of 22,577 miles of

track was a great stimulant to the steel rail market while the building of 16,000 cars made a great demand on the numerous industries dependent upon such work. The manufacture and installation of the engines and boilers to generate more than a million horse power reported for the power plants of the electric railways was sufficient to keep our largest foundry and machine shops busy for many months. The extent to which the manufacturers of electrical apparatus are dependent upon the roads is indicated by the fact that almost 5,000 large generators, transformers, boosters, auxiliary generators, rotaries, and motors were in use, also over 16,000 storage battery cells, and this does not take into consideration the electrical equipment of the cars, wiring of the road, or the lighting and telephone facilities.

The Census Office received reports from 987 companies, but if the present rate of consolidation is continued for another decade, we can secure reports for two-thirds of that number and still cover the entire trackage. The term company or establishment is rapidly losing its significance in all of our important industries. It is of no statistical value in the report on electric railways. If the word "system" could have been used to designate the number of separate holdings it would probably have conveyed a more exact meaning, but this was impossible because in some instances, separate reports were made for constituent companies. The two systems in the District of Columbia insisted on making eight reports and would not be satisfied until they were counted eight times. There were nine companies operated by regular steam railroads as an auxiliary of the railroad business, and to which it was impracticable to apply your system of accounting. Eleven companies operated incline planes exclusively and, therefore, cannot be strictly classed as street railways. There were also 53 companies operated exclusively by animal power, 2 by cable, and 3 by steam. Eliminating these and the 170 lessor or non-operating companies, there remain 739 companies with 18,730.28 miles of single track to which your system of accounting could be considered as applicable. But a large number of these companies have complicating features that are difficult to overcome in the application of your system of accounting. For instance, 252 companies generate electric current for sale and the business was of such importance that separate reports were secured for the light and power plants of 118 companies in which the revenue from the sale of current amounted to \$6,469,726. The form of account recommended by you does not take sufficient cognizance of this feature of the industry. It is a feature that appears to be developing very rapidly and should be recognized in any system that is to be made of universal application. After deducting the 252 companies that generate electric current for sale, we have 487 companies and of these, 50 operate gas plants, water works, or some other industry that has no connection with the railway business. There are, therefore, only 437 companies to which your form of accounting is strictly adaptable. These conditions illustrate the tendency toward consolidation of independent interests, which is a feature of our industrial progress in all lines of industry. All of these conditions should be considered in formulating a system of accounts or preparing a schedule for statistical work. The accounts and schedules must be changed to meet the conditions. The industries will not be conducted so as to fit the accounts or schedules.

The establishment of interurban lines is a feature of electrical railway development which is now attracting the greatest attention. It is the field which offers the greatest possibilities for expansion and for the application of improved and more powerful machinery. The improvements that have invariably followed upon the introduction of an electric road into a community, especially in the suburbs of cities, warrants the conclusion that the construction of such roads will continue with the same degree of rapidity that has characterized their advance during the past decade.

Electric roads run indiscriminately into urban and rural districts, there are none confined exclusively to interurban traffic, and it is impossible to make a separation of the roads so as to show the statistics for those engaged in rural and interurban work unless arbitrary methods are used. The Census report gives the miles of track within and outside of city limits but this can only be accepted as a rough indication of the inter-

urban roads. A road may be considered as engaged primarily in interurban business if at least one-half of its track is within city limits. On the other hand, a road may connect two or more cities and be classed as an interurban line although more than half of its track is within the legal limits of suburbs of the cities it connects. In making a separation of the roads, it is found that about 60 companies can be considered as operating interurban lines. Their total single track amounted to 8,803.30 miles and their total earnings from operation for the year to \$1,000,000, less total operating expenses were \$20,100,951, the net earnings being \$1,000,000. The single track of these companies comes 60 per cent of the total for all companies and their operating earnings 10 per cent of the total earnings from operation. The interurban traffic, therefore, forms only a very small proportion of the total electric railway business. There are about 60 companies with 3,212.10 miles of single track that operate what may be classed as fast long distance interurban lines. Each of these companies operates at least 20 miles or more, the average length of single track per company being 53.53 miles. The maximum running speed outside city limits was at least 20 miles per hour. The total operating earnings amounted to \$1,000,000 and the operating expenses \$1,321,568, the net earnings being \$20,100,951. These roads have some features which are distinctive and the Census Office is now preparing an analysis of their statistics which will be included in the final report.

It is time to say goodbye to the horse car line. It has been discontinued in almost every city where it was in a flourishing condition a few years ago. While there were 67 companies using animal power and 209.1 miles of track operated by such power, the greater proportion of the track was owned by companies which used other motive power on a portion of the line. There were only 53 companies which used animal power exclusively and their single track amounted to 158.12 miles, being an average of about three miles for each company. It is strange that the Metropolitan District in which the most advanced electrical appliances are in use on the street railways, is also the home of the antiquated horse car. Almost half of the trackage operated by animal power is located in Manhattan, and the Dry Dock, East Broadway & Battery Railway is the largest road operated by a company using animal power exclusively. With the exception of New York, the following cities are the only places in which more than five miles of track were operated by animal power in 1902: Hutchinson, Kansas, 7.83 miles; Santa Rosa, Cal., 7.33 miles; Chicago, Ill., 6.76 miles; Winfield, Kansas, 6.25 miles; Los Angeles, Cal., 5.95 miles; San Francisco, Cal., 5.65 miles; Arkansas City, Kansas, 5.50 miles; and Tucson, Arizona, 5.10 miles.

The cable, which fifteen years ago had such bright prospects, is now antiquated. There are only two street railways operated exclusively by cable power. From the Census Bulletin, there appear to be twelve roads of this character, but ten of them are inclined planes.

Steam has never been accepted as a proper motive power for roads of the class covered by this report and it is doubtful if any of them should have been included. It was difficult to break away from tradition and the few enumerated have been so classed in prior census reports and technical journals, and they were included so as to preserve the comparison.

I have referred to the different classes of roads and industries other than a legitimate railway business carried on by railway companies, to illustrate the fact that, as a whole, the street railway business is not as clearly defined as most people suppose. The temptation to engage in other lines of industry cannot be resisted, and it is impossible to compile exact statistics for the railway business, exclusively. If you believe that your system of accounts is capable of practical application to all companies and that its use would enable the government to compile exact statistics, I am afraid you will be disappointed. It can be applied to the majority of the companies and the results of its application will be very beneficial.

As accountants, you are particularly interested in the financial statistics, but I am of the impression that the chief value of the Census report lies in its detail presentation of the phy-

seal equipment of each road. These tables enable you to make an exact comparison of the power plant and rolling stock of your company with those of every other company doing a similar business. Such comparisons can be of no detriment to any company, on the contrary, they tend to better the conditions in all. Such a comparison cannot be made of the financial statistics without disclosing the operations of individual companies and, as a number of companies expressed the desire that this should not be done, the only comparisons possible are based on the totals for several companies, in each of which slightly different conditions prevail.

The general tendency in most lines of industry is toward over capitalization and the conditions prevailing in the electric railway business seem to have been especially conducive to this result. The par value of the common and preferred stock on which no dividends were paid during the year, amounted to \$667,878,624, or about 50 per cent of the total issued. The practice of some companies to equalize the cost of construction with the amount of capital stock and bonds, and the apparent inability of others to furnish definite information concerning the cost of construction, made it impossible to compare the actual cost with the stock and bonds issued. Accepting the figures as reported, it appears that the stock issued and the funded debt outstanding for all roads, exceeded the cost of construction by \$140,648,022.

The tables presented in the bulletin show the earnings and expenses in the form prescribed by your Association for all roads in each state, and other groupings will be made in the final report which may be more instructive. The grand totals for all roads in the entire country, or for any state, are no indication of the conditions prevailing in any individual company or in companies engaged in particular lines of traffic. A grouping of these statistics for interurban or urban roads, or roads in cities of a given population would indicate the amount of income and expenditure that should prevail in the companies operated under similar conditions. Such tables are now being prepared for the final report but the work is not sufficiently far advanced for me to give you the results.

To be of value, the totals for the same groups of receipts and expenditures should, in every case, be composed of the same items. The absence of uniformity in this respect is the cause of much uncertainty in accounting and this is greatly emphasized in the preparation of totals so large as those given in the census reports. No more important service can be rendered the statistical science than the adoption of uniform systems of accounting, but there are comparatively few lines of industry in which the same system can be uniformly applied to all establishments. Your system was devised primarily for companies doing an electric railway business exclusively, but the Census investigation developed the fact that there are comparatively few companies that do this. For instance, in reporting the analysis of operating expenses, the majority of the companies, in answering the subquestions, included the expenses incident to the generation of electric current for sale but there was an expenditure of \$2,188,752 for such work that it was found impossible to segregate. The expenses incident to such work are, therefore, included for some companies and omitted for others. In many cases of this character the companies contended that the system was not applicable to roads operating electric light and power plants. If expenses incident to the generation of current for sale are included in the operating expenses of the road it is manifestly wrong to use those totals to compute the expenses per mile of track, per car, or per car-mile. In fact there are comparatively few companies for which it is practicable to obtain statistics concerning a year's business that could be used to make such computations with exactness. It is probable, however, that the census totals are sufficient for general comparisons. They are uniform for all sections of the country and can be used to indicate the conditions in one locality as compared with those in another, on the theory that the elements which are wrongly included exist in about the same degree in all localities.

In formulating the schedule for street and electric railways the Census Office endeavored to adopt a series of inquiries which would comply with the requirements of the law and,

at the same time, be easy to answer by all companies and also develop information of interest and value to those engaged in the industry. The inquiries suggested by your form of accounting seemed to answer these requirements. The numerous items enumerated as the proper ones to be assigned each general subdivision indicated a careful analysis of the industry. The organization had been in existence a number of years and its system appeared to have developed very largely with the industry and had been put into more exact and positive form by the promulgation of printed schedules. Under these conditions, the form was evidently the correct one to be used and you are familiar with the negotiations which culminated in its adoption for census work. The adoption of your schedule was part of an extensive scheme now being worked out by the Bureau of the Census for the collection of statistics of every description. The demands for statistical information have been so pressing during recent years that the Federal and State statistical offices have developed more rapidly than a due regard for their work would warrant. A number of railroad companies in different states complained of the numerous demands for government reports and express the hope that action be taken by the Federal and State governments to secure uniformity in regard to the periods to be covered by such reports. This is particularly the case in Pennsylvania, where the railways are required to make three reports during the year at varying periods, neither one of which, as a rule, conforms to the business year of the company. The work must be systematized so as to avoid duplications, produce uniformity in schedules, and establish fixed periods for the collection of data by the different states and the United States, in a word, to "standardize."

After adopting your schedule, the Census Office immediately ascertained to what extent it had been used by the state railroad commissions. The commissions in New York, Massachusetts, Connecticut, Maine, and New Hampshire, were using schedules that followed the form almost exactly. These five states contain 6,386.92 miles of single track or 28.30 per cent of the total trackage in the United States. This fact alone would have justified the office in using your form, but it was also found that a number of other states had collected information from which the schedule could be partially prepared. Pennsylvania is one of the most important states that had not adopted the standard form but the Commissioner informed me it was his intention to do so. The adoption of this form by the offices in all states would aid greatly in its uniform application, and it seems to me you should endeavor to accomplish this by persistent work with the state commissioners.

Under the conditions, the preparation of an acceptable schedule proved to be the easiest part of the investigation. It was necessary to secure a report on this schedule from every street and electric railway in the entire country, of which a great many had never used the form devised by the Street Railway Accountants' Association. This has been accomplished and, with a few exceptions to which I will refer, reports have been secured from every company, irrespective of its size, location, or character of its motive power. It has been a very difficult work and the experiences of the special agents engaged in collecting the schedules were not uniformly agreeable. While the majority of the larger companies furnished the reports without hesitation and treated the agents in a manner that was very gratifying, a number contended that the form of account was not applicable to the road, or that it had never been used, would not be adopted because it was faulty, that the furnishing of government statistics was a perfunctory matter, that the companies never gave correct information, and if the agent wanted the report he must call again. In one case, the general manager, on being questioned about the characteristics of his motive power, informed the agent that the mules, (he had two of them), would insist on running on the outside of the rails instead of between the tracks. He was assured that the adoption of the standard system of accounts would remedy this evil.

The agent who worked in Delaware and Maryland reported that only one company, the United Railways & Electric Co. of Baltimore, had adopted the standard form of accounting. The other companies, as a rule, charged all expenses for additions and betterments to one account and could make no segregation. For operating expenses, three accounts were kept, i. e., Main

franchise, track, and General. Separate items were not shown and had to be estimated.

The tendency with the smaller companies seemed to be to cut short all bookkeeping work by lumping many of the smaller and even some of the larger items. This is satisfactory to the stockholders and to the management. In some cases, the work is done by the manager without a special bookkeeper. To follow a detailed system would necessitate an expense not justified by the interests involved. As a rule it was not difficult to secure reports in detail from the roads in the New England states, but estimates were necessary for some of the items. One of the agents who worked in the eastern part of Massachusetts found difficulty in securing schedules for some of the companies as signed to him, and reports as follows:

"The method of accounting in vogue by the electric street railway companies in Massachusetts is not the same as the Street Railway Accountants' Association of America, but it is more in conformity with a state system. I call it a sympathetic system between state and railway companies. In some cases it would seem that the simplest possible methods were adopted by the railways so long as the state could be answered, while in other cases a double system was practised, one for the state and the other for the company.

"On the whole, it seems a pretty good guide was available for the railway census purposes of Massachusetts, the facts, in totals, being provided, the segregation had to be made, and no positive exceptions were taken to this, when possible to accomplish with any reasonable amount of effort. It was policy to insist for answers to each question in the Census schedule as it undoubtedly resulted in securing data which might not otherwise have been brought out. Only upon satisfactory evidence that exact data could not be obtained were estimates accepted.

"The United States Census inquiry met with general approval, and some regrets were made that accounts were not in a condition more favorable to it. The idea was advanced that if the United States Government would notify railway companies a year in advance, filing a form with such notification, when an inquiry was to be made and to be governed accordingly, it would be agreeably received and given careful consideration."

It is probable that in Philadelphia more roads are controlled from central offices than is the case in any other city, and we supposed their system of accounting would be perfect. Very few of the companies, however, kept their accounts in conformity with the standard form. In a number of cases, it was found necessary to estimate the amounts from daily reports received from superintendents or managers. In one case, the account books for a considerable property consisted of a day book, a letter file, and a check book. The entries on the day book were wages, expenses and receipts. The president of this company informed the agent that this system and poor management had cost the company \$60,000 during the past few years; nevertheless, they had made no improvement. Other companies in Philadelphia appear to keep their accounts in a manner to fit the peculiar conditions existing in their respective properties. There were only one or two cases in which the books were kept in the form contemplated by your system. But in many cases it was found possible to obtain answers to the different inquiries by combining several items shown separately in the account books.

After examining the schedule, the general manager of a company in Missouri stated that the system of accounting was not in strict conformity with the one used by his company but he thought that his books would enable him to prepare the report. After considerable searching in his private offices, he returned with a bank deposit book and, to the surprise of the Census Office agent, this was the only book kept by the company. From this, they jointly prepared a schedule.

Of the different items specified in your system of accounting, the segregation of the amounts chargeable to "Construction and Equipment" caused the Census Office the greatest trouble. You will see by the Census Bulletin that it was impossible to obtain amounts in answer to the different sub-inquiries with sufficient accuracy to justify their publication. Referring to this inquiry, the agents in Eastern Pennsylvania reported that in many cases, and particularly in cases of leased roads, there was no sub-division of construction and equipment. In some cases, not

even the cost of equipment was shown on the books, the road having been built with a view to its immediate lease to an operating company which would use its own equipment for the new section. They were reported as carried on the balance sheet and, this being more or less arbitrary, it was impossible to estimate the sub-divisions required by the inquiry. It was with great reluctance that the companies estimated the amounts that should be charged to track and road way construction, as distinct from overhead construction. The impossibility of sub-divisions of this character was due primarily to the fact that the construction was generally paid for in a lump sum of stocks or bonds. Reports for construction and equipment of lessee companies necessarily show only the gross amount as carried on the balance sheet. It was practically impossible to obtain reliable answers to the inquiry concerning cost of right of way. This item was generally charged to construction, the constructing company providing for the purchase of the rights of way. In other companies, the land through which the road passed was largely owned by persons interested in the enterprise and the cost of rights of way was considered in making the issue of "stocks and bonds" to land owning stockholders in lieu of cash payments. These amounts appeared, as a rule, to be greatly in excess of what cash payments to disinterested parties would have been. Amounts charged to organization, engineering, and superintendence, were also more or less vaguely defined. The itemized form is only applicable to companies which have constructed their own line and but comparatively few of the present owners have done this.

If a reliable sub-division of the total cost of construction and equipment could be secured for each company, I believe it would prove to be one of the most interesting and instructive features of the investigation, but the Census Office was loathe to base any conclusions whatever on the imperfect answers given to the various sub-inquiries. For a large majority of the companies, the sub-divisions were purely estimates prepared by the agent in consultation with the general manager or other officer. It is possible that in time it will be practicable to have this inquiry applied systematically to all street railways. The general tendency now, however, appears to be to equalize the cost of construction with the capitalization.

No provision is made in the Construction and Equipment account for the cost of franchise. In cases where a value was given to a franchise for which no actual expense was incurred, it was not considered in the construction and equipment account, but was placed as a sundry item in the balance sheet. Where a road was purchased and an amount was actually paid as a bonus or for franchise rights, it was treated as a miscellaneous item in the construction account. Many companies reported an item of other permanent investment, such as stock and bonds of other street railway companies which they did not entirely own and also of gas, water, ice plants, and ferry systems, that it was impossible to segregate from the railway business and which were therefore included in the balance sheet as other permanent investments. In such cases, the amounts included in the income account were the net income from operations, while the amounts paid for interest, taxes, and other fixed charges, included the total amount of such charges, irrespective of the property on which it was paid.

With comparatively few and unimportant exceptions, the Census Office was able to obtain satisfactory answers to the different sub-divisions under operating expenses. While the books for a considerable number of the companies did not show the separate items for each of the various sub-divisions under the general groups of "Ways and structures," "Equipment," "Operation of power plant," "Operation of cars" and "General," nevertheless the total amounts for these general sub-divisions were obtainable and it was possible to make acceptable estimates for the various items included under each. A number of companies employed only such general sub-divisions as maintenance, operation, superintendence, etc. In such cases it was necessary to resort to the payrolls and more or less difficulty was experienced in distinguishing between wages and other expenses. Practically all of the large companies in Pennsylvania kept their books, so far as operating expenses were concerned, in conformity with the standard form of accounting.

A peculiar condition of affairs was found at Cape Girardeau, Missouri. The promoters and owners of the Citizens Street Railway Company had operated a system for a number of years but had not been able to make the system pay expenses, and declare the dividends to which they thought they were entitled. They therefore decided to go out of business but were unable to find any purchaser for the road. Therefore, they concluded to be public spirited citizens and determined to give the road to some reliable party who would agree to operate it for the benefit of the community. This was apparently a very inducing opportunity to some energetic man and was immediately taken up. The contract was executed and the whole system, including the rolling stock, horses and equipment was turned over without a dollar's compensation, the only condition being that the road would be kept in running order and operated during business hours. Eight months of operation convinced the new general manager that he had not made a good business transaction. In fact, he was constantly losing money, and not being a man of great financial responsibility, he decided to get rid of the road. He could only accomplish this by leaving the community, and the original owners have not been able to locate him.

The conditions on the Pacific Coast and in most of the western states were in striking contrast to those in the east. The agent who worked in California reports that of the 15 or 20 companies from which he obtained reports in and around San Francisco, only three or four had ever heard of the form of accounting recommended by the Street Railway Accountants' Association of America and none had followed it. It must be admitted, however, that the majority of the companies were small, only four or five falling in the class of large corporations. The business methods used in San Francisco appear to prevail pretty generally over the entire state of California. In some respects the forms of bookkeeping used are antiquated and the conditions are such in the street railway industry that the companies did not appear inclined to adopt the form recommended by your Association. The agent states that "Corporations sacrificed good business principles and practices for immediate profits to enhance the market value of stocks, that will quickly sell at big margins for promoters. To this end, expenses are kept within limits often below the point of good business economy. One of the favorite places of curtailment is in the clerical force of the central office which is, as a rule, ridiculously inadequate. In consequence, the system of accounting is crude, simple, and direct. The books are organized for large, comprehensive groupings with few of the divisions and none of the refinements that the Street Railway Accountants' Association would have instituted. Three of the largest corporations scheduled kept fairly good sets of books. Their groupings of items was not in conformity to our schedule but calculations could be made for the segregation of groups so that the totals returned on the schedule were correct and the individual items close approximations. With the smaller companies, the grouping was not carried to such a degree of refinement and most of the items of inquiries for construction and equipment and operating expenses, had to be estimated. The totals returned, however, agreed with those shown by the books of the companies. To illustrate: If wages of conductors and motormen, in operating expenses, were consolidated and carried as *one* item on the company's books, as was frequently done, the correct total was preserved in the returns but segregated into the two items by calculations based on the relative number of the two classes of employees, their wages, and their hours of service. The indications are that the adoption of the form of accounting proposed by the Street Railway Accountants' Association, by the street railways of the Pacific Coast is discouragingly remote." In fact, the results of the Census Inquiry lead me to believe that your system of accounts has not been generally accepted in the Western States.

An agent who worked in the states of Missouri and Ohio, securing reports from eighteen companies, found that only five of the 18 had adopted your form of accounting and in these five companies the system of accounts differed slightly from the standard form. This agent found that one or two companies were using an old form of accounting recommended by the American Street Railway Association some years ago, and which

differed, in some respects, from the revised form. Five of the companies canvassed by him used a very simple form of accounting, keeping practically only two accounts, the income account and the expense account. In these companies, it was necessary to make estimates for the different sub-divisions of operating expenses.

I have referred thus in detail to the experiences of the special agents employed in collecting the reports from the street railways in the different sections of the country, to emphasize the fact that your form of accounting is far from being in universal use. The system, however, has been in vogue but a comparatively short time and the tendency appears to be, among the railroad companies, to adopt it and a number informed the office that it was their intention to change their books accordingly. While it is possible that a number of companies will adopt the form, it is also probable that they will not follow it in all of its details. The grouping of items, however, will be such as to enable the preparation of a complete report in conformity with it.

Another difficult feature of this canvass was the disinclination on the part of a few companies to furnish reports of any character. On this point, the ideas of the company and the public differ in some instances so radically that it is apt in the future to retard the compilation of reliable statistics. The present condition of society and industry makes it indispensable that statistical information be collected and published either by the Government or by private enterprise. Each and every one of us is exerting his strength to the utmost, both mental and physical, to succeed in the business in which he is engaged, but no one can hope to meet with success unless he is thoroughly familiar with all the details of his industry. An essential part of such knowledge is information concerning the business methods of other persons engaged in the same lines of pursuit and data showing the extent of the industry, its relation to other industries, and to the public. The Census is the only reliable source of such knowledge. The statistics show the result of our combined energies in the multitude of industrial enterprises. The man who refuses to contribute to this knowledge by declining to supply data, certainly does not have liberal ideas or is not interested in the general prosperity of the country.

Fortunately this spirit of indifference does not predominate in the street railway fraternity. The majority of the companies were very liberal in their ideas on this subject, but one or two important systems refused to furnish any information or answer certain inquiries concerning financial operations. We presume that these companies have good reason for their action, but I do not believe that they appreciate the uses made of census reports or the value that such reports are to the railway people and the public. After our negotiations with you and, as we presumed, through you placing ourselves in touch with the street railway interests, we were in hopes that every company would co-operate in compiling a report which would be a complete presentation of the industry. I cannot conceive that there is any good and sufficient reason for refusing to supply the data required by the census law. No one other than the sworn officials of the Government is permitted to examine the individual schedules, and the published reports contain no information from which the financial operations of the individual companies can be identified. Therefore, competitors, if there are any, cannot obtain information that would be of the slightest advantage. If the reports should show that the electric roads are paying large dividends on watered stock, the public would not, on that account, stop patronizing them. On the contrary, the inclination would be to invest in the stock and encourage your friends to ride on the cars in order to increase the dividends. On the other hand, if there are pernicious practices existing in the industry that are contrary to honest business methods, or detrimental to public interests, I believe you will all agree with me that the sooner the census reports are printed and the methods exposed, the better.

There were a number of companies that retarded the early publication of the census reports by delaying the preparation of their schedules, but there was only one that finally and definitely refused to make a report of any character. This was a

large system in Kansas and its action was based on the ground that it was not a street railway and did not desire to be so classed. This reason was persisted in notwithstanding the fact that the company was sent a schedule in which no reference whatever was made to street railways and was assured that it would be classed as an electrical company, and that all other roads in the same state operating under similar conditions had made reports. In addition to this, there were three companies in Illinois that refused answers to all inquiries concerning financial matters. There were also fourteen companies that, for various reasons, were unable to make a report for financial operations. Some of these were steam railroad companies operating electric lines for which separate accounts were not kept, some of them had been recently acquired by the present owners and the books of the original companies were not available. Two companies, one in Colorado and one in Pennsylvania, declared their inability to make a balance sheet and two stated that they could not make a report as to the number of employees and wages. These constitute the 22 companies referred to in the Census Bulletin as not making complete reports.

The adoption by the Census Office of the form of accounting used by the Street Railway Accountants' Association was of benefit to the Government and I believe it was also of great assistance to your Association. It enabled the Government to complete the inquiry at an earlier date than would otherwise have been possible, it brought the form to the attention of every company in existence, and they have all made at least one report in conformity with it. The indications are that the form of account will be followed by a number of companies who have not heretofore used it, thus assuring a wider application of a standard form and greatly enhancing the value of statistics that may be gathered for the industry in the future. It remains with you to perfect or change it so as to make it practicable for all companies and then to urge its universal application.

UNION SWITCH AND SIGNAL CO.

Two recent and important contracts by the Union Switch & Signal Co., are those for the Interborough Rapid Transit Co., (Subway), of New York and the North Shore Railway of California.

The Westinghouse electro-pneumatic system is to be installed on the first named, but a new feature is to be introduced, that of using alternating current. It is obvious that the use of track circuits on third-rail roads, where the rails are used for the return circuit, and at the same time for the signalling circuit, introduces what may be serious complications. In order to avoid these difficulties, the signals will be controlled by alternating current, through relays that are sensitive to alternating current only, and which will not be affected by the direct current used for train service in the subway.

On the North Shore Ry. which runs about 30 miles north from Sausalito, Cal., across the bay from San Francisco, the electric semaphore system of automatic block signals is to be used with a track circuit. This being a high tension third-rail electric road, alternating current will be used for the signal system.

WESTINGHOUSE EXHIBIT.

The main feature at the Westinghouse space in the court is the multiple unit control.

The Westinghouse turret system of electro-pneumatic train control is a new combination of old devices that have been in successful operation for thirty years for controlling and actuating the movements of switches and signals. In this service these devices have successfully continued to perform the most critical and important mechanical functions in railway operation absolutely essential to the safe and expeditious conduct of railway travel. The Westinghouse multiple control possesses in the same degree the reliability of the electro-pneumatic Switch and Signal apparatus.

In this system the actuating mechanism is not directly connected to the main source of electric energy. Connections for the low voltage control circuits are the only ones which have

to be established between the cars of the train, no air connections being required outside of the ordinary brake hose. The main source of energy is frequently and necessarily interrupted by the blowing of fuses, and the presence of sleet and ice on the "third rail." The Westinghouse system of control has an independent source of power, therefore the controlling apparatus can be worked while the main current is cut off, thus making it possible to reverse the motors and use them to produce a braking effect, when such an operation is desirable. This cannot be done where the controllers are operated by line current.

In the Westinghouse system of control the contact devices are actuated by pistons operated by compressed air working against spring pressure.

The length of break can also be made sufficiently great to reduce arcing to a minimum. The control therefore possesses a decided advantage over those systems in which the contactors are actuated magnetically and where the power available to break contact and the length of the break are inherently limited by practical conditions of design.

The same air pump or reservoir supplies both brakes and control.

The Standard Traction Brake Co. (Westinghouse) is showing on the veranda of the hotel cottages facing the pagoda a standard straight air brake equipment; controllers for the operation of the Westinghouse magnetic brake; and motor driven air compressors.

The Westinghouse interests at the convention are cared for by 52 representatives including officials, agents and other representatives.

YANKEE DRILL GRINDER.

At the foot of the steps leading to the main meeting room is the space of the "New Yankee Drill Grinder," which is made by Wilmarth & Morman Co., of Grand Rapids, Mich. The grinder is shown in operation by Chas. E. Meech, secretary and treasurer.

C. S. KNOWLES.

C. S. Knowles, of Boston, the "insulator" firm is represented by W. J. Walther, J. S. Lapp and C. H. Clark. A full line of glass and porcelain insulators are displayed.

J. C. DUNER.

J. C. Duner, of Chicago, has samples of the Duner double folding doors, and the Duner sand box. The movement of the Duner vestibule door is controlled by one pin projecting upward into a guiding track. A slight push is all that is necessary for their operation. Double wire gates for summer use can be operated with same attachments.

The Duner sander permits a constant or intermittent discharge of sand, as desired. Action is positive and clogging impossible. A wire "agitator" moves up and down through the sand each time the hopper is tilted.

JOHNSON CAR REPLACER.

The Johnson Wrecking Frog Co., of Cleveland, is showing the Johnson car replacer, a device designed to aid in replacing a derailed car, engine or electric motor on the rail. This wrecking frog can be placed in position very quickly and is said to be the only replacer that will slip under the frame work of a derailed truck without danger of being displaced by being struck by the brake shoe or frame. It depends entirely upon the rail for support. The company representatives present at the convention are George C. Ewing, of Boston; H. F. Lanville, Philadelphia, and T. J. Courtney, of Richmond, Va.

The Electric Storage Battery Co. states that its various sales representatives report very favorably on the convention and general business prospects.

J. J. Coleman, of New York, is in attendance.

THE ADVANTAGES AND DISADVANTAGES OF THE "BAG SYSTEM," AS COMPARED WITH THE "RECEIVER SYSTEM" OF HANDLING CONDUCTOR'S REMITTANCES.

By Frank R. Henry, Auditor St. Louis Transit Co., St. Louis, Mo.

To be read Sept. 4, 1903, before the Street Railway Accountants' Association.

I shall begin my subject at a time when street railroading was in its infancy; especially, when the accountant and the accounting department were not considered as a necessary adjunct to the operation of the road. In those days the bobtail cars were in use and passengers deposited their fares in a box at the end of the car, or through a slot arrangement which communicated with the box.

It became necessary afterwards, on account of increased travel, to abolish these cars for larger ones and employ conductors to operate the cars and to collect the fares. Tickets were then introduced to the public and generally used by passengers who were induced to buy them in slips of five at five cents each, in preference to paying seven cents cash fare. The system in vogue was to have the tickets collected each half-trip, put in packages marked with the number of trip and number of fares and deposited by conductors, when passing the car stations every trip or half-trip, into their individual receptacles communicated with by a slot arrangement, above which their numbers were indicated, the company adhering to the box and slot arrangement as used in the bob-tail days by aggregating the boxes at the stations for the conductors to make their deposits in. At the end of the day these packages were taken out and sent to the general office to be compared and checked against the trip cards.

ST. LOUIS TRANSIT CO. DATE REMARKS

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FORM A. (Back)

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ST. LOUIS TRANSIT COMPANY.

DAILY CAR REGISTER REPORT.

DATE 1903

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ST. LOUIS TRANSIT COMPANY.

DAILY CAR REGISTER REPORT.

DATE 1903

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After the general use of the tickets was discontinued, passengers paid their fares in cash and registers were inaugurated, the system of having conductors make remittances in boxes at the stations still remained in force for some time, but eventually proved so unsatisfactory that it was abandoned. The frequent mistakes of the conductors depositing their cash and tickets through the wrong slot arrangements, and claiming money had been deposited when it had not, were the chief dissatisfactions.

It was then that the system of having conductors place their money in bags, together with deposit slips showing the contents, and deposited into a safe of special construction located at the stations, was adopted. This, too, was abandoned and we are now using the "Receiver System."

By comparison the quickest and most accurate knowledge is gained. I shall therefore present as concisely as possible the "Bag System" and "Receiver System," as operated by the St. Louis Transit Co., with the comparative advantages and disadvantages that have been experienced. The description to some may be short and *over* to others.

THE BAG SYSTEM.

(1) The conductors were required to register all fares. Each car was provided with two registers, one on which the five-cent fares (cash and adult tickets) were registered, the other on which all other fares (transfers, half fares and passes) were registered. The conductors were provided with trip cards (Form A) of their respective lines, on which were columns to indicate the operation of the car (or cars) each half-trip.

(2) Each conductor taking his car (or when taking car from another conductor) found a register card (Form B) in the rack located under the registers, its place until taken out by the register taker. On this card were indicated the starting-out readings of the registers (or readings of previous conductor). He examined the card to see if it agreed with the readings of the register taker (or readings of previous conductor taken in each other's presence). If so, he placed his readings beneath. If not, he called the attention of the foreman (or motorman, or another conductor), who made a statement of the difference on the register card signing it; failing to call anyone's attention to the difference, conductor was charged with the register taker's (or previous conductor's) readings. Next, he wrote in the proper place his line number, run number, name and time taking car. He then took his trip card and enumerated the register readings on it.

(3) When completing each half-trip, all ticket-fares (except adult tickets) collected, were placed in an envelope with name, number of car, number of trip, time and the number of the several kinds of fares, and deposited in a small locked box located under the registers. From time to time, he recorded on the trip card the operations of the car each trip, and, before leaving car, he took the register card and wrote below the first (or last) readings, time leaving and readings of the registers; also, on his trip card he recorded the register readings and filled out the spaces showing the results of the day's operation.

(4) Then he counted his money and adult tickets and made up a conductor's deposit slip showing the different denominations, adult tickets, name and badge number of conductor, placed the money, adult tickets and deposit slip in a bag with the number of his line on it, tied it with a string and deposited the bag through a slot arrangement into a safe, specially made for conductors' deposits. His trip card he disposed of by depositing it in a box.

(5) Each register taker, in gathering up the register cards and envelopes from each car, took the register card, read the registers and checked off the last statement made on the card; if not correct or figures were indistinct, he wrote the correct readings on the bottom. On a new card he wrote (with indelible pencil) a statement of the register showing what the registers were charged in with (what they would start with next morning) and placed the same in the rack. After collecting the envelopes from the box beneath the registers, he tied them together. Upon completing the collections, all register cards and envelopes were taken to the office and locked up.

(6) Seven or eight buggies were used by money counters from the treasurer's office to make the rounds every morning to col-

lect the bags, reports, etc. Each counter was accompanied by a clerk who took the bags out of the safe, counted them in the foreman's presence and gave him a receipt showing number taken. These bags were brought to the treasurer's office, opened and contents counted by the money counters, and checked against the conductor's deposit slips. If correct, money was separated and thrown into different receptacles. If not, an actual inventory was made opposite the conductor's inventory.

(7) When the remittances (money and adult tickets) from each line were counted, the money was placed on trays for each denomination. The deposit slips were then taken to an adding machine and totaled to find out amount of cash received from each line. The trays of money and deposits were then passed to the head money counter who checked the contents against the counter's deposit slip. When all of the money counters had finished, he put the money up into bankable shape to be deposited the following morning. The deposit slips, fastened with a slip attached showing total cash received from each line, together with adult tickets, were sent to the auditor's office.



F. R. HENRY.

Operation in the Auditor's Office:

(8) Each register clerk, upon receiving the register cards and trip cards allotted, arranged the register cards numerically according to their car number; also, the trip cards according to their run number. The outgoing register statements were then checked against the incoming statements indicated on the register cards of the previous day to see if readings recorded by the conductors were correct.

(9) In the meantime, the ticket boys (who counted the contents of the envelopes) checked the different fares (transfers, half-fares and passes), as indicated by each conductor on the outside of the envelopes against the fares as entered on each trip card. As the envelopes and trip cards from each line were checked, the trip cards were handed to the register clerks who had that particular line. Each ticket counter then proceeded to count his tickets and check the contents against the number of different fares indicated on the outside of each envelope. If any discrepancies were found, an actual inventory was made on the envelopes which were handed to the register clerk who made a note of the differences on each conductor's trip card.

(10) As the contents of the envelopes and bags were being verified, each register clerk took the register cards and checked the various statements of the conductors against the readings made by each conductor on his trip card to ascertain if all of the operations of each car were accounted for.

(11) After all of the register cards were checked against the trip cards and additions and subtractions verified, the deposit slips received from the treasurer's office from time to time, were next checked against the total cash and adult tickets as indicated on the trip cards to find out if each conductor had remitted for all of the five-cent fares collected. As fast as one line was completed, or the trip cards were checked in their entirety, they were entered on their respective statements of passenger receipts (Form C) in run order, also filling out in their respective columns the conductor's name and results of the day's operation, noting all shorts and overs. The entire returns from the treasurer's office were not received until about three o'clock in the afternoon.

(12) Before recapitulating the receipts for each line, the regis-

ter clerks made out an original and two carbons of the over and short report, stating the nature of each difference. Two of these were sent to the treasurer's office to the over and short clerk, who in turn sent one copy with an over or short envelope made out for each conductor, to a clerk at each station to collect or pay, and return. The shortages, when collected, were placed in the short envelopes; the overs when paid, receipts were taken on the over envelopes and returned every morning.

THE RECEIVER SYSTEM.

Each receiver should be conveniently located and afforded proper protection. Therefore, the station is considered the most accessible and suitable place for the reason that the conductors turn in their cars there also, because they generally reside in close proximity thereto. Another reason, the receiver can be better protected in case of an attempt being made to hold him up as an alarm can quickly bring the men working in and around the station to his assistance.

Our receivers are protected by iron cages in which are located one or two foot push buttons which ring a gong in the shed. It is their duty to test these signals at six o'clock every night, same being answered by one of the men.

The "Receiver System" is practically the same as described in paragraph one (1) to three (3) inclusive, of the "Bag System" in setting forth the operations of the conductors and register takers, except the following changes which were found necessary.

Instead of conductors depositing their money and adult tickets in safes and trip cards in boxes, they are required to present them to the receiver. This is done so the receiver can determine whether he has received the full number of five-cent fares.

Instead of the clerks in the auditor's office making out the statements of passenger receipts as to five-cent fares, each receiver does so in order that he can keep an account and check off each conductor as they turn in.

Each receiver upon commencing his work is provided with a run sheet by the foreman. On the statements of passenger receipts for each line, he fills in the run number in numerical order, afterwards writing in the name of each conductor opposite his run.

When each conductor presents his money and trip card to the receiver who counts the money and adult tickets in his presence, checks and verifies the subtractions and additions of the five-cent register and indicates the amount of each received on the trip card, he signs his initials thereto and deposits it in its proper place.

From time to time as opportunity presents, results of each trip card are entered (so far as the five-cent register fares are concerned) upon their respective statements of passenger receipts opposite the indicated run number and name of conductor, the total cash, total five-cent register fare as indicated on trip card, five-cent cash fares and adult tickets.

Each receiver is supposed to keep posted about when the conductors turn in their runs, and if they are not in promptly he immediately makes out three notices (original and two carbons), sending one to the night foreman and one to the treasurer's office along with his cash.

When all of the conductors have reported, a total is made of the cash—five-cent fares and adult tickets—on each of the respective statements of passenger receipts.

Two receiver's remittance blanks (Form D) and a bank deposit slip are then made out. On the two receiver's remittance blanks (made out in duplicate for auditor and treasurer) he recapitulates the total of each line at the bottom by entering opposite their respective line numbers, the total cash and adult tickets from each line. These added together give the total amount of money and adult tickets he should have.

The money, separated into different denominations, is counted. Total of each denomination are then entered on the two receiver's remittance blanks and bank deposit slip opposite their respective class and when totalized should agree with the grand total of the different lines. The adult tickets are next counted to see if they agree with the grand total of the different lines and then entered on the two receiver's remittance blanks in a space provided, after which they are placed in an envelope marked with receiver's name and number of tickets.

The money, together with envelopes containing adult tickets, receiver's remittance blank (for treasurer) and bank deposit slip, are placed in a metallic box (locked with a Yale lock) marked with the number of that particular station, then placed in a safe and locked.

The statements of passenger receipts, fastened together with receiver's remittance blank (for auditor), and trip cards are placed in a drawer. These, as well as the envelopes and register cards, are collected every morning by a collector from the auditor's office.

Three sets of metallic boxes (marked with station number) are kept to supply each receiver. There are two keys to each box, one held by the receiver, the other in the custody of the assistant to the treasurer. The combination to the safes are known only to the receivers, relief receivers and collectors.

Three cars are now used to make the rounds every morning to collect the money boxes. Each car operated by a motorman and conductor, is accompanied by a guard and clerk from the treasurer's office. The boxes are taken out of the safes and brought to the general office (which is centrally located and making a convenient place to have the three cars meet) where the boxes collected by two cars are transferred to the special money car.

The assistant to the treasurer boards this car, unlocks each box, checks the receiver's remittance blank and deposit slip against the total on the packages of paper and bags of silver, leaving each receiver's bank deposit slip in its respective box, only taking the receiver's remittance blank with him. The adult tickets are taken from each box and sent to the auditor's office, receiving receipt therefor. He then selects the boxes to go to a certain bank and makes out a regular bank deposit slip specifying thereon the number of each box and setting opposite total amount in the box. These amounts added together show the total deposit for that particular bank.

The money is then taken to the bank by the assistant to the treasurer, two guards, conductor and motorman. The boxes are passed in to the receiving teller, who checks the total on the packages of paper and bags of silver against the receiver's bank deposit slip, likewise checking the total of each station box against the deposit slip made out by the assistant to the treasurer.

All shortages in money and adult tickets are charged against the receiver.

All persons handling money are bonded in surety companies.

The company carries hold-up insurance.

The actual passenger earnings are deposited each day, a separate deposit being made for miscellaneous cash received from any other source.

The work in the auditor's office is practically the same as that described in paragraphs 8, 9, 10, 11 and 12 of the "Bag System," except the following:

Instead of checking the conductor's deposit slips, which formerly came through the treasurer's office, against the trip cards, the reports of the receiver now on the trip cards, are checked against the five-cent register fares on the statements of passenger receipts, besides the other preliminary changes previously mentioned.

ADVANTAGES AND DISADVANTAGES OF THE BAG SYSTEM.

When the "Bag System" was in use, we operated cars, during the greater portion of the time, from 19 stations over 28 routes. Five of the stations were very small, and the clerical work was done by the foremen. Five money counters were employed in the treasurer's office and 12 register clerks were engaged in the auditor's office in checking registers and conductor's cash remittances. To have adopted the "Receiver System" under the above conditions would have required 19 night and 19 day receivers. Allowing that the assistants to the foremen could have done the day receiving, also, that a portion of the work in the auditor's office could have been done by the receivers, it would have necessitated the employment of at least 12 additional clerks which would have been an additional running expense. Besides, cages and receiver's equipment would have had to be installed in 19 stations. The advantages to be obtained by the institution of the "Receiver System" under these

conditions, we did not believe would justify the outlay. The economy in operation is the single advantage the "Bag System" possesses over the "Receiver System," under these or like conditions.

The disadvantages we experienced were as follows:

(1) Numerous errors and shortages occurred daily, classified and proportioned as follows:

First. Errors in register readings, 15 per cent.

Second. Errors in calculations, 15 per cent.

Third. (a) Failure to deposit money bags and half-trip envelopes.

(b) Errors in contents of bags and half-trip envelopes.

In disputes arising over errors of the first and second class, we were always able to precisely, and to the satisfaction of the conductors, show that they were responsible.

When disputes arose from the third class, we were unable to produce any convincing evidence whatsoever. Conductors would claim that they deposited money bags when they had not done so; also, contended they had turned in one amount while we claimed they had turned in another amount. According to their way of putting it, the office clerks made all the mistakes. The utmost care was exercised in handling the bags and counting the contents; every courtesy was shown the conductors who called to investigate errors; nevertheless, the greater proportion of the conductors who were compelled to pay shortages of the third class firmly believed they had been treated unfairly, which we believed had a tendency to make conductors dishonest, because they desired to get even with the company. Up to the time of the consolidation, the constituent companies of the Transit company had not experienced any serious dissatisfaction, but a short time thereafter, and especially during our labor trouble, the dissatisfaction among the conductors became very great. I attribute this principally to the fact that the offices of the constituent companies were consolidated into one general office which required most of the conductors to go a great distance from some stations, consuming as much as two hours, in order to investigate their errors; also, a desire to find fault with everything in general.

(2) It took about twenty-four hours after conductors were supposed to have made their returns before a failure to do so was detected. This enabled the conductors to borrow the company's money for a few days, which was especially evidenced just before pay day.

(3) The loss of two days' collections was possible.

(4) Deposit in bank was delayed two days.

(5) The work in the auditor's office was delayed by having to wait for returns from the treasurer's office.

(6) The general office had to be kept open on Sunday and holidays until 2 p. m. in order to count and check remittances. If this had not been done, conductors would have had a good opportunity to purloin two or three days' collections.

ADVANTAGES AND DISADVANTAGES OF THE RECEIVER SYSTEM.

When the "Receiver System" was adopted, the stations were reduced to eight. This required ten receivers; one each at seven stations, two at one station, and a relief man to relieve the nine men once in ten days. Under these conditions and arrangements we found the running expenses no greater than under the "Bag System."

The results we experienced, enumerated in order of their importance were as follows:

(1) Reduction in number of charges for errors about 60 per cent, and about 90 per cent in value. This reduction was caused by the money being counted in the presence of the conductors and any errors as to amount (foreign or counterfeit money) being corrected instantly, as conductors are required to account for the amount as shown on trip cards, therefore making it impossible (except by doctoring trip cards) to borrow the company's money. The number of charges under the "Bag System" were reduced the following proportions:

First. Errors in register readings, None.

Second. Errors in calculations, 10 per cent.

Third. (a) Failure to deposit money bags and half-trip envelopes.

(b) Errors in contents of bags and half-trip envelopes.

This reduced the work necessary to keep account of charges.

Much satisfaction has been experienced in the reduction in charges of the third class, as it removed the dissatisfaction among the conductors, and confusion in the office force, growing out of the futile attempts to substantiate our claims for shortages; also, reduced losses from dishonesty of conductors by removing the incentive "to get even" for imaginary wrongs.

(2) Failure of conductors to make remittances for cash collections at the proper time and for the correct amount can be detected quicker.

(3) Opportunity for purloining receipts reduced to one day's collections.

(4) Money can be deposited in bank one day earlier thereby saving interest on one day's earnings.

(5) Facilitates work in the auditor's office as no delay is caused by waiting for returns from treasurer's office; also, receipts for the day can be ascertained earlier the following morning without having to do the unnecessary work of recapitulating trip cards on adding machine to ascertain same.

(6) The general office can be closed on Sundays and occasionally on holidays.

(7) A better system and uniform hours can be established in the offices.

FINAL.

The local conditions in some cases would have to be the determining factor as to the advantages of either system, but matters of accounting should be less susceptible to the influence of local conditions than matters of operation and construction.

The choice would also rest upon the consideration of accuracy in accounting and economy in operation.

However, it will be conceded, I think, by all that the ideal method of having conductors make returns, is to have them settle in person with the company's agents.



LE VALLEY-VITAE CARBON BRUSH CO.

The Le Valley-Vitae Carbon Brush Co., of New York, is exhibiting frames containing samples of the different styles of carbon brushes for which it is favorably known. The attention of passers-by is attracted by the aid of an "electric advertiser" by means of which are displayed fancy pictures, views of the Le Valley-Vitae brushes, well-worded advertisements, and the claims made for this company's products. Street railway men who call at the booth are presented sets of car motor brushes upon application. The exhibit is directly in charge of J. V. Clarke, president of the company, assisted by William H. Bell, of the New York office.



MAGANN AIR BRAKE CO.

The Magann Air Brake Co., of Detroit, is represented at the convention by its manager, E. C. Rutherford, who calls attention to the fact that the cars of the Schenectady Railway Co. are equipped with the G. P. Magann storage air brake. As many of the delegates and visitors will participate in the excursion to the General Electric Co.'s works today, an excellent opportunity will be afforded to view the Magann system in actual operation. In lieu of any other exhibit, therefor, the company's booth is being utilized for office and reception purposes.



William P. Wescott, Jr., of New York, representing the Galena-Signal Oil Co., and S. T. Baker & Co., visited the convention yesterday.



Among the arrivals at the convention Wednesday was that of Henry W. French, representing the Consolidated Engine-Stop Co., of New York.

SEVENTH REGULAR ANNUAL MEETING STREET RAILWAY ACCOUNTANTS' ASSOCIATION

Saratoga, N. Y.—Sept. 2—4, 1903.

THURSDAY, SEPT. 3, 1903.

President Davies called the meeting to order at 10:20 a. m.

In the temporary absence of Secretary Brockway, the president appointed Mr. Ross, of Montreal, as secretary pro tem., who read the first paper on the program, on "Car Maintenance Records," by Mr. S. C. Stivers, lately auditor of the Jersey City, Hoboken & Paterson Street Railway Co., Hoboken, N. J.

[For Mr. Stivers' paper, see page 667.]

The Chair called for discussion of the paper, and Mr. Magilton stated that the system had been resorted to but had not gone to a very great extent as yet, and he asked if any instance could be cited where car wheels or other important parts of the car had been rejected as not up to standard. This work in their case was done outside of the general office and he (the speaker) had not a very deep interest in it directly as yet, though he expected to have later on. They had from time to time rejected certain purchases, but the records were not yet complete enough to show that they had not been up to standard.

Mr. Pease said their wheels were all guaranteed to make a given number of miles. If they did not make the required mileage the company did not pay for them. They were not keeping the car maintenance record except so far as car wheels were concerned. For that the facts were ascertained by the use of the usual car-mileage record, with the date when the wheel was put on and taken off, and if it were reground that date also was entered. When a wheel was removed on account of chipped flange and had not made the required mileage they did not take the wheel. They kept a record of each wheel and not of a few selected ones only. He did not know whether it was necessary to number each wheel. They kept a record of each wheel and not of a few selected ones only. He did not know whether it was necessary to number each wheel, but thought it was advantageous; their wheels were all numbered by the car wheel company, no two bearing the same number.

Mr. White reported that his company kept car mileage records but they did not buy their wheels with any special guarantee, at least did not keep the record for that. If they did not get the mileage out of the wheels that they expected they looked about for something better. They never got any rebate on any wheels that did not wear. He inquired if under the guarantee there was ever any question made of the purchaser's complaints.

Mr. Pease replied that there never had been in their experience. The cause of removal of the wheel was a determining factor. If a wheel were worn flat from sliding or skidding, then reground and afterward made the required mileage, the purchasing company paid for the wheel; 40,000 miles with them covered the life of the wheel.

Mr. White pointed out that there was quite a number of things entering into the question of the life of a wheel, some of which, in the way of repairs, he thought were rather unnecessary. For instance an armature winder should be held responsible for an armature that went bad a good many times, and often the motorman should be discharged rather than the armature winder. He thought the foreman of the shop should be able to tell what work his armature windings were doing.

Mr. Smith wished to know whether Mr. Pease's company could get the same guarantee from the manufacturers on wheels to be used with the air brake as with the hand brake, and was answered in the affirmative.

At this point the president announced the arrival in the room of Mr. T. Comerford Martin, the special expert of the United

States Government on street railway statistics, who had kindly consented to read, in the absence of the author, a paper prepared for the Convention by Mr. W. M. Steuart, Chief Statistician for Manufactures of the United States Census Office.

Mr. Martin was received with applause, and read the paper referred to, which will be found on page 631.

Mr. Duffy paid a high compliment to the instructiveness and interest of Mr. Steuart's paper and moved that the thanks of the Association be extended therefore, which motion was carried.

President Davies also acknowledged on behalf of the Association the obligation felt for the statistics furnished by the Bureau, which contained valuable information for the standing committee of the Association and for the members themselves, and they would await, he felt sure, with great interest the final report, in which he understood Mr. Martin was to have a directing hand. He predicted that as a result of the work of this Association and the Census statisticians the next eight or ten years would witness improvements in accounting which would perfect the art still further than it was carried at present.

Mr. Martin said that while he could not say just what the final report would be, as yet, but it would have some 40 or 50 tables in addition to those presented in the present bulletin, and he thought they would bring out some further points of interest.

The president then announced the presence of ex-President Calderwood, of Brooklyn, and invited him to address the meeting.

Mr. Calderwood expressed his great pleasure at being able to meet with the Association after an unavoidable absence from the last three conventions, and that the pleasure of the meeting was mutual, was amply evidenced by the welcome extended to the speaker.

The president then called for any further discussion of the paper on Car Maintenance Records, and in response Mr. McDole said he thought the subject was one which would come more directly under the jurisdiction of the operating department, and Mr. Mitchell stated that that was the course adopted by their company, the auditing department dealing simply with the totals.

Mr. Wm. F. Ham, on behalf of the Committee on Standard Form of Report for Electric Railways, then presented the report of that committee, which on motion, duly seconded, was received and the thanks of the Association voted the committee for its efficient labors.

REPORT OF COMMITTEE ON FORM OF REPORT FOR ELECTRIC RAILWAYS.

At the last convention of this association, your committee submitted a report which was thoroughly discussed and finally adopted. The form of report presented was primarily for use in submitting reports to the railroad commissions of the several states. The same subject was to be considered by a joint committee of the National Association of Railroad Commissioners and your association, and a report presented by such joint committee to the convention of the National Association of Railroad Commissioners to be held in Portland in July, 1903. By action of your convention, the committee was continued and authorized to agree to such corrections as the railroad commissioners might require.

Your committee conferred with the Hon. George W. Bishop of the Massachusetts Board of Railroad Commissioners at Bos-

ten in June last and a form of report was prepared embodying, without change, the form of report prepared by your committee. This report was presented at the convention of the National Association of Railroad Commissioners held in Portland July 14th, 15th and 16th last, and was unanimously adopted.

To show the latitude allowed the several states in the use of this report, the following excerpt from the report of that committee will suffice:

"We realize that it is no easy task to prepare a form of report acceptable to all, as what one state might demand, another state might consider entirely unnecessary. If the form submitted lacks information which in the opinion of any state should be furnished, provision may be made for it without interference with the balance of the report.

"If, on the other hand, more information is demanded than is thought necessary, it may be omitted without changing the substance of the report. In this connection we refer particularly to Schedule C, 'Detailed statement of rental of leased lines and terminals,' Schedule D, 'Construction and equipment,' and Schedule E, 'Construction and equipment of leased lines.'"

In presenting the report, the chairman, Hon. George W. Bishop, of Massachusetts, stated before the convention that he felt very much indebted to his associates on the committee representing the Street Railway Accountants' Association of America, stating that they had spent a great deal of time on this matter and that practically what they had worked out had been adopted in the report; also stating that he thought that the convention should feel much indebted to them and their associates for the time they had devoted to this work. Your committee makes mention of this simply to present to your attention the cordiality felt toward this association by the National Association of Railroad Commissioners.

At the Portland Convention your delegates were treated with the greatest courtesy and consideration, and we feel that the work of this association was impressed upon the minds of the railroad commissioners present.

Having fully completed our labor, we suggest that our committee be discharged.

W. F. Ham,
E. M. White,
C. N. Duffy,
Committee.

Mr. Judson, the accountant of the New York Board of Railroad Commissioners, was introduced by the president, and received with applause. Mr. Judson said he could only greet the members, as he had but just arrived, and would be satisfied if they would just allow him to sit down and listen to what was going on.

Mr. Duffy reverted to the question of the admission of associate members, in connection with which a committee was appointed at Tuesday's session to report on an amendment to the by-laws, and said he thought there was some misunderstanding among the members generally as to the scope of the movement proposed. Personally he would prefer that it should be simply an admission to associate membership of public certified accountants of recognized standing and ability in the practice of their profession, with the privilege of receiving copies of the proceedings and such other literature as the Association issued. For the information of the committee and by way of developing the sentiment on the proposition he (the speaker) suggested an expression from those present.

The chair called upon a number of the members to state their views on the question.

Mr. F. E. Smith, the originator of the proposal in Tuesday's session, said that Mr. Duffy's statement about expressed his personal opinion in the matter; he (the speaker) had had no idea of admitting the public accountants to the privilege of the floor, but limiting it to giving them our literature. He thought they would be not only willing but glad to pay for this privilege, that they might get it regularly and feel entitled to it without asking. A great many of the members of this Association were in touch with the public accountants, who were recommending the Association's standards, many of them, wherever they could, and he thought it would result in mutual benefit if such

a limited membership could be established. He would not, however, favor admitting them to the meetings of the Association.

Some further discussion was had but no action taken in regard to the matter.

Mr. Ross, chairman of the Nominating Committee, announced a meeting of that committee for 9 p. m., to prepare its report for presentation at Friday's session.

On motion, adjourned until Friday morning at ten o'clock.

THE BULLOCK EXHIBIT.

The Bullock Electric Manufacturing Co., of Cincinnati, has on exhibition in Booth No. 96, a 400-kw., 500 r. p. m. three-phase 25-cycle rotary converter which has attracted much favorable comment because of its handsome appearance and points of superior merit. This rotary is one of five similar machines built by the Bullock company, for the Scioto Valley Railway Co., of Columbus, Ohio, whose one hundred mile road the Bullock company is equipping completely, the equipment including three 1,000-kw. three-phase 25-cycle, 94 r. p. m. alternating current generators, together with all the necessary step-up and step-down transformers, switchboards, etc., for a 33,000 volt transmission and sub-station equipment. The rotary on exhibition is most liberally designed for capacity and strength and has many points of exceptional merit; these including a special method of armature ventilation, and a D. C. commutator with brush holders so designed as to prevent "flashing" and its attendant troubles. The workmanship, design and finish of the rotary are of the highest order and fully up to the high standards for which the Bullock company has become so well and favorably known. The Bullock company is ably represented by Ward S. Arnold, C. Van Deventer, R. T. Lozier, Geo. B. Foster, B. F. Foote and Jos. E. Lockwood.

The Parmenter Fender & Wheel Guard Co., 77 Summer St. Boston, has a very attractive exhibit near the entrance to the Convention Hall. George A. Parmenter, manager of the company, is in charge of the exhibit. The company's souvenir this year is a leather bill book.

W. R. Garton, president of the W. R. Garton Co., Chicago, was among the early arrivals. To call attention to the electrical supplies handled by the company, Mr. Garton was distributing leather card cases and aluminum letter openers as souvenirs.

Berry Bros., of Detroit, were giving the railroad men who called at their booth a leather covered Memorandum Book which is designed besides being useful, to call attention to the fact that Berry Bros. make railway varnishes.

F. W. Darlington, consulting electrical and mechanical engineer, 1120 Real Estate Trust Building, Philadelphia, is in attendance at the convention.

The Michigan Electric Co., 101 Woodward Ave., Detroit, is represented by its president, Joseph E. Lockwood.

The many friends of Giles S. Allison, president of the Security Register Co., St. Louis, will be pained to hear that Mr. Allison was prevented by illness from reaching the Convention until Thursday afternoon. Mr. Allison has been under treatment at the Johns Hopkins Hospital at Baltimore.

Robert Skeen, general manager of the American Automatic Switch & Signal Co., reports that the company has received orders enough during the past two days to keep the factory busy for several months, and also that yesterday a caller wanted to buy the two signal boxes shown at the company's booth and wanted them shipped at once. Mr. Skeen states that he arranged with a street railway company hereabouts to loan him two boxes, so he could ship those ordered yesterday.

TWENTY-SECOND ANNUAL MEETING AMERICAN STREET RAILWAY ASSOCIATION

Saratoga, N. Y.—Sept. 2—4, 1903.

THURSDAY'S SESSION.

Vice-President Ely called the meeting to order at 10:15 a. m.

The Chair: The first business which we shall consider this morning is the matter which was under consideration at the time of adjournment yesterday—that relating to the carrying of the United States mail. The Chair understands that Mr. Grant has a resolution to offer on that subject.

Mr. Grant: Mr. President, I offer the following resolution:

RESOLVED that the President of this organization be empowered to appoint a committee of three to confer with the Postmaster General in relation to compensation for the carrying of mail by interurban cars, for mail in pouches and mail cars in cities; said committee to enter upon its duties forthwith and report to the secretary of the association immediately upon the completion of its work.

The resolution was seconded and adopted.

The Chair: We will now take up the paper by Mr. W. L. R. Emmett on "Steam Turbines."

Mr. Emmett presented the following paper:



RECENT STEAM TURBINE DEVELOPMENTS.

By W. L. R. Emmet, General Electric Co.

When the writer agreed some months ago to present a paper to this meeting he fully expected that its subject-matter would mainly consist in a record of practical results accomplished with commercially operating machines and that such matter would be full enough to justify its presentation and discussion. Some months ago a paper was presented to the American Philosophical Society on this same subject which has since gone the rounds of the press. This paper dealt at some length with our expectations concerning the new steam turbine developments now going on at Schenectady, but gave no actual results other than those produced by a single 600-kw. machine which has been operating for some time at Schenectady, and which is different in many respects from the machines now being built.

The scant array of established facts in this paper and the rather liberal presentment of expectations have called forth some criticism particularly from European turbine builders. Such criticisms are not unnatural under the circumstances, and we are naturally eager to demonstrate to the world the soundness of the claims upon which the General Electric Co. and its customers have based such large undertakings.

The writer had confidentially expected that before this date the 5000-kw. turbine recently installed at Chicago would have been fully tested and verified and that its results could be here presented to the members of this Association who are so deeply interested in the success of developments of this kind. We have fallen a little short of this expectation through such unforeseen delays as are usual in such cases, but still have produced results which are highly interesting and suggestive although no complete tests have yet been made. The machine has been installed in the new station of the Commonwealth Electric Co., which is probably the finest and best equipped station in the world, and has been connected to its regular equipment of boilers and condensing facilities. It has been started without any hitch or delay and has been operated repeatedly at full load and under a variety of conditions to test its performance. It has operated with a wonderful steadiness and perfection, has governed perfectly from full load to no

load with only 2 per cent speed variation and has in every respect shown itself to be a thoroughly desirable operating machine. A test of steam economy was also very carefully conducted on this machine, very perfect facilities for weighing water and maintaining a steady and accurately measured load having been provided. Unfortunately, the results of these tests were found afterwards to be entirely indefinite since a large leakage of circulating water, through a misplaced valve, into the steam space of condenser was discovered, which water had been weighed in connection with the condensed steam. When this was discovered it was too late to ascertain with certainty the amount of this leakage at the time of test. The flow with no load, however, indicated that this leakage was very large and the general inference drawn from our test is that a very fine steam economy was shown. We will, however, refrain from making any positive statements on this subject until we have obtained tests which are absolutely unquestionable.

All the conditions in connection with the running of this machine have given very favorable indications. The machine is connected so that the condensed water passes from the hot well through a heater and is pumped directly back into the boiler. This whole system was in operation and worked perfectly. The water returned to boilers was, of course, entirely free from oil and quite clear except at light load when the leakage from river appreciably discolored it. The plant operated at full load with four 500-h. p. boilers fired out of the eight which have been provided for each machine. These boilers were fired with Illinois coal on chain grates and their performance of the work is in itself an indication of good economy.

After this test run the machine was taken apart for the purpose of making a minor internal change which was thought to be desirable. The machine will not be required for service for some months and our desire is to get it in the best possible condition in advance of the time when it will be required to carry a large winter load. The machine will probably be ready to run again within about a week or 10 days and conclusive tests will then be made.

In order to properly understand the significance of the successful starting of this machine, it is necessary to review the history of its design and to compare it with engines of other types. After the experiments with Mr. Curtis' steam turbine inventions had proceeded for several years, certain experimental results were obtained which seemed to justify the production of commercial machines and it was decided to build a commercial machine for use in the Schenectady Works. A 600-kw. machine with horizontal shaft was designed, the mechanical arrangements being in most respects in accordance with the plans which Mr. Curtis had formed previous to that time for building the turbines. This machine was built and tested nearly two years ago.

These tests showed a high steam economy and it was very soon after decided that the performance of this machine justified the building of other commercial machines which could safely be relied upon to perform as good or better results. The question of mechanical design for these larger machines then became a matter of first importance. The steam economy could safely be expected to conform closely to that of the machine which had already been tested but the whole question of cost and commercial desirability depended upon the mechanical construction adopted for accomplishing the desired results.

It was decided at this time to build a steam turbine unit as large as the largest engine driven generating unit in the coun-

ture, and as the result of this decision the design of the machine now in Chicago was made up after a great amount of thought and study. This design embodied many very radical features as compared with other engines, turbines or machines of any character. The shaft is vertical, the whole weight of the revolving part is borne by an oil film delivered by a pressure pump to the lower bearing, the delivery of steam to turbine is controlled through a system of electrically operated individual valves worked by a small controller something after the manner of multiple unit train control systems, the centrifugal governor moves the controller. The revolving field is mounted upon the same shaft with the turbine wheels, and the stationary portion of the generator is supported by the stationary portion of the turbine, the whole building up into the general form of a vertical cylinder about 25 ft. high and about 14 ft. in diameter. The total weight of the turbine and generator is about 400,000 lb. and its capacity is 5000 kw. at full load. It is capable of running at about 75 per cent overload condensing and at nearly full load non-condensing.

The question as to why the vertical shaft design was adopted for this unit has often been raised and many doubts and criticisms concerning it have been expressed. It is not easy to explain all the reasons which lead up to its adoption but it may be said that the compactness and simplicity of this unit, which are its most marked characteristics, are largely due to the merits of this design. With the vertical shaft arrangement all lateral strain is removed from the bearings which align the shaft and all deflection of the shaft is avoided with a minimum number and length of bearings. This matter of properly supporting shaft and keeping it exactly central and in perfect alignment is an important one where small clearances are desirable with a large diameter in the revolving part. To carry such weights as are necessary in the revolving part of this large unit many very large bearings would be required if the shaft was in a horizontal position. An elaborate system of forced lubrication with artificial cooling would be necessary in connection with these bearings and a failure of any of these bearings would occasion serious danger to the operation of the machine. If the machine were built in a horizontal position it would be very difficult to so support the wheels that their clearances would not be affected by sagging of shaft or looseness in bearings, and also, it might be difficult to place them with such a relation to each other that the clearance would not be affected by expansion of the shaft. In the vertical design the space between wheels is reduced to a minimum, the supporting structure is perfectly symmetrical and cannot be in any way distorted or put out of line either by mechanical or steam pressure strains or by the effects of expansion.

The oil pressure step bearing at the foot of shaft supports the whole revolving element in a balanced position by perfectly symmetrical suspension and preserves the exact relation of level between the stationary and revolving parts. As long as this step bearing fills its functions a multitude of mechanical difficulties and uncertainties are overcome.

At the time this design was adopted there was no good precedent for the support in this manner of such a weight operating at so high a speed, and there were many predictions of failure, examples being quoted where similar methods had failed with water wheels and other machines. It seemed clear, however, that with proper arrangements the operation of this bearing must be stable and reliable, and since forced lubrication was necessary to success in any case, it seemed advisable to put it where it would accomplish the greatest number of good results.

Experience with a number of machines has fully justified our decisions in this connection. The bearings have run perfectly with an inappreciable amount of friction and when properly supplied with oil operate with perfect steadiness and regularity. In one respect these bearings have agreeably surprised us, that is, they have been much less injured by stoppages of oil than we expected. In the course of our experiments imperfect pumping arrangements have been used and repeated failures of the oil flow have been experienced, but in no case has any damage to the machine resulted. Even the cast iron blocks

which constitute the step bearing, are as a rule not destroyed. Our experience has been that they cut and heat when the oil supply is removed, but in all cases the surfaces have ground themselves to an operating condition after the oil flow is renewed so that the machine could be continued in operation. This might not always be the case, but it seems quite certain that the damage could never be as serious as that which would result from a failure of the lubrication system where heavy weights are carried on high speed horizontal bearings.

In our newer machines we are providing a heavy stationary collar below the lowest wheel which can be used to support the wheels in case the step bearing is removed and which would serve as a brake to bring the machine to rest in case the step bearing should cut enough to allow the wheels to settle to a dangerous degree. Our experience has been that there is very little tendency to settlement of the shaft in case of such cutting and this latter function of the collar will presumably seldom be called into requisition.

The oil for step bearings and also for the upper bearings of machines is delivered by a small electrically driven pump which operates continuously from the exciter circuit. In most of the large plants where we are installing turbines we have recommended in addition to these electrical pumps, a weighted accumulator with steam pump arranged to keep it full automatically. This accumulator with its steam pump affords an automatic reserve for the lubricating system. Its capacity is such that there would be ample time to shut down the units even if everything in the station should be stopped by the bursting of a boiler or steam pipe.

The 5,000-kw. machine in Chicago is the second of our vertical shaft turbines to be put into operation. The first machine of this type was one of 500-kw. capacity installed by the Newport & Fall River Street Railway Co. This machine has been in daily operation since last June. During all this time its daily operation has been indispensable to the service of the plant and there have only been two or three interruptions of a few minutes each which could be charged to its defects. It has, however, developed some minor troubles which have been the cause of some annoyance and which it has been very difficult to correct owing to the almost continuous operation of the machine. With new types of machinery which have to be put in service without any period of experimenting some such difficulties and delays can hardly be avoided.

The only serious troubles at Newport have been with parts of governor and with valves which have given out owing to overstraining of springs or other mechanical causes which are easily corrected. These troubles have occurred as the result of continued service and are being rectified as rapidly as it has been possible to analyze their causes and apply suitable remedies. Nothing has happened which suggests the possibility of a serious difficulty and it can be safely predicted that a condition will very soon be reached in which the turbine can operate for an indefinite period with a very small expense for care and renewals.

Our machine at Newport has been tested and has shown results decidedly better than the reported tests of steam turbines of other makes but the conditions have been such that we have reasons to believe that decidedly better results can be produced with slight changes in nozzles and adjustments of pressure. Up to the present time we have not been able to experiment with this machine or properly analyze its performances owing to the almost constant requirements of service. We are, however, installing a second machine at Newport and very soon expect to make a proper analysis of its performances and to bring both machines to a representative condition. All the experience which we can gain with these early experiments is, of course, available for the prevention of similar troubles and mistakes in other plants.

One important matter in connection with the introduction of our turbines has been the establishment of proper condensing facilities in order that the great benefits of high vacuum might be realized to the greatest possible extent. In turbines which we have tested the steam consumption has been reduced from six to seven per cent for every additional inch of vacuum above

25 in. Such a reduction is, of course, very important and justifies large expenditures upon condensing apparatus. The fact that the turbine may be better than a condensing engine with equal vacuum must not be considered a reason for assuming that a condenser which is good enough for the engine is also good enough for the turbine. The selection of condensing facilities should be governed by the economic possibilities.

We have recently designed for some of our large new turbines surface condensers which themselves constitute the base and supporting structure of the machine. These condensers are of very ample cooling surface and are so arranged that the maximum degree of vacuum is obtainable with a given amount of water. One feature of our turbine which is very advantageous in obtaining a high vacuum is that it can be easily so arranged that the air leakage is reduced to zero. The two points where the shaft passes through the casing are fitted with packings which are kept sealed by steam. Another advantage is that there is no oil in the steam and consequently that the exterior of condenser tubes is kept perfectly clean. Several turbines with condenser bases are now being built and it is probable that there will be a large production of machines of this type.

I have mentioned above that no oil comes in contact with the steam in these turbines and I need hardly call attention to the great importance of this fact. The condensed water can be delivered directly back to the boilers and all possibility of trouble in boilers from oil, dirt or scale is eliminated. Even in plants where feed water is good and cheap, this constitutes a great advantage since a considerable amount of heat is saved by using the condensed steam on account of its higher temperature. There is, however, no such thing as perfectly pure and clean natural water and there are few boilers that in their average working condition are perfectly clean. Cleanliness in boilers improves circulation and evaporation, prolongs life and constitutes, therefore, a very distinct and definite advantage.

The designs of these first machines started at Chicago and Newport are now about two years old. They were entered into upon the basis of a very limited experience with the turbine and nothing to guide us other than the theoretical possibilities which previous tests had demonstrated. The period which has elapsed since the conception of these designs has been occupied in a battle with the innumerable difficulties attendant upon the production on a very large scale of radically new devices. When we became convinced of the practicability and the advantages of our designs, we determined that the possibilities could only be developed quickly through production on a large scale and by a concentration of force upon the work. We consequently decided upon guarantees which we felt certain of fulfillment and upon prices which would be attractive to our customers, and have taken a large number of orders for machines of several sizes. We now have on our books contracts aggregating more than 200,000-kw. in steam turbines generating units. A large proportion of these machines are now either finished or well under way.

This immense production has been introduced at a time when our regular manufacturing facilities were strained to the utmost and when the difficulty of obtaining or sparing good men was very great. The trials and difficulties of such an undertaking are hard to describe. A vast amount of very expensive special machinery has had to be designed and built and almost every step has required thought and experimenting. In such new work the average man cannot be made to advance with the same confidence that he does on established lines. He presupposes the possibility of difficulty or failure and is constantly being brought to a halt and making mistakes that he would not make under different circumstances. Important processes are handled carelessly and unimportant ones are unduly deliberated over. The strain is incessant and an abundance of faith is required in those who would direct such work.

As the work of developing these designs has advanced, experience has shown the possibility of better and simpler methods and the steady continuance of experiments has extended our knowledge of the theoretical possibilities. Consequently, new designs have been proposed and developed and we now have in production a large number of machines which we consider greatly superior to those which are now being put into service.

This process of experimental development will continue and the production and test of each new machine will extend our knowledge and make possible further advances.

Our machines at Newport and Chicago and other machines of about the same date are of what we call the "two stage" type. The Newport machine has two compartments with three rows of moving buckets in each compartment, and the Chicago machine has two compartments with four rows of moving buckets in each compartment. Our later large condensing machines have four stages or compartments with two rows of moving buckets in each. All the details of their design have been worked out in such a manner that their construction is greatly simplified and the steam economy will presumably be much increased.

Thus, such successes as we may accomplish in the future will be the result of the large experience which responsibility for our existing work has entailed. We have been through long trials and have combated many predictions of failure but the facts seem to indicate that we have succeeded and to promise that we will in future accomplish greater successes.



The Chair: Gentlemen, the paper is open for discussion, and we are all very much indebted to Mr. Emmett for the valuable paper which he has presented to the meeting. I will call upon Mr. John I. Beggs, of Milwaukee, and ask him if he will kindly open the discussion.

Mr. Beggs, of Milwaukee, spoke of the very promising future of the steam turbine, but suggested that when perfected it might find a new power—the gas engine—in the field. He also spoke of the cost of steam turbines as compared with reciprocating engines and said that he believed this had been substantially reduced within a year. Mention was made of the Nuremburg gas engines to be installed at St. Louis next year.

The Chair: This is an interesting subject and Mr. Beggs' remarks are of much value, and I hope that others will take part in this discussion. Referring to the very interesting subject of gas engines, of which Mr. Beggs spoke, I might merely allude to the fact that in the new plant of the Lackawanna Steel Co., at Buffalo, by apparatus quite simple in its nature, the escaping gases from stacks of the blast furnace and the ovens are recovered, washed and conducted to the engine room, where they are used as fuel, costing nothing to the plant, yet supplying fuel for an installation of 40,000 h. p. of gas engines; power to move the machinery is supplied by the gas engines in that way. I have seen the plant several times. The engineer in charge is a Russian—of course, you all know that in the matter of gas engines, their manufacture and use, we are far behind Europe. I think units are 2,000-h. p. each, perhaps there are some of 5,000-h. p., but my impression is that most of them are 2,000 h. p. units.

Mr. Beggs spoke further of the growing field for gas and of the danger of competition that was threatened by a newly organized coke manufacturing company, which wished to dispose of its by-product, gas. This might be done by selling the gas or by burning the gas to generate electric current, in either case competing with electric lighting and gas companies now operating.

Mr. Connette: I know very little about the steam turbine, other than what I have read and I presume other gentlemen in this convention have read upon the subject. I will say, however, that while I am not a prophet or the son of a prophet, ten years ago at the meeting of this Association in Milwaukee, I had the honor to present a paper upon "Power House Engines." In that paper I predicted that the steam turbine would finally supplant the reciprocating engine. I merely remember that, and mention the fact here today.

Mr. C. O. Mailloux, New York: I had occasion to contribute to the discussion of the paper on steam turbines at the meeting last year, and as it happens that I had and am still having, some experience with steam turbines, I think possibly you may be interested to hear some words on that subject from me. First of all I would claim your indulgence for a few minutes of your time for the purpose of discussing the relation between the gas engine and steam turbine, although it has just been pointed out that a discussion of the gas engine is not exactly relevant

to the subject before the house, but it seems to me, since the matter has been brought before the house, that I would be neglected in my duty to my fellow-delegates in this meeting if I did not also contribute the information which I have in regard to the relationship or comparison between the two.

It so happens I have had occasion to investigate the question of gas engines, as well as the question of turbines, in my professional capacity to my clients, and I think I can sum up my view of the applicability of the gas engine by the old, trite saying—"Circumstances alter cases." I find it makes all the difference in the world whether you get gas for nothing or have to produce it. In a case where the gas costs nothing, as at Buffalo or in places similarly situated, or the gas is obtained at a cost which is below twenty cents per 1,000 cubic feet, I think gas engines will undoubtedly be more economical, or at any rate as economical, as steam turbines, especially when coal is relatively high. But when the power producer is compelled to produce his own gas, the situation is quite different. I had occasion to institute an interesting comparison recently, in the case of a plant of 15,000 kw. where I received estimates from a concern that offered to do the entire work by gas engines—the same gas engine as is used in Buffalo—and where I also had estimates based upon the use of steam turbines. It is for that reason I thought I would speak of this comparison, since it is a case in point. I found as the first point in the comparison, that in the gas engine system the largest unit was about 2,000-h. p. It would be necessary to have something like ten units, and therefore a larger building would be required for the plant, and a larger maintenance account, because the number of units is greater. The gas engine is not a simple device and has a certain maintenance account. I found also, in order to get the economy promised to me by the representative of the system, that I would have to go into the chemical business—in other words, I was told that out of the combustion of the gas or manufacture of the gas, I would get certain chemical by-products and would have to go into the chemical business to sell them. I understood that in an installation of 3,000-kw. that there would be something like \$50,000 a year or more recovered in the form of chemical by-products. The principal objection was that it required an initial outlay of over \$1,000,000—that was the crucial thing. If you consider the interest upon the extra initial investment—the depreciation, insurance, taxes, and all things which constitute fixed charges, you will find you must have greater efficiency and economy in your coal to come out even. In that particular case, I found that instead of coming out \$100,000 ahead as against the steam turbines, we would be more nearly that much behind each year. It is needless to say I did not advise my clients to adopt the gas engine plant in that case.

On the other hand, I had a case of a pumping plant in Mexico, where coal is \$15 a ton, delivered on the mountain 700 miles from the nearest coal mine. I found in that case a gas engine, operated with producer gas, though it might cost more than the steam turbine, would pay for itself in something like three or four years. The pumping duty is constant and it lasts 24 hours a day. There is an ideal load curve, which is an exactly suitable condition for the best economy to be obtained by the use of the gas engine.

I had occasion to investigate a case in Arizona where the power was to be used for lighting and traction, and found in that case that the cost was very nearly even. The company was one which produced gas as well as electricity. They make the gas and could procure it at the lowest cost, but after a careful investigation they decided to adopt steam turbines. Further investigation in the case shows that in the present state of manufacture the cost per kw. of the gas engine outfit is at least twice that of the steam turbine outfit. I have had a station operating under my direction which has been installed for a year, running one unit per year and for the last five or six months running two units of 400 kw. each. The results have been extremely satisfactory and we have recently ordered two units of 3,000 kw. each. I do not think I am telling any trade secrets if I state that the cost per kw. for the last two units ordered is under \$28, for the unit installed, not including the piping or condensers.

The great point in the steam turbine which appeals to me

as the result of my experience, is that it enables the station equipment to be greatly simplified, not only in detail, but also those things which eventually tell on the maintenance. You have fewer parts; there are no adjusting parts and various other things of that kind are much simpler in the steam turbine. But there is one other feature which is, I think, of the greatest utility, and that is the ability to apply superheat in the use of the steam turbine. I pointed out in the discussion last year that there is no limit to the superheat that you can apply in the case of the turbine; there are no conditions of lubrication to impose limitations; no packing, nothing to prevent you from applying all of the superheat possible to get. The steam turbine is related to the question of the design of the plant in another way—heretofore we have been accustomed, when we wanted a higher efficiency in our steam-producing outfit, to consider the introduction of fuel economizers. We have also been obliged to resort to extremely high steam pressures. We find with the steam turbine, allowing yourself ample superheating, with a moderate steam pressure, 150 lb., which is high compared to ten years ago, but low as compared with the practice of today, with a steam pressure of 150 lb. and superheating up to 600 degrees, you are enabled to get as good economy as you would get with perhaps 175 or 180 lb. of steam pressure, using fuel economizers. The cost of the station is less, expense of running much less, and all things considered the cost of reducing power is much reduced.

The only possible drawback which I have thus far had brought to my attention connected with the steam turbine, is the fact that it is not economical without condensation, and in fact without very good condensation. One needs with the steam turbine a very good vacuum, and I have experienced some difficulty hitherto in getting a satisfactory vacuum; but others have attained it, and I have no doubt that I will be able, by slight changes which I contemplate, and which I will introduce in new apparatus, to overcome the difficulty. I feel convinced that the design of the condensing outfit requires much more care and involves some more cost, perhaps \$3 or \$4 per h. p. for the condensing outfit of the turbine than for the condensing outfit of the ordinary engine. I know from the results obtained that there are no difficulties which lie in the way of carrying out perfectly a system of condensation giving results which would lead to the best economy; and I do not know of any other respect in which, even in the present state of the art, the steam turbine is inferior to the other method. When you consider the saving of space in the building, the reduction in materials, oils, supplies, etc., there is no doubt that if the pounds of steam were the same, there would be a saving in the use of the turbine.

In conclusion, I will say that while I was a strong partisan of the steam turbine last year, that as the result of my experience during the past twelve months I am today a stronger advocate of the steam turbine than ever.

Mr. J. G. White, New York: I assume many of the gentlemen are in practically the same position as myself in reference to this important subject, and that is that probably most of the people who have given the subject any considerable attention appreciate the necessity of high vacuum and high steam pressure, which is obtained by the turbine, and also the advantages of reduced space, saving in initial investment, saving in oil, and other supplies—but what most of us want to know is what can be depended upon as to reliability? Can we install steam turbines today and be certain that they will start off without serious interruption, or at least that after a few weeks of operation they can then be depended upon to take up the regular load and carry it day after day?

The Chair: I would ask Mr. Emmett, in answering Mr. White's question, to also close the discussion as far as he wishes and say anything further he desires upon the subject.

Mr. Emmett: We have had experience with two turbines, one 600-kw. in Schenectady, which is of the older type, and a vertical shaft turbine at Newport, which is of the newest type. The machine at Schenectady involved no radically new or peculiar mechanical devices, and was put in service two years ago and has run almost continuously without having any interruption of service or trouble of any kind. The machine located at Newport has carried its load continuously, and it is only through an excess of conscientiousness that in the paper I

tell you anything of the troubles we have had, because there have been practically none which interrupted the service. We have made a record of all stoppages, and I think there were three stoppages which interrupted the service in Newport, between June and September, and the longest stoppage was less than twenty minutes. This, however, was inspired by a certain amount of trouble going on in the valves which had to be corrected from time to time. However, the Newport machine as it stands, if it had to be kept in its present condition, without improvement, and simply maintained by the renewal of those valve parts as they give out, would be maintained and run at a small fraction of what it would cost to maintain any reciprocating engine of equal capacity.

In comparing the turbines and gas engines, I think Mr. Mailloux's statement of the comparison is a very just one. It is purely a question of the cost of fuel; that is, with the turbine in its present state of development. The actual fuel economy of the gas engine in its greatest state of perfection is greater than that of any steam engine heretofore produced. However, the very highest results obtained so far with steam turbines, in the matter of fuel economy, that is, actual consumption of combustibles, are not so far below the results obtained from gas engines. The very best gas engine that has ever been operated on a theoretical basis produced a fuel economy something like 32 per cent. total work units or mechanical equivalent from the heat in the coal. The best results produced with highly superheated steam under favorable conditions, I cannot say just exactly what the thermal economy is, but they operate at something like 23 or 24 per cent. The gas engines which actually operate on commercial basis do not run anywhere near the engine which had an efficiency of 32 per cent; they run nearly 26 or 27 per cent, and while they compare favorably with ordinary engine performances, they are not very much in advance of the best steam turbine performances. Furthermore, the cost of the gas engine is, as Mr. Mailloux says, possibly twice the cost of the steam turbine unit. If, however, the steam turbine unit is credited with the possible simplifications which surround it, the difference will be much greater.

The steam turbine needs no heavy foundation. A power station for boilers and turbines could be floated on three feet of concrete on any salt meadow, and a like inexpensive structure made to shelter it, and its efficiency be as good as if it were installed in the most expensive station. There will be simplifications in this direction—the ideal turbine station which will be far removed, maybe, from the city, will be laid out more on the lines of a coal yard, or any similar place than on lines where a large and expensive building will be required. On this basis the difference of cost will be greater than Mr. Mailloux stated, and even now, if we capitalize the difference in fuel consumption between the two engines, it will not cover the first cost.

Furthermore, the turbine is ideally simple and the gas engine is very complicated. Every one knows how simple the steam turbine is in a proper state of development. The only experience we have had in this country with steam turbines is with very new steam turbines. The troubles now experienced we think are of a purely temporary character. The steam turbine, as it will be in six months from today, can be operated by a child indefinitely, virtually without maintenance. The wear and deterioration is nothing and the whole plant can be reduced to an ideal condition of simplification. Against this we must consider a gas plant in which gas must be produced, and in which an immense maintenance cost goes on in connection with deterioration and renewal of converters and mechanism which must be attended to—the maintenance of engines twice the size of steam engines twice as complicated and less perfectly interested. The gas engine is a gasoline automobile on a large scale, and perhaps some of you have had experience with those; whereas the steam turbine is as simple as an ordinary grindstone. Naturally every one is interested in the development of the gas engine, and we all realize that some day if coal continues to increase in cost, and gas engines are improved, at the same rate that the turbine has been improved, the time will come when fuel economy will be the only consideration and gas engines will come into more extensive use. I think, however, the introduction of a steam turbine is certain to give the gas engine a long set-back.

Mr. Mailloux: A question was asked me by Mr. White, and if it be the pleasure of the meeting to have me answer the question, although the discussion has apparently been closed, I will be happy to do so.

The Chair: We shall be glad to have you answer the question, Mr. Mailloux.

Mr. Mailloux: I will confine myself merely to a statement of fact. The first 400-kw. unit was ready some time early in the winter. We were expecting to run the turbine light on Saturday, and to start it in regular service on Monday. We had been making preparations to get it running on Monday. We started it up a little in the morning of Friday. That afternoon we had a burn-out in one of the units that was carrying the load. It left us entirely unprepared to carry on the work of the station unless we pressed a turbine into service. Even though the packing was not finished, we pressed the turbine into service, started it up and we have not been able to spare it since. It has not stopped except during periods of light loads, when it became possible for us to dispense with it, that we might complete the piping and adjustment of the unit. If any trouble has occurred with it, it must have occurred since I left New York. So far as I know there has not been any interruption whatever. We experienced a little difficulty in paralleling the two units—there was a slight hunting or some disturbance due to imperfect belting. It was remedied. I have kept close watch of the performance of the two units and there has not been any disturbance of the action. At first the attendants were careful to exercise a strict supervision of the turbines, and remained around the unit while it was running, feeling they should be there in case of emergency, but they have become accustomed to the machine and do not feel it is necessary to be there so much and the unit is left to take care of itself.

There was a discussion on the question as to what extent the proceedings of the convention should be given to the technical press for publication, before the remarks were revised by the various speakers. The enterprise of the technical press in publishing the discussions was commended. Some of the members thought there might be a freer expression of opinion if the report of the proceedings was not printed before revision by the speakers, and some members expressed the opinion that a member should have the privilege of having expunged from the record any remarks he did not wish to have printed. The discussion was participated in by W. Worth Bean, St. Joseph, Mich.; L. E. Myers, Peoria, Ill.; H. H. Vreeland, New York; C. O. Mailloux, New York; G. Tracy Rogers, Binghamton, N. Y.; John I. Beggs, Milwaukee, and J. G. White, New York.

The Chair appointed the following committee to consider the matter and report to the convention: Messrs. Mailloux, White and Beggs.

The following named gentlemen were appointed as a committee on resolutions to report at this convention: W. Worth Bean, St. Joseph, Mich.; C. Loomis Allen, Utica, N. Y.; Thomas Hawken, Rockland, Me.

The following named gentlemen were appointed a committee on rules to report at the next convention: E. G. Connette, Syracuse, N. Y.; T. E. Mitten, Buffalo, N. Y.; W. E. Harrington, Camden, N. J.; Richard McCulloch, Chicago, and John J. Stanley, Cleveland.

Mr. Beggs offered the following resolution:

RESOLVED, That the executive committee to be elected at this annual meeting be requested and directed to make an earnest effort to have prepared and presented at the next annual meeting papers from prominent and experienced manufacturers of reciprocating engines, manufacturers of steam turbines, and the manufacturers of gas engines, as to their respective merits.

The resolution was seconded by Mr. Connette and carried.

The secretary read an announcement of the meeting of New York State Association to be held in Syracuse, Oct. 6-7, 1903.

On motion the convention adjourned at 12:20 to meet at 9 a. m. Friday.



Edward James Lawless, of the John Stephenson Co., together with David Moffitt and Mr. Root, are in attendance at the convention.

FIRST REGULAR ANNUAL MEETING

American Railway Mechanical and Electrical Association

Saratoga, N. Y.—Sept. 1—4, 1903.

THURSDAY'S SESSION

The convention was called to order at 10:10 by President Farmer. The following paper was read by the President in Mr. Carver's absence.

THE USE AND ABUSE OF CONTROLLING MECHANISM.

By D. F. Carver, Chief Engineer, Public Service Corporation of New Jersey, Jersey City, N. J.

This paper presupposes that the driving and controlling machinery of the rolling equipment has been bought and installed in a manner best adapted to meet the special conditions of service which vary on many of our roads, subject to local conditions of grade and alignment, operating management, stops and starts to be made, vehicle traffic to be avoided, acceleration desired, and laws and restrictions imposed by the community through the municipal government. With the machinery at hand properly designed to work under the conditions imposed, it is not a difficult matter nor an expensive one to keep the controlling mechanism in first-class condition and prevent it from depreciating in earning value to its owners at a faster rate than has been



D. F. CARVER

caused in the past by the progression in the art of design and construction of operating machinery. It now seems probable that the present type of magnetic blow-out controller for city cars has come to stay and that the future changes in it will be only in detail and not radical.

Therefore, it is a good investment to spend necessary money in maintaining these controllers and keep their depreciation through wear and tear as small as possible, and it is good railroading to watch them and care for them and protect them from the abuse which they too often get from inexperienced and untrained handling while being in use on the road.

The secret of successful mechanical management is watchfulness, care, systematic inspection. It is not often that machinery breaks down as the deacon's one-horse shay. It gives indications and warnings beforehand that something about it is not doing the right thing. Our difficulties are to provide methods to watch the operations of our mechanism so that the first indications of

internal trouble may be made known; after that there must be provided the experienced inspector who is trained to know what causes the peculiarities he discovers and he must know how to remove the cause of trouble. Several times every day while the cars are at the suburban terminals the controller cases should be opened and the whole interior mechanism given a hasty cleaning and a little lubrication of the contact fingers with a good quality of refined lubricant, vaseline being one of the best, though somewhat expensive.

There is a tendency on some well-managed roads to have only two points on the controller, viz., on and off — the various graduations of resistances being largely a matter of form. This method gets the cars over the road and pleases passengers who like a jolt now and then, but it is exceedingly hard on the motor equipment and runs the cost of its maintenance into large proportions.

There are some methods provided to limit the rate of turn of the controller handle in going towards the loop and in the larger equipments the rate of application is automatic and not under the control of the motorman. In city traffic where cars and vehicles have to go over the same ground and where the vehicle has by common consent the right of way, it is not good practice to limit very much the rate of travel of the controller handle, because the men will find they cannot make ordinary slow-downs for the vehicle traffic with a controller slow of application and cover the ground on schedule time, so they resort to the much worse evil of only operating the controller in case of a last resort and using the brake to hold down the speed, making the motors work against the load on cars as well as the brake. This is especially easy to do with power brakes — except the electric — and is a violation of rules which is very hard to detect.

A somewhat common form of abuse for which no one in the service can be held directly responsible is due to the fact that on many of the roads there are now running small equipments which were designed to haul small cars and small loads. The great growth of traffic which has come so rapidly on the trolley systems was not anticipated ten years ago, so many of us are in the position of having a large number of equipments partly worn out which are always overloaded by any loads they now have to carry, consequently they are running on our roads mixed with motor equipments of recent design and ample strength, and the poor old inadequate equipment must be driven along out of the way of the new and fast cars and it usually gets all the abuse of heavy loads, fast schedule and frequent stops; without any friends it runs along somehow, because it was so well built that it takes its own time about failing.

Mr. Mundy: Regarding Mr. Carver's expression that the controller has only two points and about the rheostat being merely a matter of form, I can state that some few months ago we were blowing up and completely destroying the interiors of controllers at the rate of about sixty per week and we have now reduced that to a very small percentage of the original, but we have tackled it not by going to work on the controllers, but by getting the rheostat on the cars properly. The condition of the rheostat affects the controller more than anything else. The older type of resistances made were made with asbestos between the layers of iron. That would burn out, short circuit and have all kinds of trouble. We have been substituting the great rheostat which will break sometimes but does not change materially in

resistance and you can take a controller, throw it around to the same points and you won't blow it out provided you have the steps graded on the rheostat properly. It has reduced the cost of our controller repairs, it is hard to get percentages but it is hardly comparable with what it was before.

Mr. Morgan: We have had that same trouble and particularly so on our interurban line. We run there with the K-14 controller and run as fast as 45 miles per hour and down a long grade we have between New Castle and Sharon we run probably 50 to 53 miles an hour. We have had the greatest trouble with the resistance because that asbestos and iron jammed from one coil to the other. It occurred to me yesterday, and I put it up to the Westinghouse company without any results, that there should be absolutely no reason why a great rheostat should not be substituted for a single one of those coil rheostats. Have you tried that? It is practicable, isn't it?

Mr. Mundy: Yes.

Mr. Morgan: Have you tried the substitution of one individual set of coils without taking out your full equipment and throwing it away?

Mr. Mundy: We are using the great rheostat for the highest, the R-3 to R-5, and the first points R-1 to R-2 seldom burn up. Those we keep in service, using both the General Electric ribbon type between the vitrified granite blocks and the Westinghouse round type, and we find that they hold up very satisfactorily. Regarding the proportioning of the resistances, I am somewhat radical and go further than the manufacturing concern in that I do not make the first point in my controller a running point. I make that more an arcing point, raising the resistance probably 50 to 75 per cent higher than would be proper to get the right acceleration of the car. That reduces the arc in turning off and makes considerable difference in the tendency to blow up.

Mr. Morgan: We have adopted that entirely. In fact, if we put the controller on the first point the car will not start. The second point is really the running point on our controller.

Mr. Mundy: Our practice is identical with Detroit and that is the only reason I say that getting the rheostat of the very best proportions will help to save the controller.

Mr. Pestell: I quite agree with Mr. Mundy and Mr. Morgan. In regard to extra resistance on the first point, the great trouble with the blowing out of controllers, arcing and blowing through the cover, has been due principally, I think, to the fact that the controllers were put on one notch and thrown off again before the motors had time to get any speed at all. Thus, if the motorman got two bells to start and then, before the car had actually got under way, he got a bell to stop, in throwing off, nine cases out of ten it would blow through the cover of the controller; putting on the extra resistance on the first point tends to stop that. We had a little experience here a short time ago using an S. R. G. motor on a transfer table and we found that the ordinary magnet in the controller would not take care of the arc at all. That is, there was so much self induction in the motor and the resistance so high that the small amount of current would not make a strong enough magnet to blow out the arc and the arc would be maintained for some time; in fact long enough to burn out the controller and we had to rig it up with a smaller wire. I think this holds good in starting and stopping the controller, not that there are not enough turns of wire on the controller, but the fact that the motor has a high self induction before it is started, both in the armature and the fields, which tends to kick back and blow holes in the cover when we do not get the motor started before we shut off.

Mr. Mundy: Another cause for blowing up controllers has been very serious and practically impossible to overcome from the motorman's standpoint and that is in case the motorman sees he is getting into a tight place, either a car or a wagon ahead of him. His first inclination is to throw the reverse handle. With a full motor equipment this means that the motors buck at once. After that wagon clears the track he goes ahead and pulls the reverse handle back into the forward position; there is nothing to break the arc except the reverse cylinder because the motor generates and that arc draws the reverse cylinder, short-circuiting and the next thing we have is the outside shell of the controller. The rest of it has gone up in smoke. To try to overcome this I have taken it up with the manufacturers and they are making for me today what might be called a special

controller and is one which I think they expect to make a standard, in which the reverse cylinder is made with much longer breaks. This, of course, does not overcome the bucking but it does keep the arc from going from finger to finger. I do not think we can educate the motorman, because I find that when I get on a car my inclination is to commit the same fault as the motorman.

Mr. Morgan: I would like to say in that connection I had very much the same trouble but I have posted rules relative to that, my position being over the mechanical department as well as over the operating, which requires that the motorman shall wait before he does that. I have also experienced the trouble of inclination to do things that you do not want the motorman to do. But I argue he is running the car every day and he should do it a great deal better than I do. A motorman has no right to assume because a man running a car once a week does something which is perhaps a little wrong, that he is justified in doing it also. I always point out to them that I am not a motorman.

Mr. Pestell: I would like to ask whether anybody here has had any experience with flashing over the controllers on the connecting board below the blow-out magnet for no apparent cause, that is, when the board has been apparently clean and all right previous to the time of flashing over?

Mr. Mundy: I think I said yesterday, recently I was testing some fuses on the car and purposely applied the brake as tight as possible in throwing the controller around to the full multiple position to try the fuse. The controller drew some arcs at the top end which drew an arc from the controller finger to the cover of the controller but when I opened it up I also found that the head of every screw in the connection board had simply been burned off and you could not use a screw driver in getting any screw out, the cause being that the gases formed by the arc completely filled the controller and short-circuited the different connections.

Mr. Olds: We have that same trouble. Sometimes in a short circuit, as you throw off, you will find the connecting board contacts burned, as well as possibly with the trolley, or wherever the short circuit may occur. Regarding the reversing of the car we think it is policy and best that the motorman should understand the reversing of the car although some have thought best to take off one of the contacts on the backing-up part of the cylinder at each end so that should they wish to back, they are obliged to do it on two motors. I think that is poor policy because there are times that we want a man to use anything that he can to make a quick stop. I think if they must strip the gears or strip the armatures—I do not care what they do—if you get in a close place, stop your car! But we have the same trouble Mr. Mundy speaks of, the men will use the reverse when they ought not to, and the burning of the reverse is quite a serious matter, especially during the winter. The motorman will come in with his controller burned up. You will say to him "You have been using your reverse." "Oh, no, no, no, I never use the reverse." But open it up and you will find blisters on the back of the contact. They are all burned, whereas the go-ahead would be perfectly clean. Regarding Mr. Mundy's improvement—because I consider it is his improvement—he is the man who suggested it and took it up with the General Electric Co.—I think it will help us out in that matter considerably. We are experimenting a little today upon putting the controller in the center of the car mechanically. Just what will be the outcome of it I am not prepared to say but we wish to get the controller off from the front platform. All our electrical appliances, if possible, should be taken from the platform. Whether we can accomplish it is problematical. The Type M does do that to a very great extent although they place the circuit breaker on the platform or in the motorman's cab which is sometimes a source of trouble.

Mr. Mundy: I would like to modify Mr. Olds' statements by the fact that they'd place the circuit breaker on the hood of the car, but appreciating the difficulties that we are just speaking of, they have not been developed and they are now proposing to install an electric equipment and short circuit breaker which is to be put on the car along with the apparatus for the blow system.

Mr. Pestell: I would like to ask the representatives of any road here: on their roads motormen are instructed relative to the generator effect of the motors in stopping a car so that they would have proper instructions for starting a car, provided the trolley was off and they had no power, and the brakes refused to work. The thought occurred to me in connection with the statement that some roads did away with some of the contacts on the reverse cylinder in the reverse position. It seemed to me that if that were done and the trolley came off or the power gave out and it was necessary to stop a car while the brakes refused to work, it would be a hard thing to do. I would like to know if any of the roads instruct their men relative to generator action of their cars.

Mr. Morgan: I have always believed that was pretty general practice. I know I have always done so with roads I have been connected with for years. I take the stand in regard to reversing a car that no matter what mechanical damage is done, anything is better than personal damage and of course you must stop your car, if you are in trouble with the brakes, some other way. Our men understand the effect of the four-motor equipment and also understand how to reverse their cars with two-motor equipment. We have that so arranged that we are anticipating now having a monthly examination of all men on such points as that particularly. I would say that an unfortunate accident a short time ago brought that very vividly to my mind. We run a single track system with time limit and we had an excursion train coming behind a regular. The head car had broken its trolley and the trolley had gone up and with the usual luck in such cases, had struck a pole and bent so they could not move the front car at all without going on top. The motorman flagged the rear car immediately and the conductor went on top to fix the trolley. The result was that this rear car came ahead and in stopping, the brakes refused to act; the motorman put on his reverse but it had just rained and left that very greasy effect on the rail, and the result was he just skidded right down, although the motorman was a remarkably cool man. If he had not been instructed regarding the reverse the accident would have been found more serious, and I attribute the fact that it was no worse to his understanding thoroughly his reversing.

The reversing has been spoken of as not being a good feature, and motormen are not instructed thoroughly. I believe the time is coming when we will have to adopt very much the same practice in regard to the instructing of our motormen as is adopted by the steam roads. I think Mr. Ely mentioned in his address yesterday the well-known fact that an engineer or even a brakeman on a steam railroad is efficient on any road in the United States and it strikes me that we are taking a stride in exactly the right direction, particularly for interurban roads, if we endorse and help in every way the movement that is on foot to instruct motormen and conductors on a general rule plan so that, understanding the rules of one road, they will understand the rules of all other roads.

Mr. Olds: Mr. President, regarding the adopting of standard methods, I find it is a very important matter and when we go back to the records of the Master Mechanics and Master Car Builders we find that practically the first thing that they adopted was a standard journal and journal box. It seemed but a small matter at the time but now we see the position of these associations. Managers of the steam railroads will not adopt a thing that is not recommended by the Master Mechanics or Master Car Builders. We do not expect to be able to get everything down to a standard but we can go a long way toward it. On our own road, seven years ago, we put in a standard axle and journal box. Everything up to the present day that we have purchased or ordered has used that same journal box and axle. With three or four different styles of truck, the same car wheels can go in in any of them. On our new interurban cars we have put in the M. C. B. standard $4\frac{1}{4}$ by 8-in. journal box. The new city cars are to have the $3\frac{3}{4}$ by 7-in. journals and we propose to continue this policy. These remarks are out of order as discussion on this paper, but I feel we should, as soon as possible, hit upon standards and the instruction of our motorman can be along those same lines. A number of years ago we had an accident caused by the power failing on a very steep

grade. The motorman set his brake, the conductor became excited and went to the rear end and also set the brake. We found all eight wheels were locked. The locking of the wheels had caused the car to slide more than it would if they had simply set the brakes as they should. The motorman in that case did not understand that if he had left the controller at the running speed it was a two-motor equipment, his motors would have generated and stopped. And for that reason I think it is very important that our motormen all have that instruction, that the motors of a two-motor equipment will generate when in parallel and with a four-motor equipment by simply pulling the reverse handle.

Mr. Morgan: Instruction for motormen is somewhat of a hobby with me for some time because I have had to contend with just such troubles because of motormen not having been instructed on other roads and turned in perhaps a little quickly on our road, because we are a small road. If we were a large road and could afford to go through the system of training which is done on most of the large roads now, a regular school, we would be in a different position, but we cannot afford to take our men through and give them mechanical and electrical instruction before we make motormen of them.

The standardizing has been, as most of us know, a matter of discussion with the American Street Railway Association for some time, but I think the forming of this Association has a splendid opportunity in that very thing, the standardizing of equipment and particularly on trucks. We all recognize the fact that electrical equipment is still advancing and we cannot expect to standardize or change the mechanical construction which has been the construction for a number of years. We can standardize as well as the Master Car Builders can and in so doing we help our suppliers and ourselves and our expenses and everything, and I would strongly urge that matter be considered seriously by this Association at this time so as to put it in process for our next convention.

The Secretary: A letter has been received from the "Street Railway Review" offering to the Association the use of the type set for use in the "Daily Review" if it would be of assistance in publishing the proceedings of the convention. This letter was read at the meeting of the Executive Committee Tuesday evening. Mr. Wakeman, vice-president of the Street Railway Journal, dropped in at the meeting just as we were passing a resolution of thanks to the "Review" and he has requested me to announce that the Journal would be glad to share the expense, if the offer of the "Review" were accepted.

A vote of thanks was extended to the Street Railway Journal for the offer.

The Committee on Nominations reported the following recommendations:

President, E. W. Olds.

First Vice-President, Alfred Green.

Second Vice-President, C. F. Baker.

Third Vice-President, W. O. Mundy.

Executive Committee: T. J. Mullen, H. H. Adams, D. F. Carver, H. J. Lake.

Secretary and Treasurer, Walter Mower.

The officers as nominated were unanimously elected.

President Farmer in a few well-chosen words proposed a vote of thanks to Secretary Mower for the excellent manner in which he had handled the business of the Association entrusted to his care, which was carried unanimously.

Mr. Olds: We at this time have a gentleman occupying our chair who was the first one to call us together, one year ago. At Detroit the matter was discussed and the meeting was called and through his efforts and the efforts of our worthy secretary we have the meeting today in Saratoga which I feel has been a grand success and I hope that our year to come may be as successful as the year that has just flown. I wish to thank each one of you and the companies that you represent for the honor that you have conferred upon me today and at the same time I wish to make a motion that we extend to our president, Mr. Farmer, a vote of thanks for his efforts in making a success of our organization as we see it today.

Carried unanimously.

President Farmer: I think the newly elected officers will take

hold immediately after the adjournment of this meeting and I suggest that as Mr. Olds may have some things to say or have done which he can do much better here than by correspondence, it would be well to adjourn the meeting so Mr. Olds can call the meeting together, and I would say that I am very much obliged for the courtesy that you have shown me in overlooking the mistakes I have made in presiding at this table. I am a better hand in the shop than I am here and I will never forget the kindness that you have all extended to me.

(President Olds took the chair, being escorted to it by Mr. Mundy and Mr. Baker.)

Mr. Mundy: I think, next to keeping apparatus in proper shape, the keeping of records is of as much importance as anything else, because it soon tells us whether we are following along a line consistent with good practice and consistent with what other roads are doing. If somebody else is doing things better than you are you will find it out. You never know that unless you keep those records. I think the standardization of all records adopted by all roads to give you this direct information is so important that we ought to have a committee to start to work on it at the present time—for something to at least give us grounds to work on at our next regular meeting.

Mr. Lake: The report sheet matter is a thing that I have not heard mentioned during any of the meetings, and that is, the most of our talk has pertained to the city use of cars. I, for one, have no city cars whatever to look after and my work is entirely interurban and I think, very likely, that there are other members of the Association in the same fix.

Mr. Mundy: I have in mind our president's request that the various members of the Association make suggestions as to the proper subjects for papers next year. If we have to rely on a small committee to pick out the subjects and the men who are to write on them, we are not so liable to get the best papers. I think if each member will consider the point that he thinks is the most important, will write, giving that suggestion to the secretary, the committee selecting the papers will have some ground to work upon.

Mr. Olds: Matters of standardization not only of our equipment but of our system of records needs to be gone into. That should be one of the matters that should come up at our next meeting. Regarding the appointing of committees I wish to leave that until our executive meeting.

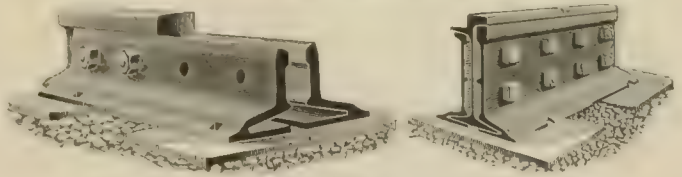
The Association then adjourned.



CONTINUOUS RAIL JOINTS.

We present to our readers a view of the Albany Iron & Steel Works, located at Troy, N. Y., the property of the Continuous Rail Joint Co. of America, where the company makes a complete line of its well-known and largely used "Continuous" rail joints, this being believed to be the only rolling mill in the country devoted exclusively to the manufacture of rail fasten-

year, however, as one of the largest rolling mills in the west produces a great tonnage annually for this company.



THE "CONTINUOUS" RAIL JOINTS.

The Continuous Rail Joint Co. of America is represented at the convention by B. M. Barr, S. P. McGough, W. E. Clark, L. F. Braine and W. A. Chapman.



A REVOLVING TRACK SANDER.

The Revolving Railway Sander Co. of America is the name of a new company which is showing a revolving track sander for which a patent has just been issued. Briefly, this device consists of a circular galvanized iron drum with a small hole in the top. The sand is put in the drum and by pressing down a pedal the small hole is brought into line with a tube at the bottom through which the sand flows in a constant stream until the pedal is released and the drum is righted. A series of projections on the outside of the drum serve to stop its revolving at the proper points for its successful operation, the projection also serving as hammers to jar and disintegrate sand that may become caked. The drum, which is 20 in. in diameter, is water tight. Two drums may be attached to the pedal rod, one over each rail, or a single drum may be used. G. Stevenson, secretary pro tem., states that the new sander is meeting with a favorable reception at the convention.



J. E. Blakesley is exhibiting an inverted third rail and third rail shoe, which were invented by him and which look to be simple and practicable. His exhibit will be found in the American Automatic Switch & Signal Co.'s booth.



George E. Morgan, of Philadelphia, is in charge of Merritt & Co.'s exhibit, which comprises several of its well-known steel lockers.



B. S. BARNARD ELECTED PRESIDENT.

The Standard Vitrified Conduit Co., of New York, has recently made a change in its official staff, R. W. Lyle having resigned as president on account of other pressing business engagements, he being president of several corporations. B. S. Barnard, vice-president and secretary, has been chosen as Mr. Lyle's successor. The "Review" tenders its best wishes to Mr. Barnard in his new position. The success of the company, which has been extraordinary, is largely due to Mr. Barnard's efforts. He is well known throughout the country as an enterprising business man.

The capacity of the Standard Vitrified Conduit Co.'s factories has been greatly increased and the output at the present time is upwards of 100,000 cu. ft. of conduit daily. The Interborough Rapid Transit Co., of New York, recently awarded this company the contract for 55,000 third-rail insulators for the subway system. These insulators are similar to the Manhattan type, which is made by the company. The Scioto Valley Traction Co. has also ordered 20,000 Manhattan insulators, and the United States Steel Co. has equipped several plants with them. Several other important third-rail systems are considering the adoption of these insulators, for which strength, simplicity and low cost are claimed.



Frank H. Seavey, of Boston, exhibits his 1903 model of the Seavey automatic car tender.



The Celluloid Co., of New York, has the first exhibit space on the end of the piazza nearest the hotel entrance, where it shows several car seats upholstered in "Texoderm," a very attractive material made for car seats and curtains. W. C. Crosby and Warren S. Sillocks, Jr., represent the company.



ALBANY IRON AND STEEL WORKS

ings. Two views of the "Continuous" rail joints are also shown herewith. The rolling mill has a boiler capacity of 1,500 h. p., and two trains of rolls are kept constantly busy turning out "Continuous" rail joints. The mill has rolls ready for service for 125 different sections of rail ranging from 30 lb. T rail to a 9-in. girder rail. The output of this mill represents only a portion of the total product of "Continuous" rail joints sold every

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AMERICAN STREET RAILWAY ASSOCIATION.

FRIDAY, SEPT. 4, 1903.

Morning: Third Session at 10 a. m.

"Electric Welded Joints," Worcester Consolidated Street Railway Co., by William Pestell, superintendent of motive power and chief engineer.

"The Evils of Maintenance and Champerty in Personal Injury Cases," Detroit United Ry., by Michael Brennan, attorney.

"Train Orders and Train Signals on Interurban Roads," International Railway Co., of Buffalo, by C. A. Coons, superintendent of transportation.

"Freight and Express on Electric Railways," Birmingham Railway, Light & Power Co., by J. B. McClary, manager railway department.

"The Manufacture and Distribution of Alternating Currents for City Systems," Chicago City Ry., by Richard McCulloch, assistant general manager.

"Comparative Merits of Single and Double Truck Cars for City Service," Milwaukee Electric Railway & Light Co.

"The Right of Way," Interurban Street Railway Co., by H. H. Vreeland, president.

Afternoon, 1:00 p. m.: Excursion to Lake George as guests of the Hudson Valley Railway Co., returning at 6:00 p. m.

Evening, 8:00 p. m. Annual Banquet and installation of officers-elect.

The Weber Railway Joint Manufacturing Co. is displaying samples of its joint which has been made standard on the Interborough Rapid Transit Co.'s subway tracks in New York. The company is represented by Manager Holbrook and Messrs. Barr, Poor, Holloway and Thompson.

A controller regulating device is being shown by the Durkin & Barrett Manufacturing Co., of Scranton, the company being represented by P. S. Barrett.

STREET RAILWAY ACCOUNTANTS' ASSOCIATION.

FRIDAY, SEPT. 4, 1903, 10 A. M.

Paper "Advantages and Disadvantages of Bag or Envelope System and of the Cashier System of Receiving Conductors' Deposits," by F. R. Henry, auditor St. Louis Transit Co., St. Louis, Mo.

Comparison of the Municipal Tramways Association of Great Britain proposed "Standard Classification and Form of Report" with the American Standard, by C. N. Duffy, secretary Chicago City Railway Co., Chicago, Ill., chairman Committee on Standard Classification.

Replies to questions.

Report of Committee on Resolutions.

Report of Committee on Nominations.

Election and Installation of Officers.

Adjournment.

PRESIDENT OLDS.

Mr. Edwin W. Olds, president-elect of the American Railway Mechanical and Electrical Association is a "Green Mountain Boy", having been born in Franklin County, Vermont. He was educated in the common schools and local academy. From early boyhood Mr. Olds has been engaged in mechanical pursuits; even while attending school he was also working in the general shop of which his father was the proprietor, and being intrusted with charge of work early developed that executive ability which has made him so successful as a shop manager.



E. W. OLDS.

In 1890 Mr. Olds became identified with street railway work, going with the Denver Tramway Co., of Denver, Col. Since 1896 he has been with the Milwaukee Electric Railway & Light Co. for which he is superintendent of rolling stock.

Mr. Olds' election to the presidency of the association is an honor which is well-deserved, he having been one of the men most active in effecting the organization, and in contributing to the success of the first annual meeting.

MR. ANTHONY H. METZELAAR resigned as general manager of the Knell Air Brake Co., of Battle Creek, Mich., on August 20th. He was associated with that company three years, the first part of the time as sales manager. Previous to that he was for two years constructing engineer for the Magann Air Brake Co. Mr. Metzelaar, who is about 30 years of age, is a graduate of the Technical Institute of Mechanical Engineering of Amsterdam, Holland, and upon coming to America he took a post graduate course at the University of Michigan. He has traveled extensively and has a wide acquaintance with street railway managers and street railway work, and it is his desire to again become affiliated with those interests after he has enjoyed a brief vacation, part of which is being spent at the street railway convention. Mr. Metzelaar will continue to reside at Battle Creek, where he may be addressed.

LOST!

Mr. J. V. E. Titus, secretary of the Garton Daniels Co., yesterday had the misfortune to lose in the corridor of the Grand Union Hotel a pocket book containing a considerable sum of money. The finder will please leave at the office of the hotel.



KEEP THE "DAILY REVIEW."

We beg to call attention to the fact that the pages of the "Daily Street Railway Review" are numbered consecutively with the pages of the monthly "Street Railway Review," and all four copies of the "Daily" must be preserved to have the Volume XIII complete for binding.



EXCURSION TO SCHENECTADY.

The special train carrying the convention attendants on the visit to the works of the General Electric Co. at Schenectady Thursday afternoon comprised 10 coaches, there being about 700 persons in the party. What was termed "lunch," but was in reality a banquet, was served in the balcony of the new building which is to be used as one of the turbine shops. The party returned to Saratoga at 7 p. m.



STREET RAILWAY CONVENTIONS.

The Twenty-first Annual Convention of the Street Railway Association of the State of New York will be held at Yates' Hotel, Syracuse, Tuesday and Wednesday, October 6th and 7th. The conventions of this Association are usually held in September, but the date was changed this year in order not to conflict with the Saratoga conventions. The president of the New York Association, Mr. G. T. Rogers, has extended an invitation to all street railway and supplymen now in attendance upon the national convention to attend the New York meeting, which promises to be unusually interesting.



The 12th annual convention of the Pennsylvania Street Railway Association will be held at the Park Hotel, Williamsport, Pa., on Wednesday, September 23d. All persons who are interested in street railways in the state of Pennsylvania are urged to be present and take with them as many members of their company as possible.



The T. H. Symington Co., of Baltimore, is exhibiting its Symington journal boxes, Symington dust guards and its new Mogul metal for all classes of car, locomotive and street railway equipment.



The Van Dorn automatic couplings are being shown by W. T. Van Dorn, of Chicago, who incidentally presents gentlemen visitors aluminum cigar cases as souvenirs.



C. H. Whall, of Boston, is exhibiting Whall's metallic window casing, which is claimed to be not only dust and rattle proof, but prevents the window from sticking.



Gus Suckow, general manager of the Vose Spring Co., of New York, has been renewing old acquaintances and forming new friendships during the convention.



The William B. Seafie & Sons Co., of Philadelphia, sole maker of the Seafie and the Wolfen-Go water softening and purifying systems will hereafter be represented in Philadelphia by Duncan W. Patterson, M. E., with headquarters in the Harrison Bldg., Eleventh and Market street. Mr. Patterson, who has been handling the Bachman system of water purification, succeeds M. Furstine, whose office were in the Bourse Building.



The Robins Conveying Belt Co., of New York, is showing a working model of its conveyor and it is attracting much attention.

The Flood & Conklin Co., of Newark, N. J., makers of surfacers, or varnishes, for railway cars, is a newcomer among the exhibitors this year.



Berry Brothers, of Detroit, show two highly-varnished panels of different colors to demonstrate the virtues of their well-known varnish products. The rest of their booth is tastily fitted up for reception purposes.



Adam Cook's Sons, of New York, had the misfortune not to receive part of their exhibit, and what did arrive came late. Still, a respectable showing of Albany grease is made possible, and the company's representative, Albert J. Squier, is well qualified to entertain callers. George C. Cook, one of the proprietors, was expected to arrive last night.



The United States Curtain Co., of Newark, N. J., is represented by H. F. Sanville and A. E. Meixell, both of Philadelphia. They exhibit the company's curtains and curtain fixtures. These products were placed on the market a year ago and have been well received.



John H. Nickerson, of West Newton, Mass., president of the United States Electric Signal Co., which is making a comprehensive exhibit, reports that the outlook for an excellent business as a result of the convention is very encouraging.



The Lumen Bearing Co., of Buffalo, is making its usual attractive exhibit of bronze motor and truck bearings and its improved "Ideal" trolley wheel.



The National Electric Co. is giving out a very useful souvenir, it being a steel measuring tape having metric measurement on one side and standard on the other.



The Fowler truck side bearing is being exhibited by William H. Fowler, of 1301 Fisher Bldg., Chicago, and it is thought to be a very excellent device. The bearing has but three parts, is strong and simple in construction and can be applied to any size or style of truck.



The Brady Brass Co., of Jersey City, is exhibiting its lines of bronze bearings and babbit metals, the company being represented by D. M. Brady, C. P. King and G. C. Morse.



The National Lock Washer Co., of Newark, N. J., exhibits among other devices a new curtain fixture for which a patent has just been allowed. The curtain is balanced in the center and at the ends of the tube are light spring shoes which run in the grooves in the window frame. Constant alignment is practically secured, and there are no pinch handles or cords. The company is represented by Daniel Hoyt and R. L. Thomas.



The Economy Lubricator Co., of Chicago and Milwaukee, is represented by B. R. Stare and W. H. Stare, who show the new "Economy" lubricating device for car journals at the space of the Peckham Manufacturing Co.



Allen & Morrison Brake Shoe & Manufacturing Co. exhibits a Detroit re-insulating machine and brake shoes.



The "Uni" electric railway signal system for electric railways can be seen in operation opposite the high board fence at the rear of the court yard.



The United States Steel Co., of Everett, Mass., is exhibiting the Neal duplex brake and Jupiter steel castings, the exhibit being in charge of William E. Reid, mechanical engineer, assisted by L. H. Miller, of the steel department.

AMERICAN CAR SEAT CO.

The American Car Seat Co., of Brooklyn, N. Y., exhibiting various types of its "pushover" cross seats and stationary back seats in rattan and plush upholstery. The stationary back seat is especially adapted for cars which are operated from one end only and is creating considerable interest among



railway officials. The pushover cross seats exhibited include several designs, a notable instance being a plush-covered seat with high-roll head rest, automatic movable foot rest, and side arm, this style of seat being adapted for high speed in-



terurban cars. Another seat to which especial attention is called is a rattan upholstered seat, with corrugated back, for ordinary electric car service. The principal aim in the construction of this seat is to simplify the mechanical push-over action and to embody as few parts as possible. This pushover action consists

of three metal parts, including a simple cam movement to shift the rocker and elevate the seat cushion, and the cost for maintenance of these seats is said to be inconsiderable. This company makes all of its canvas-lined rattan webbing for seat covering and is also direct importer of sweeper rattan, which it furnishes in natural and cut lengths. The president of the company, Joseph Salmon, has just returned from an extensive trip abroad, where he has greatly furthered the company's export interests. The export consignments, he states, have largely increased during the past year. Mr. Salmon is attending the convention, as is Hiram E. Ackerly, the company's sales manager.

J. G. BRILL CO. WINS SUIT.

The Brill company is circulating a facsimile of a clipping cut from the Philadelphia Public Ledger. The clipping reads as follows:

"Trenton, N. J., Aug. 29.—Judge Bradford, of Delaware, especially assigned to try the cause, to-day decided against the North Jersey Street Railway Company, now a portion of the public service corporation, in the patent rights suit brought by the J. G. Brill Company, car builders, of Philadelphia.

"The Brill Company sued for an accounting from the North Jersey Street Car Company for infringing a patent on pivotal steel car trucks. The opinion of Judge Bradford carries with it an order compelling this accounting."

McGUIRE MANUFACTURING CO.

The McGuire company is keeping open house in one of the hotel cottages. The company is well represented at the convention.

SHERWIN-WILLIAMS CO.

The Sherwin-Williams Co. is showing its paints and colors for all classes of street railway work, the samples embracing all the steps in the process of painting a car from wood to finish. Special attention is called to its Ajax insulating varnishes, also. The famous "Covers the Earth" signs are displayed on easels and attract a great deal of notice. The company is represented by E. M. Williams, manager of the street railway department; F. A. Elmquist, special street railway representative, and L. W. Barney, New England representative.

H. W. JOHNS-MANVILLE CO.

The H. W. Johns-Manville Co. occupies space No. 67 where it shows to excellent advantage a well-arranged assortment of the latest developed devices pertaining to the Sachs "Noark" enclosed fuse apparatus. There is also a very complete line of up-to-date overhead line material, ears, clips, trolley wheels, insulated and metallic crossings and section insulators, and electric car heaters, of which several new designs have been recently brought out. The company distributes a very attractive and useful souvenir. Among those in attendance are J. W. Perry and J. E. Meek, of New York; H. H. Voorhis, of Philadelphia, and James Humphreys, of Boston.

The representatives of the Johns-Pratt Co. in attendance are E. B. Hatch, president; Joseph Sachs, electrical engineer, and Mr. Newton.

Karl A. Andren, purchasing agent for the Stone & Webster Co., Boston, was an interested spectator at the exhibit yesterday.

The Standard Pole & Tire Co. of New York has a number of sample poles in the court yard.

The exhibit of C. O. Oberg & Co., of Boston, makers of register rod handles, is personally conducted by Mr. Oberg.

Richard Ham is exhibiting his new trolley catcher and retriever at the space of the Consolidated Car Fender Co.

REGISTRATIONS THURSDAY, SEPT. 3, 1903

A. S. R. A. DELEGATES.

Boston, Mass.—W. H. Trumbull, Boston & Worcester Street Ry. Co.
 Buffalo, N. Y.—Marcell Cohen, Jr., J. Millar, J. E. Stevenson, C. A. Coons, C. K. Marshall, A. J. Farrell, International Ry. Co.
 Cleveland, O.—F. W. Coen, Lake Shore Electric Ry. Co.
 Des Moines, Ia.—John W. Glidden, Des Moines & Amesbury Electric Co.
 Exeter, N. H.—W. D. Lovell, Exeter, Hampton & Amesbury St. Ry. Co.
 Lakeland, N. Y.—J. T. Smith, Citizens Railroad, Light & Power Co.
 Queens Falls, N. Y.—H. Wakely, D. M. H. H. H. Hudson Valley Ry. Co.
 Hamilton, O.—L. M. Sheldon, C. E. Palmer, Cincinnati, Dayton & Toledo Traction Co.
 Harrisburg, Pa.—Mason D. Pratt, Central Pennsylvania Traction Co.
 Hartford, Conn.—E. S. Goodrich, J. R. Goodrich, Hartford St. Ry. Co.
 Haverhill, Mass.—D. A. Belden, Exeter, Hampton & Amesbury St. Ry. Co.
 Indianapolis, Ind.—R. A. Scheutscher, J. L. Matson, Union Traction Co.
 Jersey City, N. J.—John N. Akarman, Public Service Corporation of New Jersey.
 Kenosha, Wis.—B. J. Arnold, Kenosha Electric Ry. Co.
 Maynard, Mass.—Charles H. Persons, Concord, Maynard & Hudson St. Ry. Co.
 Memphis, Tenn.—Frank G. Jones, C. H. Ruddock, Memphis St. Ry. Co.
 New Orleans, La.—C. V. Cosby, New Orleans Railways Co.
 New York—Richard W. Meade, R. E. Binning, Interurban St. Ry. Co.; F. R. Slater, Interborough Rapid Transit Co.
 Oneida, N. Y.—Robert E. Drake, Oneida Ry. Co.
 Philadelphia, Pa.—H. B. Nichols, Philadelphia Rapid Transit Co.
 Quebec, Canada—G. N. G. Holman, H. H. Morse, Levis County Ry. Co.
 Schenectady, N. Y.—W. B. Potter, F. G. Spence, D. W. Gross, J. E. Woodbridge, E. J. Ryan, Schenectady Ry. Co.
 Syracuse, N. Y.—E. G. Connette, Syracuse Rapid Transit Co.
 Sanford, Me.—I. L. Melvon, Atlantic Shore Line Ry.
 Utica, N. Y.—W. J. Harvie, H. J. Root, Utica & Mohawk Valley Ry. Co.
 Worcester, Mass.—I. H. McLean, Worcester Consolidated St. Ry. Co.

A. R. M. & E. A.

Albany, N. Y.—H. A. Benedict, United Traction Co.
 Anderson, Ind.—John L. Matson, Indianapolis Union Traction Co.
 Buffalo, N. Y.—J. Millar, International Railway.
 Boston, Mass.—C. H. Hill, Boston Elevated Ry. Co.
 Concord, Mass.—E. T. Millar, Concord & Manchester.
 Canton, O.—E. J. Rauch, Canton-Akron Ry. Co.
 Chicago, Ill.—Charles E. Lund, M. O'Brien, Chicago City Ry. Co.
 Denver, Col.—John A. Beeler, Denver City Tramway Co.
 Fond du Lac, N. Y.—W. H. Collins, Fond du Lac, N. Y. & Gloversville R. Co.
 Hudson, N. Y.—R. P. Leavitt, Albany & Hudson R. R. Co.
 Indianapolis, Ind.—R. A. Scheutscher, Indiana Union Traction Co.
 Middleboro, Mass.—Charles H. Cox, Middleboro, Wareham & Buzzards Bay St. Ry. Co.
 Rochester, N. Y.—E. J. Wilcoxon, Rochester & Status Bay R. R. Co.; R. E. Danforth, Rochester Ry. Co.
 Rockland, Me.—Thomas Hawken, R. T. C. St. Ry.
 Seattle, Wash.—John F. Knowlton, Schma St. & Suburban Ry. Co.; W. B. Moorman, Southern L. & Traction Co.
 St. Louis, Mo.—Merle R. Griffith, St. Louis Transit Co.
 Youngstown, O.—W. E. Harrington, Youngstown, Sharon & New Castle Ry. Co.
 New York—Henry W. French, Engine Stop Co.
 New York—Charles G. Rally, General Line Co.
 Sandusky, O.—B. K. Mickey, James Partridge, Sandusky, Carleton Co.
 Pittsburgh, Pa.—Calvert Townley, Westinghouse Elec. & Mfg. Co.
 Pittsburgh, Pa.—Arthur Hartwell, Westinghouse Elec. & Mfg. Co.
 New York—Henry W. Blake, W. K. Beard, Street Railway Journal.

REPRESENTATIVES OF NON-MEMBERS.

Amsterdam, N. Y.—T. S. Williams, T. S. Williams, T. S. Williams & Co.
 Brooklyn, N. Y.—Edward Taylor.

Branford, Conn.—W. G. Bushnell, Branford L. & W. Co.
 Grand Rapids, Mich.—W. K. Morley, Roland G. Morley, Grand Rapids, Grand Haven & M. Ry.
 Gloversville, N. Y.—J. N. Shannahan, F. A. Bogg, Fonda, Johnstown & Gloversville R. R. Co.; A. B. Ryan, Mountain Lake Co.
 Hempstead, N. Y.—Charles G. Mather, N. Y. & Long Island Traction Co.
 Levis, Quebec—G. U. G. Holman, Levis County Ry. Co.
 Manchester, Conn.—J. A. Spalding, Hartford, Manchester & Rockville Tram Co.
 Moline, Ill.—John Balch Blood, Moline, E. Moline & Watertown Co.
 Natick, Mass.—F. P. Quackenbush, Natick & Cohituate St. Ry. Co.
 New Orleans, La.—C. V. Cosby, New Orleans Ry. Co.
 Northampton, Mass.—E. M. Damon, Northampton & Amherst Co., and W. F. Carty and H. M. Chaffee.
 Paris, France—Duncan MacDonald, East Parisian Co.
 Quincy, Mass.—James P. Parker, Old Colony St. Ry. Co.; William H. Mullane, Quincy & Boston St. Ry. Co.
 Spokane, Wash.—A. L. White, Spokane Traction Co.; A. L. White, Coeur d'Alene & Spokane Elec. Co.
 Schenectady, N. Y.—D. J. McLane, Schenectady Ry. Co.
 Staffordshire Potteries, England—George C. Kent, Potteries Elec. Traction Co. Ltd.
 Troy, N. Y.—A. Fairweather, Powers & Turner Truck Co.
 Winnipeg, Manitoba—W. Phillips, Winnipeg St. Ry. Co.; R. R. Knox, Winnipeg Elec. Ry. Co.

MISCELLANEOUS.

Aspinwall, L. M., Westinghouse Elec. & Mfg. Co., Pittsburg, Pa.
 Anderson, P. T., General Elec. Co., Schenectady, N. Y.
 Anthony, Wm. M., formerly, New Haven Car Register Co., New Haven, Conn.
 Allan, J. B., Allis-Chalmers Co., Chicago, Ill.
 Andrews, Wm. C., E. P. Roberts & Co., Cleveland, O.
 Bucher, J. G., Columbia Mechanical Works, Brooklyn, N. Y.
 Bove, F. C., formerly of New Haven Car Register Co., New Haven, Conn.
 Bony, C. E., General Elec. Co., Schenectady, N. Y.
 Bemis, S. A., Bemis Car Truck Co., Springfield, Mass.
 Bartholomew, Wm. S., Adams & Westlake Co., Philadelphia, Pa.
 Bradley, John, The New Haven Car Register Co., New Haven, Conn.
 Barley, F. A., American Brake Shoe & Foundry Co., Boston, Mass.
 Braden, N. S., Westinghouse Elec. & Mfg. Co., Cleveland, O.
 Brown, G. W., W. A. Wood Co., Boston, Mass.
 Brady, Paul T., Westinghouse Elec. & Mfg. Co., Syracuse, N. Y.
 Brislin, A. J., Westinghouse Traction Brake Co., N. Y.
 Baker, Geo. E., Westinghouse Traction Brake Co., N. Y.
 H. D. Bayne, Montreal, Can.
 Bragg, C. A., Westinghouse Elec. & Mfg. Co., Philadelphia, Pa.
 Brown, R. S., Westinghouse Elec. & Mfg. Co., Boston, Mass.
 Campazze, J. G., Curtains Supply Co., Chicago, Ill.
 Callman, Jos. F., Jr., Universal Brake, New York.
 Cruise, J. L., Westinghouse Elec. & Mfg. Co., New York.
 Corey, F. B., General Elec. Co., Schenectady, N. Y.
 Clark, I. B., Westinghouse Traction Brake Co., Cincinnati, O.
 Chaplin, Edward H., Rochester Car Wheel Works, Rochester, N. Y.
 Condit, S. B., Jr., S. B. Condit, Jr. & Co., Boston, Mass.
 Clark, S. F., W. E. Baker, New York.
 Dryer, Edwin, Westinghouse Elec. & Mfg. Co., Chicago, Ill.
 Donaldson, Wm. W., Gould Storage Battery Co., New York.
 Davis, H. P., Westinghouse Elec. & Mfg. Co., Pittsburg, Pa.
 Dawson, E. H., Westinghouse Traction Brake Co., Pittsburg, Pa.
 Drake, L. E., Westinghouse Elec. & Mfg. Co., New York.
 Diamond, John B., The Barney Trolley Catcher, Rochester, N. Y.
 Dehart, W. S., Bemis Car Truck Co., Springfield, Mass.
 Daniels, H. A., Sterling Elec. Mfg. Co., New York.
 Demuth, Gold Car Heating Co., New York.
 Elliott, Jon. R., Westinghouse Traction Brake Co., New York.
 Elliott, C. R., Westinghouse Traction Brake Co., New York.
 Estep, A. F., R. D. Nuttall Co., Pittsburg, Pa.
 Elets, A. P., Westinghouse Elec. & Mfg. Co., Pittsburg, Pa.
 Ellis, Frank H., Barbour-Stockwell Co., Cambridge, Mass.
 French, T. C., Westinghouse Elec. & Mfg. Co., Buffalo, N. Y.
 Flemming, A. E., Nernst Lamp Co., Chicago, Ill.
 Ford, D. R., Chicago Varnish Co., New York.
 Franklin, Wallace, Union Trust Bldg., Detroit, Mich.
 Field, Arthur W., Peckham Mfg. Co., Boston, Mass.
 Francis, Francis, Sterling Elec. Mfg. Co., New York.
 Green, F. V., Westinghouse Traction Brake Co., New York.
 Gordon, J. R., Westinghouse Elec. & Mfg. Co., Atlanta, Ga.
 Gaylord, T. P., Westinghouse Elec. & Mfg. Co., Chicago, Ill.
 Gray, E. W. T., Westinghouse Elec. & Mfg. Co., New York.
 Gregg, E. E., Pittsburg, Pa.
 Herr, E. M., Westinghouse Traction Brake Co., Pittsburg, Pa.
 Hagar, G. A., Westinghouse Traction Brake Co., Chicago, Ill.
 Hurtwell, Arthur, Westinghouse Elec. & Mfg. Co., Pittsburg, Pa.
 Hayden, C. A., Wendell & Macdullie, New York.
 Macdullie, R. L., Wendell & Macdullie, New York.
 Hoadley, Geo. M., Bemis Car Truck Co., New York.
 Hagar, A. P., Continuous Rail Joint Co., Newark, N. J.
 Ingersoll, J. B., Westinghouse Elec. & Mfg. Co., Pittsburg, Pa.
 Ingersoll, Fred., Pittsburg, Pa.
 Johnson, Charles F., Charles F. Johnson, Buffalo, N. Y.
 Jones, A. P., G. E. Co., Schenectady, N. Y.
 Keely, W. W., Walter McLeod Co., Cincinnati, O.
 Kidder, S. J., Westinghouse Air Brake Co., St. Louis, Mo.
 Kolsteth, H. S., Westinghouse Air Brake Co., Boston, Mass.
 Kellener, C. W., Ohmer Fare Register Co., Dayton, O.
 Keyes, F. A., American Steel & Wire Co., New York.
 Kirkhilde, G. B., Standard Auto L. Co., Philadelphia, Pa.
 Keefer, D. H., Keefer Car Switch Co., Albany, N. Y.
 Latch, E. B., H. W. Johns-Manville Co., New York.
 Lovell, W. W., Westinghouse Elec. & Mfg. Co., Cleveland, O.
 Laurie, Abrah. K., The Pittsburg Reduction Co., Pittsburg, Pa.
 Myler, P. J., Westinghouse Traction Brake Co., Hamilton, Can.
 Miller, J. F., Westinghouse Traction Brake Co., Pittsburg, Pa.
 Manson, D. E., Westinghouse Elec. & Mfg. Co., Boston, Mass.
 Merrill, M. M., Westinghouse Elec. & Mfg. Co., Boston, Mass.
 Mills, E. D., Westinghouse Elec. & Mfg. Co., Boston, Mass.
 Mithell, Geo. H., Westinghouse Traction Brake Co., Boston, Mass.
 Machoskie, Geo., General Elec. Co., Schenectady, N. Y.
 Medall, David, American Car Seat Co., Brooklyn, N. Y.
 Morse, J. J., St. Louis Car Wheel Co., St. Louis, Mo.
 McFarland, W. M., Westinghouse Elec. & Mfg. Co., Pittsburg, Pa.
 Nudbury, C. E., Westinghouse Elec. & Mfg. Co., Detroit, Mich.
 Newton, A. D., H. W. Johns-Manville Co., New York.
 Nell, W. A., Forest City Elec. Co., Cleveland, O.
 Palmer, F. B. H., Westinghouse Elec. & Mfg. Co., New York.
 Probusco, W. M., Westinghouse Co., New York.
 Pufner, Geo. W., Westinghouse Elec. & Mfg. Co., Syracuse, N. Y.
 Peckham, E., Peckham Mfg. Co., New York.
 Pappenhagen, P. Alfred, Green Engineering Co., Chicago, Ill.
 Parsons, C. R., The Penn. Steel Co., Boston, Mass.
 Rugg, W. S., Westinghouse Elec. & Mfg. Co., New York.
 Ray, Wm. D., Westinghouse Traction Brake Co., Cleveland, O.
 Regier, C. W., Westinghouse Elec. & Mfg. Co., Chicago, Ill.
 Storer, S. B., Westinghouse Elec. & Mfg. Co., Syracuse, N. Y.
 Storer, N. W., Westinghouse Elec. & Mfg. Co., Pittsburg, Pa.
 Spies, Chas. F., D. Van Nostrand Co., New York.

Sheldon, H. W., The Standard Steel
Wagon Co., Philadelphia, Pa.
Stewart, H., Stuart-Howland Co., Boston,
Mass.
Stewart, J. A. West, Sterling Macker Co.,
New York, N. Y.
Sydney, E. H., The T. H. Syndington
Co., Baltimore, Md.
Sydney, E. H., The T. H. Syndington
Co., Baltimore, Md.
Sisk, Rodney, Railroad Gazette, New York
Sydney, E. H., Railroad Gazette, New
York.
Sylvester, G., Philadelphia Elec. Co., Phila-
delphia, Pa.
Stewart, John A., John A. Stewart Elec.
Co., Cincinnati, O.
Sawyer, W. H., General Elec. Co., Sche-
nectady, N. Y.
Scott, P. H., Vase Spring Co., New York
Franklin, H. W., Westinghouse Co., New
York.
Forbes, G. M., Expert Engineer, R. R.
Commission, Mass.

Townley, Calvert, Westinghouse Elec. &
Mfg. Co., New York.
Lyons, F. E., Whiting Foundry Equipment
Co., New York.
Parker, E. W., Albee Chairmen Co., Chi-
cago, Ill.
Taylor, T., Taylor, Tummeliff & Co., Stan-
ford, England.
Chapman, Jos. F., Universal Brake, New
York.
Lyndell, Wendell & Macdiffe, New York
Van Duesse, A., Albee Chairmen Co., New
York.
Wheldon, Louis B., formerly New Haven
Car Register Co., Boston, Mass.
Wilson, W. W., Peckham Mfg. Co., New
York.
Woodworth, A. C., The Consolidated Car
Lender Co., New York.
Whitney, S. R., Imperial Machine Co.,
Pittsburg, Pa.
Westinghouse, H. H., Westinghouse Traction
Brake Co., New York.

LADIES.

Mrs. J. Millar, Buffalo, N. Y.
Mrs. W. J. Hooper, Little Rock, Ark.
Mrs. Frank G. Jones, Memphis, Tenn.
Mrs. R. E. Bingham, New York.
Mrs. F. R. Slater, New York.
Mrs. John Begley, Onondaga, N. Y.
Mrs. G. N. G. Holman, Quebec, Canada.
Mrs. E. G. Connette, Syracuse, N. Y.
Mrs. Wm. B. Bartholomew, New York.
Mrs. John E. Dugmont, Rochester, N. Y.
Mrs. G. L. G. Holman, Levis, P. Q.,
Canada.
Mrs. G. B. Kiehlidde, Philadelphia, Pa.
Mrs. D. Medall, Brooklyn, N. Y.
Mrs. J. J. Meuse, St. Louis, Mo.
Miss Margarette Fausson, Boston, Mass.
Mrs. E. A. Simmons, New York.
Mrs. W. H. Saward, Schenectady, N. Y.
Mrs. J. A. Spalding, Manchester, Ct.
Mrs. J. S. Shannahan, Gloversville,
N. Y.
Mrs. T. S. Williams, Amsterdam, N. Y.

HEYWOOD BROS. & WAKEFIELD CO.

The Heywood Bros. & Wakefield Co., of Wakefield, Mass., and New York city, shows seats of the well-known Wheeler pattern in various styles of upholstery. Its high back seat, with head rest, pedestal base, shifting foot rest, mahogany arm, bronze grab handle will meet admirably the demand for a comfortable handsome seat for long distance interurban roads. This is designed to withstand the hard usage seats are subject to, and it can be attached to the side of the car thereby utilizing every inch of space for seating and giving a wider aisle.

This company is said to be the largest maker of car seat webbing in the world. It uses only hard enamel finish rattan for this purpose.

The company is represented by Bertram Berry of 129 Charlton St., New York city, and F. H. Henry, of the Wakefield office.



GLOBE TICKET CO.

The Globe Ticket Co. is showing samples of tickets and transfers, including the new Ham patent transfer. The company is distributing a cigar cutter as a souvenir. W. C. Pope, D. C. Griffiths, P. C. Snow, and H. N. Brown are attending.



GOLD CAR HEATERS.

The Gold Car Heating Co. has a full line of its latest improved electric heaters. Especial attention is called to a large bank of heaters, arranged to show the method of regulating. The exhibit is in charge of E. E. Gold, J. E. Ward, W. H. Stocks, and Frank Cahill, chief engineer.



CURTAIN SUPPLY CO.

One of the most artistically arranged booths at the convention is the exhibit of the Curtain Supply Co., which is located in a conspicuous corner of the main veranda. The company is showing samples of the Forsyth and Burrowes roller tip type of curtain fixtures. Attention is drawn to an improved type of fixture which permits adjusting the curtain fixture to meet any variation in the window opening without taking the curtain from the grooves. A locking device prevents any increase or decrease in the tension on the spring in the fixture. This new type is known as the Forsyth fixture No. 86. W. H. Forsyth, B. S. McClellan, and A. L. Whipple are in attendance for the company.



FIRE PROOF WOOD.

The American Wood Fire-Proofing Co., Ltd., of 156 Fifth Ave., New York City, is circulating a reprint from an article which appeared in the New York Times dealing with the subject of fireproofed wood for electric railway cars, the article having been prompted by the recent disaster in the Paris subway. The company draws attention to the fact that if the wood used in the making of the Paris cars had been treated by the fireproofing process of the American Wood Fire-Proofing Co., the conflagration would not have occurred.



MAGNETIC ADHESION.

Considerable interest is being shown in the exhibit provided by the Magnetic Equipment Co., of Chicago, it being in

the nature of a miniature car weighing 210 lb., which glides up and down a track with 45 per cent incline, now and then stopping as if the brakes had been applied. The whole forms a demonstration of magnetic adhesion, which is attracting the attention of railroad men everywhere. The idea is to virtually substitute magnetism for dead weight in procuring increased adhesion to the rail, and the model exhibited is said to show at the drawbar an increased pull of 300 per cent with the device operated. It requires less than one-half of one per cent of the motor current, which is taken directly from the trolley, to energize the magnetic field. It is figured that, in increasing the adhesion 300 per cent it also increases the possibility of producing 300 per cent more friction between the brake shoe and wheel without locking the wheel, thereby placing a car equipped with the device in a position to arrest its own momentum in one-third of the distance that would be required without it. The device is also designed to dispense with the use of sand on the rail.

The Magnetic Equipment Co. equipped a 40-ton Baldwin locomotive with the device about a month ago and the locomotive has since been in constant service on the Chicago, Milwaukee & St. Paul road in Milwaukee ever since. With the device the drawbar pull of the locomotive was increased 30 per cent, it is stated. The company has several letters from engineers and others connected with the C., M. & P., highly recommending the device. The company is also equipping a 200-h. p. electric motor car for demonstration purposes and will take the car from city to city to fully demonstrate its device to street railway companies. Representatives of the Magnetic Equipment Co. who are here are C. A. Ballard, treasurer; B. H. Honey, secretary; W. T. Davidson, general agent, and W. B. Frazier, chief engineer.



STANLEY ELECTRIC MANUFACTURING CO.

The Stanley Electric Manufacturing Co.'s exhibit comprises the following: Two 48-h. p., type 402 motors mounted on a Wason truck and operated by a series parallel four-motor controller; one 38-h. p., type 401 motor, opened for inspection; a switchboard mounted with circuit breaker, voltmeter, ammeter and indicator wattmeter; a street car circuit breaker adapted to care for four motors, and an additional four-motor controller for inspection. All of these devices are known as parts of the S. K. C. system. The company's standard trolley base is also shown. The Stanley company is represented by S. T. Dodd, M. C. Canfield, F. W. Garrett and W. R. Hamlen, of Pittsfield, Mass., and H. R. Wilson, of Chicago.



The Stuart-Howland Co. reports that it has sold practically the entire line of electric railway material which comprised its exhibit at the convention, and in addition took orders for considerable additional material on the strength of the character of goods shown.



W. C. Andrews is representing E. P. Roberts & Co., of Cleveland.



The National Carbon Co. has samples of its carbon products.

CLIMAX STOCK GUARD.

The Climax Fence Post Co., of Chicago, shows sections of the Climax stock guard as placed upon the truck, and also exhibits the fence posts made by this company. These products are too well known to require extended mention. H. E. Overstreet, general manager, superintends the exhibit and has the assistance of his son, Harry Overstreet.

**BENJAMIN ELECTRIC MFG. CO.**

This company's exhibit consists of wireless clusters for electric lights and other electrical specialties. One of the clusters shown is a two-light cluster such as the Interborough Rapid Transit Co. has ordered for its subway cars. Wherever series lights are used these clusters are said to be desirable. Another feature of the exhibit is a socket for two incandescent lamps for use at the ends of cars to illuminate the overhead signs. There is also shown an "all-weather" socket with an aluminum casing in one piece. The exhibit is in charge of Basil G. Kodjbanoff, manager of the eastern and export departments, New York City.

**AMERICAN CAR WHEELS.**

The American Car & Foundry Co., of Chicago, is exhibiting its solid rolled steel car wheel under direction of H. W. Fowler, manager, and Scott Bluett, of the St. Louis sales department. The exhibit is under the auspices of the steel wheel department, none of the other products of the company being shown.

**ECONOMY LUBRICATOR.**

The Railway Journal Lubricating Co., of Chicago and Milwaukee, which has placed upon the market the "Economy" lubricator and dust guard, which was described in the "Review" for August, has received many inquiries during the convention and the company's representatives report a most encouraging outlook. This exhibit, which is in the Peckham Manufacturing Co.'s booth, is in charge of Burton R. Stare, vice-president and general manager, and William H. Stare, superintendent of the company.

**A. & J. M. ANDERSON MFG. CO.**

The Albert & J. M. Anderson Manufacturing Co., of Boston, enhances the interest in its exhibit by contrasting the old with the new. One side of its booth is given over to the earliest types of overhead material, comprising section insulators, trolley wheels, metal globe strains, ears, etc., while the rest of the booth is devoted to the display of up-to-date devices, including a Brooklyn insulator designed for holding up 2,000,000 c. m. cables. Several types of third-rail insulators are shown, also including a new reconstructed granite insulator. The New York Edison Co. recently placed an order with the Anderson company for a shipment of switches aggregating 50 tons of copper. This is believed to be the largest switch order ever placed. Ernest Woltmann, of New York, J. R. Eckman, of Boston, and H. F. Canville, of Philadelphia, represent the Anderson company at the convention.

**PECKHAM MANUFACTURING CO.**

The Peckham exhibit this year includes three M. C. B. trucks and the 14 B 3 X short wheel base trucks. These are all fitted with the Taylor non-clattering brake shoe trough. The Peckham representatives are Edgar Peckham, W. M. Wampler, J. A. Hanna, E. C. Long, Mr. Richards, and W. L. Boyer. The company is asking visitors to register and a novel souvenir will be mailed to all who leave their names.

**PETER SMITH HEATERS.**

The Peter Smith Heater Co., of Detroit, is showing its hot water coil heaters, Nos. 1 and 2, designed for electric railway cars, these heaters being similar to those which have been adopted on many lines throughout the country. Heater No. 1 will heat the largest car in the coldest weather to a temperature of 60 degrees with a coal consumption not to exceed 100 lbs. in 24 hours, it is stated, while No. 2 is intended for interurban cars.

The consumption of fuel for the No. 2 heater is placed at 75 lbs. every 24 hours. Peter Smith is in charge of the exhibit and is assisted by his son, Elmer J. Smith, secretary and treasurer of the company.

**RAILWAY APPLIANCES COMPANY.**

The Railway Appliances Co., of Chicago and New York, has a novel exhibition booth representing an end section of an electric car one of the features of which are the Q and C Standard steel car steps with which it is equipped. These steps have patent metal strip threads and each strip is stamped on the portion touching the adjacent strip, so that, when assembled, the strips are interlocked, making any movement impossible. The frames are made of rolled steel of a special section and rods pass through the frames and strips firmly tying them together. Other devices shown at this exhibit include Q and C rail drills and other pneumatic tools, Ajax diaphragms for vestibules and the Symington journal box and dust guard.

**GOULD STORAGE BATTERY CO.**

The Gould Storage Battery Co., of New York, exhibits photographs of storage battery installations and samples of plates used in the batteries. There are many callers at the booth, where they are cordially received by Henry B. Oakman and W. W. Davidson, of New York, and E. L. Draffen, of the Chicago branch.



George E. Morgan, of Philadelphia, is in charge of Merritt & Co.'s exhibit, which comprises several of its well-known steel lockers.

**PNEUMATIC TOOL EXHIBIT.**

What is believed to be the first exhibit of the kind ever made at a street railway convention is that of the Chicago Pneumatic Tool Co. A large part of this company's exhibit miscarried in transit, but a sufficient number of sample tools were secured from the New York office to afford an interesting demonstration of riveting and chipping hammers and drills, and it is expected that today tamping machines for concrete will be in operation. Hydro-pneumatic pressers for commutators, wheels, armatures, pinions, etc., are shown, as well as wood-boring machines for car work. The exhibit is in charge of Thomas Aldecorn, of New York, general sales agent. It is worth inspection.

**BEMIS CAR TRUCKS.**

The Bemis Car Truck Co., of New York, shows four types of trucks—the Bemis standard single truck, Bemis No. 45 double truck, Bemis No. 47 double truck, and M. C. B. No. 51 standard double truck. The Bemis journal boxes are pointed out as being positively dust proof and oil tight, while the brasses are warranted for years. The No. 51 truck shown has a device to regulate the lateral motion by simply turning a nut. The car is carried independently of the truck frame, so as to avoid jar from the truck frame or undue motion from the action of the motor. Springs over the journal boxes carry the truck, brake mechanism and a portion of the motors. The swing bolster drops below the transom bolster to prevent forward and backward motions by the brake action. The transom bolster, with chafing blocks attached, is fitted closely into the frame of the truck making a rocking motion less liable to occur than is ordinarily the case.

The No. 47 truck has all the features of the No. 51, with the exception that the half elliptical springs rest on the yoke which carries also the car, truck, motors, etc. Bemis journal boxes can be used with the No. 51 truck as well as the M. C. B. boxes. The Bemis company is represented by S. A. Bemis, general manager, who is also the inventor and builder; W. S. De Hart, secretary and treasurer, and George W. Hoadley.



The Hipwood-Barrett Car Fender Co., of Lakeport, N. H., is showing its fender set up. The representatives in attendance are George Hipwood, the inventor, J. W. Barrett and Henry S. Jenkins, of Boston, and Archibald B. Dalby, of the New York office.

HIGH VOLTAGE TESTS.

One of the principal centers of attraction at this year's exhibit has proved to be the combined exhibits of the Archbold-Brady Co. and the Locke Insulator Manufacturing Co. A great many visitors to the testing plant in operation in the building adjacent to the booth occupied by these companies have been interested, instructed and entertained by the high tension tests which are given at frequent intervals and which form a very brilliant display, especially in the evening. Primarily the 500 volt current of the local street railway line is employed to run the motor, dynamo and transformer used in the tests, which are made at from 50,000 to 125,000 volts, the ratio of the transformer being as 1,500 to 1. The transformer has a capacity of 175,000 volts and was made by Prof. Harold B. Smith, of the Worcester Polytechnic Institute. The practice followed in testing the Locke insulators is precisely the same manner as applied in the factory, where the tests are ordinarily made at 100,000 volts, some times running as high as 150,000 volts. As the fluid arcs and plays about the large insulators, all the time snapping vigorously, the display is one that would delight a Tesla. Locke Insulators are employed by a great many electric railway companies, both in this country and abroad.

High voltage tests are also made by the Archbold-Brady Co., which are extremely interesting. This company also exhibits photographs of the high tension lines of the Utica & Mohawk Valley Railway Co., which it constructed. Views are also shown of the Atlas Works of the Standard Oil Co., which this engineering company also built. The same company is building a new factory for the Railway Steel Spring Co., of Oswego, doing both the fabricating and erecting. This factory will be 336x214 ft., steel construction.

The gentlemen representing the companies concerned in this exhibit are Fred M. Locke, of Victor, N. Y., William K. Archbold, Paul T. Brady, M. A. Dunne and J. R. McIntyre. Walter Goddard, of the Worcester Polytechnic Institute, is in charge of the transformer and high voltage tests.

**NATIONAL TICKET CO.**

The National Ticket Co., of Cleveland, is represented by C. F. Bates, its secretary and treasurer, who has received many callers and made many new acquaintances. To each he presented a souvenir of bisque ware. The company exhibits a new form of commutation ticket, and a new patent cash fare receipt is also shown.

**ADAMS & WESLAKE CO.**

The Adams & Westlake Co. is exhibiting arc headlights, signal lamps and lanterns, together with its well-known brake handles. In the evening the arc headlights illumine the courtyard in front of the booth and attract considerable attention. The company is represented by William J. Pierson, of Chicago; James A. Foster, of Philadelphia, and E. H. Stearns, of the New York office.

**TROLLEY SUPPLY CO.**

Robert K. Fast, secretary and treasurer of the Trolley Supply Co., is convinced that this has been a fine convention, for he has been kept busy showing the Knutson trolley retriever which not merely catches the trolley when the wheel leaves the wire, but actually retrieves it. This device is in use on numerous high speed interurban lines throughout the country.

**UNIVERSAL BRAKE CO.**

The Universal Car Brake Co., of Lancaster, Pa., has an interesting exhibit which has received considerable merited attention. It shows its "Universal" car brake for which it is claimed that its use will prevent many accidents and also avoid the flattening of car wheels. It is a combined rail and wheel brake. The "Universal" sander and the "Universal" brake shoe are also exhibited. The sander is worked by a pedal and the sand is carried in pockets on a depositing wheel. The brake shoe is made in three parts, a plate, holder and the shoe itself. The shoe can be removed from the holder by simply turning

two nuts on the slide, and it is stated that 30 shoes can be removed in five minutes. The company is represented by Joseph Cullinan, president; John F. Brunner, vice-president; W. M. Deal, master mechanic; I. Levi and Richard Brimmer.

**INGERSOLL LAUGHING GALLERY.**

Without question the booth which is daily receiving the most numerous visitors is that of the Ingersoll Construction Co., of Pittsburg, which has installed as its exhibit a laughing gallery, which is a mecca for young and old. It can be easily located by the laughter heard coming from that particular booth. In it are 10 of the company's best laughing gallery mirrors, which provide the most ludicrously grotesque reflections imaginable, so that the viewer spontaneously laughs in spite of himself. The Ingersoll company makes 26 different mirrors, all handsomely framed. The company is also showing a model of its Fig. 8 roller coaster, such as is installed in a great many street railway parks. The president of the company, Fred Ingersoll, says that parks make street railways and the Ingersoll products help to make the parks. Mr. Ingersoll is aided in caring for the crowds of visitors by E. E. Gregg, the secretary and treasurer, and L. W. Hyde, travelling representative. They distribute a very pretty souvenir.

**RECORDING FARE REGISTER.**

The Recording Fare Register Co., of New Haven, Conn., is showing its recording fare register, trolley wheels, trolley cords, register rods and fixtures, bell cords, punches, conductors' caps and sundry electric railway supplies. The features of the exhibit, however, are the recording fare registers and the trolley wheels. The register contains a removable cylinder upon which is firmly fixed a slip of paper and each time the register is set to zero the number of fares collected on the trip is embossed on this slip, and also the number of the register. By means of carbon duplicate or triplicate records may be made. The use of this register makes it possible to do away with the conductors' trip sheet. It is stated, and the itemized record permits the conductors' daily report to be checked in detail.

The trolley wheel shown is well and favorably known as the "New Haven" trolley wheel, for which this company is sole agent. This wheel has a bearing, not a bushing, and is stated to require no oil. The Recording Fare Register Co. is represented here by M. De Forest Yates, president; J. M. Hayes, assistant secretary, and Charles W. Yates.

**SPRAGUE ROTARY SANDER.**

The Sprague Car Appliance Co. is showing the Sprague rotary sander at the United States Electric Signal Co.'s booth. This sander is chiefly a rotating cylinder, 20 in. long and 9 in. in diameter, mounted on the car flow and discharges the sand at one end through buckets. It is operated by a pedal and it is claimed that all friction is practically overcome and caking is obviated. J. J. Ruddick is showing it to interested callers.

**NEW AUTOMATIC SWITCH.**

The American Automatic Switch Co., of New York, is showing a new automatic switch, which has been invented by R. V. Collins, the vice-president. The operating mechanism consist of a magnet and a reversing plate. Gravity and magnetism are the forces employed. The magnet is employed to throw the switch one way and the plunger within the magnet falls of its own weight when released and throws the switch back. The mechanism is encased in a tight box and the reversing plate is immersed in zero oil to keep it in condition and to prevent freezing. J. R. Shanley is president of the company, and Mr. Collins and J. H. Pennock are representing the company at the convention.



Rossiter, MacGovern & Co., of New York, exhibit street railway motors, controllers, lamps and commutators. A feature is a 500-kw. commutator made for the Brooklyn Rapid Transit Co. Frank MacGovern, R. J. Randolph, Jr., Charles McDonald and George R. Davis, of the New York office, and J. A. Peirce, of St. Louis, are in attendance.

CAR MAINTENANCE RECORDS.

By S. C. Stivers, Lately Auditor Jersey City, Hoboken & Patterson Street Ry., Hoboken, N. J.

Read before the American Street Railway Accountants' Association, Sept. 3, 1903.

In taking up this subject, the writer has confined himself to a description of a system of repair shop accounting adaptable to small street railway systems where the facilities for office work are somewhat limited and where it is necessary to have as good results as some of the larger systems.

As some of the more important reasons for keeping repair shop accounts are to enable the cost of maintaining individual cars, trucks and electrical apparatus, to be known in a manner that comparison of equipments may be made and an economical basis of maintenance be followed, to see whether the improvements in



S. C. STIVERS.

equipments from time to time are giving the results expected and to see that the labor employed on the different classes of work is being performed in an economical as well as satisfactory manner, the accounting resolves itself primarily into a

miscellaneous body, brakes, journals, wheels, miscellaneous trucks, controller, armature and fields, bearings, trolleys, gears and pinions, miscellaneous electrical which are numbered from 1 to 14 respectively.

The car record, which as mentioned, shows the amounts expended for both labor and material on the different classes of repairs which may be done on each car complete is operated in the following manner. When a car is received at the repair shop for repairs, it undergoes a thorough inspection, of which a report, showing the necessary work to be done, is made. An order bearing the car number as an order number is issued to the shop and time cards are issued to the men employed on the repairs. These time cards are printed to show the date, name of employe, total hours worked, car number and is subdivided into 14 spaces, each space being for one of the classes of repairs. These cards also have columns which allow the number of hours spent on each class of work to be inserted opposite the respective class. The foreman of each department enters the time worked on each class of repairs in the proper space on each employe's time card and forwards them to the shop clerk who enters this time in his time book. A summary is then made, of the items on the cards, which shows the amount spent for each class of work for each car. This is then entered on a daily report of repairs to all cars for that day. From this last report entry is made of each car in the car record in which a page is provided for each car and is ruled in lines for the date and a column for each class of repairs as enumerated above.

The material for the repairs is drawn from the storeroom upon an order issued by the foreman of each department. These orders show the material desired, car and order number, class number of repairs, and are entered by the storekeeper in a record book showing material delivered, price, class number and car number. The amount chargeable to each class of repairs for each car is daily abstracted from these books and entered on a report similar to the daily car report of labor mentioned above; entry is made from this report to the individual car record in the same manner as for labor. It is therefore evident by this means that a complete and detailed record of any repairs to each

STORE ROOM RECORD OF MATERIAL ISSUED (Size of original, 20½ x 15 in.)

record which shows the amount expended for labor and material upon the different classes of repairs upon individual cars, trucks and electrical apparatus and secondarily into an individual record of the more costly items of repairs such as armatures, wheels and bearings.

The system of accounting in mind provides for these objects

car is kept and by referring to the proper page and column to know at once the cost of any particular class of repairs on any car.

The armature record is important as a record of one of the more costly class of repairs and it not only shows by the time the armature was in service whether the material used was up

JERSEY CITY, HOBOKEN & PATTERSON STREET RAILWAY COMPANY.

INDIVIDUAL CAR RECORD (Size of original, 21 x 15 in.)

In having: First, an individual car record which shows the cost of all repairs both labor and material, on any one car for any period or mileage. Second, an armature record. Third, a wheel record. Fourth, a bearing record.

The repairs are classified in 14 classes, viz., paint, glass, fender,

to the standard but also acts as a check on the armature winder. This record consists of a properly ruled sheet with columns having the following headings: Date Out, Armature Number, Car Out, End Out, Cause Repairs, Winder, Last Repairs, How Long in Service, Car In, End In, Date In, Remarks. When an

armature is removed from a car, the motor repairer makes an entry of it on the blackboard in the motor shop, stating car number, armature number, end number, and cause of removal. The foreman of the motor shop makes a report at the end of the day, using this blackboard as a basis and entry is made in record under the proper columns. The armatures are removed to the armature room, the repairs made and a report is made stating the nature of repairs and who worked on the same.

JERSEY CITY, HOBOKEN & PATERSON STREET RAILWAY COMPANY
CHECK ROLL TWO WEEKS ENDING

TIME BOOK PAGE (Size of original, 12 $\frac{1}{2}$ x 16 $\frac{1}{2}$ in.)

Entry is made from this report to the armature record. The report of installations is made in the same manner. Thus the master mechanic is able at any time by looking up the record of the work to tell the value of any man in the armature room.

All of the wheels purchased by the company in mind have an individual guarantee to make a certain mileage and it is therefore important that a record should be kept for the purpose of seeing that the guarantee is fulfilled. This record consists of a sheet having spaces for Wheel Number, Date In, Date Out, Cause

WHEEL AND BEARING RECORD (Original, 15 $\frac{1}{2}$ x 9 $\frac{1}{2}$ in.)

Out and Mileage and is operated in the following manner: A report is made to the office by the foreman of the motor shop on a blank which is printed to show the car number, date, wheels taken out and wheels put in. The heading of "Wheels Taken Out" is subdivided as follows: Numbers, Circumference, Axle Number, Make, End Number and Cause. Under the heading "Wheels Put In," the subdivisions, Numbers, Circumference, Axle Number, Make, End Number, likewise appear. Entry is made from this blank to the wheel record. The individual car mileage for the car under which the wheel was placed is pro-

ARMATURE RECORD (Size of original, 12 $\frac{1}{2}$ x 10 in.)

cured for the time that the wheel was in service and is entered in its proper column in the wheel record and if the mileage made is not up to that guaranteed the proper parties are notified and demand is made on the wheel company for replacement.

The armature bearing record is used principally for the purpose of keeping track of the bearings, and is very desirable, as it enables the master-mechanic to see if the bearing metal furnished is of the proper quality and makes the mileage desired. A report called the bearing slip is made by the foreman of the motor shop, giving the car number, date and motor from which bearing was removed and this report, with the mileage made by the bearing is entered in the bearing record. When a bearing is installed a report giving the car number, date and motor is made and entered accordingly.

In conclusion a few words about the time book may be of interest.

The book provides spaces for the date of the pay roll, employee's name and rate, also columns for the days of the week, total hours and for the distribution of the charges which are headed Maintenance of Body, Maintenance of Truck, Maintenance of Electrical Equipment, and Other than Cars. When

DAILY REPORT, LABOR AND MATERIAL ON CARS (Size of original, 10 x 13 $\frac{1}{2}$ in.)

a time card is received the number of hours worked is entered under the respective day and the number of hours chargeable to the different accounts, as above, are extended to the proper columns. At the end of the pay roll the totals of the charge columns should equal the total hours worked. By multiplying the total number of hours of each charge column by the rate the amount chargeable to each account is ascertained and entered accordingly on the distribution sheet which accompanies the pay roll to the auditor's office.

Form 35

Do not write on back of this card.

Check _____

DAILY TIME CARD.

Date _____

Name _____

Order _____

Hours _____ Cur _____

| CL | NATURE OF REPAIRS | HOURS | REMARKS |
|----|----------------------|-------|---------|
| 1 | Paint | | |
| 2 | Glass, | | |
| 3 | Fender, | | |
| 4 | Miscellaneous Body, | | |
| 5 | Brakes, | | |
| 6 | Journals, | | |
| 7 | Wheels, | | |
| 8 | Miscell. Truck, | | |
| 9 | Controllers, | | |
| 10 | Armatures & Fids, | | |
| 11 | Bearings, | | |
| 12 | Trolleys, | | |
| 13 | Gears & Pinions, | | |
| 14 | Miscell. Electrical, | | |
| | Accident, | | |
| | Other than Cars, | | |

(Size of original, 3 $\frac{3}{4}$ x 6 $\frac{1}{2}$ in.)

The total number of hours worked each day are entered on the pay roll, totaled and amount due set opposite the employee's name.

I might add, that where work, chargeable to other than maintenance account, is done that the same method described in the portion of this paper relating to the car record is used, with the exception that order numbers are given and an order number book is used instead of the car record.

The time is handled in the same as for maintenance and amounts chargeable to the different accounts are extended to the column headed, "Other than Cars," and the order number entered opposite the charge.

Among the advantages to be obtained by the use of this system described herewith is the economical office operation and the elasticity of the records.

One company, which has been using this system for some time with satisfactory results, operates upwards of four hundred cars and has repairs done at six of its car barns besides the repair shop with shop office force consisting of two clerks who in addition to keeping the accounts attend to the other office work connected with the shop including correspondence, making reports, etc., which are called for from time to time.

Form A.
J. C. H. and P. Railway Co.

Form A.
Jersey City, Hoboken & Paterson Street Ry. Co.

WHEEL SLIP.

Car No. _____ Date _____

WHEELS TAKEN OUT

No. _____ Circum. _____ Cause _____

BEARING SLIP.

Car No. _____ Date _____

MOTOR

| |
|---|
| 1 |
| 2 |
| 3 |
| 4 |

(Original, 38 x 5 in.)

(Original, 38 x 4 1/2 in.)

The equipment of the company using this system, might be increased within certain limits without increasing the expense of the office. It being necessary only to have pages enough in the record books to accommodate the additional car numbers, etc.

The card system might be substituted for the books by those preferring the same and would no doubt have its advantages in this case as it has generally in office work wherever practical.



SAFETY CAR STRAPS.

The accompanying cut illustrates the Myers Y formed safety car strap which has very recently been placed on the market. This strap, which marks a great advance upon the ordinary single style, is designed to prevent accidents to passengers when a car is going around curves or when it is suddenly stopped or started, as the strap does not slide along the strap rod like ordinary straps. With this form, the effect is the same as if the passenger were holding on to two straps.



Straps of this type do not tend to accumulate at some one point on the rods on account of car vibration, and they are never near enough to each other to enable a passenger to hold two in one hand. Experience has shown that accidents are more likely to occur at the ends of a car rather than at the center, and it is therefore advisable to place a number of straps at the extreme ends which can be done by attaching one end of each strap in side and the other outside the end rod supports. The strap

branches are each 6 in. long and are furnished with buckles and holes enabling each branch to be lengthened about 3 in. The length of the middle piece is about 11 1/2 in. For the convenience of the passenger who is obliged to stand the handle is padded with fine, soft leather, and medicated to prevent the secretion of germs.

Owing to the Y-shape of these straps, they will give double the life and strength of ordinary straps, because the tension is divided among the branches. On the ordinary strap the weight of a man is concentrated at one point; the strain on the bar, therefore, is maximum at that one point. By using this car strap the strain on the bar is distributed over 6 in., thereby reducing to a minimum the possibility of bar breakage.



Consolidated Car Heating Co. has sold to date 61,454 electric heaters for use in the City of Greater New York. More than three-fifths of this number were sold during the last two years.



L. C. CHASE & CO'S. EXHIBIT.

The exhibit of L. C. Chase & Co., of Boston, Mass., includes samples of Chase leather for car seats and car curtains, Chase plushes and the Chase curtain fixture. Chase leather is made in all leather grains and it is claimed for it that it is not only waterproof, but that it will not scratch, crack, peel or stain. The exhibit is in charge of Frank B. Hopewell, assisted by William Walden.



A new feature shown this year is a curtain fixture having a "push" bar instead of a "pinch" bar; that is the curtain is released by pressure with the thumb instead of by pinching two finger pieces. This is held to be the most natural way of handling a window curtain. The curtain rod engages the window



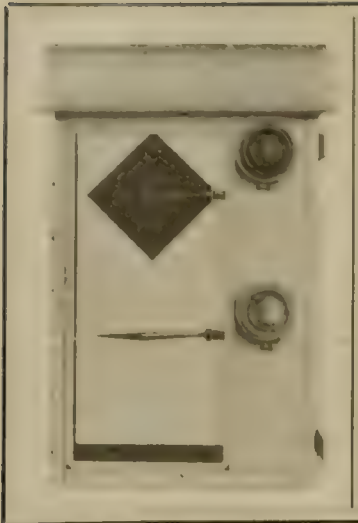
grooves at the sides of the grooves instead of at the ends of the rod, by means of a novel hinge device. The new fixture is claimed to give greater ease in handling the curtain; to prevent the rod from becoming disengaged from the side grooves; and to prevent binding.



R. M. Campbell and R. H. Harper were in attendance for the Western Electric Co.

Edwin H. Baker, of New York, viewed the exhibits with interest yesterday. He is associated with the Galena Signal Oil Co., and with S. T. Baker & Co.

The Bridgeport Brass Co., although it has no exhibit, is represented by Wylie Brown, of the New York office of the company.



The American Automatic Signal

GIVES ENTIRE SATISFACTION

It absolutely prevents head-on or rear-end collisions. When obeyed two cars cannot occupy any block or section of track at the same time. It will not permit the setting of a cautionary or permissive signal at rear end of block unless the danger signal at the end is set.

Incandescent lamps do not form a part of the main circuit, as they should not be the only visual indication of a signal, but should follow the movement of a semaphore blade, which will move each time the signal is operated, whether the lamps burn or not.

The setting and clearing circuits are closed automatically and when the signal has been set at danger it is locked and cannot be cleared until the car has passed through the block. It will work only one way when two cars enter the block from both ends at the same time. It will operate anywhere between 250 and 600 volts.

American Automatic Switch & Signal Co., 84-86 La Salle St., Chicago

THE ETERNAL FEMININE.

"Nice lookin' bunch o' clothes, ain't she?", said No. 89 as he gazed admiringly after his wife, who had just handed him his dinner bucket as his car passed their street.

"Very! Did she see you before she married you?"

"Oh! Go 'way! I ain't such a slouch when I'm washed an' fixed up! See me? Guess she did. Rode on my car close to a year 'fore we were married."

"Courtin' her on duty, eh? I'll bet a cigar it didn't cost her much for carfare!"

"There's where you lost a see-gar!"

"Did she always pay her fare?"

"Betcher life she did, she's that kind! When we got ter goin' reg'lar together I missed c'lectin' her fare onc't an' when she gets off she hands it to me an' says, says she, 'Mat, here's a nickel b'longs to th' company, guess you forgot it,' she says an' looks me straight 'n th' eyes an' you bet I c'lected a fare f'om her every time after that! Say, d'ye know what took me about that gell, first off?"

"Why, her looks, I suppose?"

"Looks nothin'—beggin' your pardon for puttin' it that way—I'm too old ter notice gell's looks unless they're rubbed into me! No, what took my eye was th' way she got on an' off th' car,—no waitin' on th' curb on'til th' car come to a dead stop an' then lookin' over it 's if she didn't like its looks or th' people in it an' wanted a c'e'tilikit about it before she got on! No waitin' 'ntil I asked her for her fare an' then takin' five minutes to hunt up her purse an' then handin' out a plugged nickel 'r a Canada quarter! No waitin' 'ntil th' car'd gone by her street an' then rusbin' out, gettin' off back'ards an' turnin' summer-sets 'n th' road—no sir. When th' car stopped she was right there to get on an' got on, had her change ready for me an' tol' me where she wanted to be let off an' was at th' door ready to get off when th' car stopped—an' it'd please you, sir, to see that girl get off, skirts an' bundles in 'er right hand, take hold 'er th' grab-handle with her left an' swing off light an' safe as you or me! Yes sir! 'Well, I says to myself when I see her do that, 'well,' I says, 'you'd be a good wife for some railroad man! You've got savvy,' says I, an' that sort o' started the matter'n my mind as to her bein' th' woman for me an' that's how't begun!—Schrady St.? We're past that Miss, two blocks back!" (Clang!)

"Why, I wanted to get off there, why didn't you call it out?" said a youthful voice from inside the car.

"I did, Miss."

"Well, you know I always get off there, why didn't you call it louder so as to make me hear it?"

"Do you want to get off here, Miss?"

"Oh, I don't know—wait a second!" and then there was a confused clatter of female voices in argument for a minute, while No. 89 stood with his hand on the bell-cord and a tired look in his eyes.

"Can't hold the car all day, Miss!" as an enquiring "Clang! Clang!" came from the motorman's gong.

"Oh, go on with your old car!" came ripping out from the group and 'two bells' started it with the result that an agonized voice shrieked out, "Oh I must get off—I really can't stay, girls," there was a swish of feminine draperies held up by the left hand, a reach for the back grab-handle with the right hand and before either No. 89 or I could move there was a very pretty bundle of clothes rolling ungracefully in the street while a chorus of shrill shrieks went up from inside the car. Of course we, No. 89 and I, the only men aboard—jumped off quickly but not before the bundle had erected and shaken itself and disclosed a very pretty and angry face. To the inquiries of No. 89 the face replied,

"Horrid thing! No, I'm not hurt but it's no thanks to you, I believe you did it on purpose! I've half a mind to have papa report you! No—I won't give you my name, it's humiliating enough to be thrown that way without having one's name in the paper about it! No, I'm all right girls,—no, don't get off, I'm not hurt the least bit! No, nothing came loose,—no thanks to this though!" and with a contemptuous motion of the head toward No. 89 as "this" she walked off and we got back on the car, No. 89 to be talked at by five indignant young women for several blocks.

"Horrid thing! He started the car just on purpose!" "I don't believe he called out the street at all, they never do and if they do you can't understand it!" "And poor Jessie might just as well have been killed, I'll bet her dress is just ruined!" "I'd sue him if it happened to me!" "Yes, it'd teach him something, starting the car that way when he knew she wanted to get off!" etc., etc., etc., while No. 89 only observed in a low voice to me,

"Now, wouldn't that jar you!"

After they had left the car, which they did with a very haughty and supercilious air towards poor No. 89, he turned to me with a comical expression on his face, held out a "witness-slip" and said,

"Would you mind signin' that sir, an' puttin' your address on it—matter o' form I guess, she'll never make no complaint to the comp'ny, she'll take it out on me, but she may tell about it to her feller an' if he's very soft on her he'll go an' raise h—I beg pardon sir—I mean he'll enter a complaint."

There was a ruminant silence for a minute and then he broke loose,—

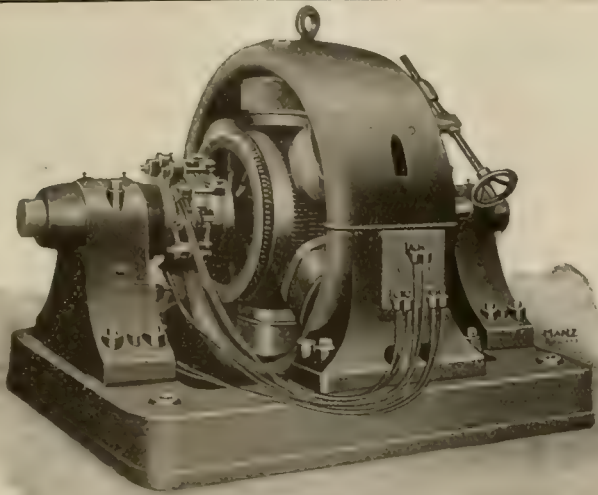
"Beats all, don't it, about women on cars. Three of 'em got on my car together th' other day, an' when I went t' c'lect their

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fares there was th' usual scrap as to who shouldn't pay. Well, they settled it 't last an' th' one as got stuck hands me out a Canada quarter an' says take out for three an' when I tells her that th' comp'ny won't take it except for twenty cents she gives me a long song an' dance about how they took 'em in her town an' was glad to get 'em. I wanted to say somphen — but I didn't — jus' told 'er as it'd come out o' my pocket if I took it for a quarter. Well, she growled an' made another dive inter' her pocket book an' fetched out a plugged dime an' a nickel so smooth it didn't have er mark er any sort on it! Then I wanted ter cuss — but I didn't — I explained as careful's I could that the comp'ny wouldn't stand fer coins like that an' I'd ha' to lose it. Well all this took time y'know cos she had ter argue about it an' there I stood waitin'. So she dives inter' 'er purse again an' rummages around an' then looks up at me an' snaps out 'Don't stand there watching me, we're not goin' to run away; attend to your duties an' I'll give you something in a minute that you and your comp'ny will take!' Then I sees her an' the other women emptyin' out their pocket books an' I knowed what was comin' an' sure 'nough she beckons me in an' puts fifteen pennies in my hand an' says 'Will you take those?' an' I wanted ter cuss worse'n ever — but I didn't. I only says 'yes'm,' an' then she says 'now we desire to see those fares rung up, we want to know that the comp'ny gets 'em!' Well, that broke my back, for you see when she'd give me the Canada quarter an' said 'take three out' I 'rung up three same as usual. Well, talk about bern' hot — I was sizzlin' by that time, everybody'd got onto the deal an' was snickerin' an' I knew I might talk to them women till night an' I'd never convince 'em I'd rung up their fares, so I jus' gritted my teeth an' says nothin' an' walks

out onto th' platform. Well, sir, you'd 'a thought that'd 'a ended it, wouldn't you? Not a bit of it! Next time I went back into th' car she calls to me 'Con-ductah!' I went over to her an' she says — very tony like an' mincin' out the words 's if it hurt'er to 'talk to me — 'I requested you' — just that way — 'I requested you to register those three fares I paid you,' says she, 'and I've failed to notice you do it,' she says. Well, that g'n me a chance an' I says, 'Yes'm, I notice you did, I rung 'em up when you fust gimme that quarter!' an' then all on'em says 'OH!!!' an' looked at one another an' held up their hands an' she says 'That will do sir, we will not discuss the matter but WE know that those fares have not been registered and we shall make it a point to see that your employers are informed of the fact an' of your ins'lence to your passengers!' an' they turned their backs on me 's if they was afraid I was goin' ter turn inter pillar o' salt like Ananias, an' they didn't want'er see it happen, — an' soon after they got off an' the Canada-quarter-woman she says as she passed me 'Honesty is the best policy,' she says. Well, even then I didn't cuss — fact is I'd got beyond it, my mouth was too dry! Well, next evenin' the ol' man (the superintendent you know) called me into th' office an' says 'Mat, what's this about your being ins'lent to ladies an' not ringin' up fares,' says he. 'I've got a complaint here,' says he, 'in four volumes,' he says, an' sure enough he had about twenty sheets of bluey paper all writ crossways an' sideways an' every-which-ways with writin' that looked like hen-tracks an' then I tumbled to what it was an' I says 'Matter o' three ladies an' a Canada quarter?' an' he nods 'Is 'ead an' then I ups an' tells him th' hull thing — jus' like it happened an' all as was said an' done, and after I was through he laughed nearly fit to kill hisself an'

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says, says he, "Take your car, I guess its as you tell it, I don't believe you've got sense enough to invent anything as good as that!" an' then if you'll believe me I went out into the barn an' I cussed a blue streak — them women was bad enough but that young whipper-snapper tellin' me I couldn't invent things — say wouldn't it 'a made you tired?"

I agreed with him that it would — it was like his case with the women — it was easier to agree than explain — then I got off.



OBSERVATION CARS AT MONTREAL.

The Montreal court before which was pending a bill brought by the president of the local hackmen's union against the Montreal Street Railway Co. and the Montreal Observation Car Co., to restrain the operation of the "Seeing Montreal" cars, on July 18th dismissed the application, holding that there was nothing in the law or the contract between the city and the company to prevent the operation of such cars, and that if the hackmen have been injured the proper course was a suit for damages.



A GOOD WAY TO SEE CLEVELAND.

"City Touring Car 400," which makes two-hour trips in and around Cleveland, O., every day, including Sunday, leaves the starting point in Public Square at 8 and 10 a. m., at noon, and at 2 and 4 p. m., covering a different route each trip, so that a person taking in the five trips, either the same day, or on different occasions, is bound to see everything there is worth seeing in Cleveland and vicinity. Each trip costs 25 cents. There is a sixth trip, at 6 p. m., which is reserved for special outing parties, and on Sunday extra touring cars are put on at 1 and 3 p. m.

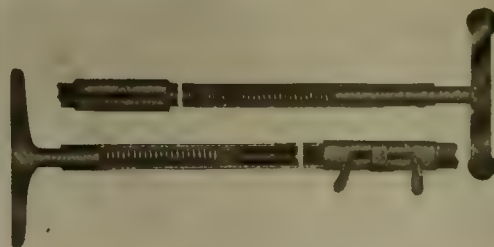
Mr. J. W. Butler, excursion manager for the Cleveland Electric Railway Co., has done much to popularize "City Touring Car 400" by causing to be issued attractive advertising matter in the form of posters, cards, blotters, etc., printed with different colored inks, the subject matter being kept alive by frequent changes.



A HANDSOME SOUVENIR.

There was distributed at the convention yesterday a handsome souvenir in the form of a cloth-bound volume, of 166 pages, treating of the Boston Elevated Railway Co's street railway system; the rapid transit facilities of Boston and its suburbs. It is the official publication of the company and contains, besides much attractive data, 24 large half-tone views, together with portraits of Major-General William A. Bancroft, president of the company; George A. Kimball, chief engineer; Charles F. Baker, superintendent motive power and machinery; Pullus E. Rugg, superintendent of transportation, and Edward Mahler, purchasing agent.

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ELECTRIC RAILWAY EQUIPMENT CO.

The Electric Railway Equipment Co., of Cincinnati, is showing wrought iron and steel tubular poles and brackets, and a full line of overhead materials. A feature of the exhibit is a hydraulic wire-grooving machine for recessing round wire, placing therein, on each side, a 4-in. groove by means of which the wire may be clutched by a drop-forge steel mechanical clip, or ear. This ear will not pull out of the groove even under a 5,000-lb. strain, it is stated, and to substantiate this claim tests are made at the exhibit under direction of F. F. Harten, superintendent. Elmer P. Morris, sales agent, is in charge of the exhibit.



F. H. Newcomb, of Brooklyn, the well known "cap" man is showing a full line of uniform caps.

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Papers Before the American Street Railway Association.

Presented Sept. 4, 1903

MAINTENANCE AND CHAMPERTY IN PERSONAL INJURY CASES.

By Michael Brennan, Attorney, Detroit United Ry.

I have chosen for this short paper, a title that may appear to suffer too much of antiquity, viz: Maintenance and Champerty in Personal Injury Cases.

Maintenance at the common law was an officious intermeddling in a suit that in no way belonged to one, by maintaining or assisting either party with money or otherwise to prosecute or defend it. It was an offense against public justice, as it kept alive strife and contention and perverted the remedial processes of the law into an engine of oppression. A man might, however, maintain the suit of his near kinsman, servant or poor neighbor out of charity. Otherwise the punishment was fine and imprisonment.

Champerty was a species of maintenance and was punished in the same manner. It derived its name from the fact that it was a bargain with a plaintiff or defendant, *campun partire*, to divide the land, sued for between them if they prevailed at law. The champertor was to carry on the litigation at his own expense and to take as a reward part of the land.

Blackstone says: "It is a practice so much abhorred by our law that it is one main reason why a chose in action is not assignable at common law, because no man should purchase any pretence to sue in another's right."

This practice was severely condemned by the Roman law and was punished by a forfeiture of a third of the goods of the guilty party and perpetual infamy.

The common law prohibition against maintenance and champerty in the various states of the Union has been substantially abrogated, and it is fair to say that in practice there is no legal punishment meted out to the champertor in any state of the Union.

As titles to land have become settled, there is nothing to do for the real champertor or divider of land, and it has been necessary for him to turn his attention to fresh fields and pastures new.

The marvelous growth of railroads in this country and the multiplication of factories and industrial establishments have necessarily increased the number of accidents accruing to employees and others. This condition of things has given rise to the existence of a class of lawyers in all large centers of population, who make a specialty of pressing cases of personal injury, and whose fees are contingent upon ultimate success, whether by compromise or at the end of a suit. In the city of New York there are on the present calendar 29,697 cases for trial, and of this number 5,796 are against the surface street railway corporations. Mr. Godkin, in Hamilton's System of Legal Medicine, states that "probably half the jury cases heard in the state of New York alone in any one year are actions for personal injuries resulting from alleged negligence."

Mr. Bailey, in his excellent treatise on Accident and Injury, published in 1898, states that Mr. F. Bermelee Prentice has recently examined the records of the Chicago Courts having jurisdiction of such cases. He states that in the year 1875 there were altogether about 200 personal injury cases pending in Cook County, and that it was safe to say that there are pending now in the Chicago Courts 3,600 of such cases, and it is needless to say

that only a small percentage of such cases ever come to trial or even get on the docket for trial.

The prosecution of personal injury cases has become a systematized business. Many firms employ runners, who maintain close business relations with surgeons, policemen, saloon-keepers and others, whose business brings them in touch with an accident shortly after its occurrence, so that these runners, who are furnished with blank contracts by their patrons, reach the hospital almost as soon as the ambulance, and secure a contract from the injured person, giving to the law firm 50 per cent of the damages to be recovered before the surgeon's knife has left its case.

It is undoubtedly from this well-known practice that the expression "ambulance chaser" has been coined. The incredulous may think this statement exaggeration, but it is too mildly drawn. The writer knows of an accident which occurred within the past year in the city of Detroit where by reason of a collision between two cars, a man named "A" had his foot crushed. It so happened that there was a damage lawyer on one of the cars, who was an eye witness of the accident. The ambulance was telephoned for and the first man to mount the steps after the injured man had been placed in it was the damage lawyer, who had a contract in his pocket signed by "A," giving him 50 per cent of the damages to be recovered, before the hospital was reached. I am compelled, however, to relate, that in this case the truth of the old adage that the early bird catches the worm did not prevail, as after the injured man had recovered he settled personally with the railway company, claiming that he was imposed on by the lawyer while he was only partially conscious.

Under our American jurisprudence, the offices of attorney and counselor are merged and the same lawyer consults with his client, hunts up witnesses, drafts the pleadings, examines the law, prepares the brief of facts and the law applicable to the case, and then goes into court and examines the witnesses and pleads before judge and jury.

In most European countries the offices of attorney and counsel are sharply divided, the attorney attending to the case outside the court and preparing pleadings and briefs, and the barrister, advocate or counsel taking charge of the conduct of the case at the trial or hearing. An advocate is supposed to stand at the bar demanding justice—and his relations to his client are not so close as those of the attorney—in fact, at one time he received for his compensation a *quiddam honorarium* (an honorary sum) and he could not receive any legal fee for his services from his client by an action at law.

In the United States, where one man commences at the beginning of the case and follows it to the end, there is a more intimate relation between him and his client—and where that relationship is made closer by the fact that the attorney owns a portion of the claim—it is a difficult thing for him to do his duty both to his client and to the court.

That such a lawyer does not do his duty to the court as a general rule is only too well known to those who are called upon to defend the interests of corporations who are unfortunate enough to be defendants in personal injury cases before our trial courts.

As long as litigants can rely upon the almost universal prejudice that exists in the minds of petit jurors against corporations, the temptation to bring actions to recover damages for personal injuries, no matter how trifling the injury and flimsy the pretext, will continue very great.

This temptation is sustained and aided by the personal pecuniary interest which the plaintiff's attorney has in the cause of action, and everything tends to aid in the result sought after. No matter how trivial the injury may be, the plaintiff is egged on so to speak by his lawyer and his physician. Even when there is no external objective symptoms of injury, the expert medical witness is promptly on hand to swear that the moving cause of the accident would produce all the ills that flesh is heir to.

The expert witness under the present lack of judicial restraint which exists in the United States has become a stench in the nostrils of the judges of the land.

The late Judge John Baxter, judge of the United States Circuit Court of the Sixth District, said that liars were divided into three great subdivisions: 1st. The ordinary liar. 2d. The damned liar. 3d. The expert witness.

Judge Peckham, in *Roberts v. N. Y. E. R. R. Co.*, 128 N. Y. 461, uses this language: "Expert evidence, so called, or, in other words, evidence of the mere opinion of witnesses, has been used to such an extent that the evidence given by them has come to be looked upon with great suspicion by both courts and juries, and the fact has become very plain that in any case where opinion evidence is admissible, the proper kind of an opinion desired by any party to the investigation can be readily procured by paying the market price therefor."

The best men, both in the medical and legal professions, have struggled for years with the question of expert testimony, yet little progress has been made, especially in this country, on this subject. In France the court may order an investigation and report by experts whenever it deems it advisable. If the parties cannot agree upon the experts the court appoints them. They are at least three in number, and are generally, though not necessarily, selected from a list of specialists termed "experts assermentés." The order directing the investigation contains a statement of its precise objections and appoints a referee or juge commissaire. Barristers or advocates are not allowed to appear before the experts, but the parties are represented before them by solleitors. The report must be signed by all three of the experts, and if there be a dissent, the dissenting opinion and the reasons for it are set forth in the body of the report. The judges, however, are not at all bound by the report if it is opposed to their conviction.

In Germany, under the code of civil procedure, after the issues are framed on which expert testimony is sought, the parties may agree upon the experts and the court appoints those agreed upon. Sometimes the court submits to the parties the names of a number of experts and allows each side to object to a certain number of them, and then appoints those remaining.

In Prussia, it is the custom to appoint a physician and surgeon for every county, and an appeal lies to a medical college in each province, if the experts disagree or the parties desire it. There is also an appellate commission for the whole kingdom.

Several of the medical societies of Chicago recently appointed a joint committee of eighteen reputable physicians to draft a bill, which was presented to the legislature of Illinois, and which was backed by the recommendation of the State Medical Society for that state. The chief provision of that bill was:

"That the judges of the Circuit and Superior Courts of the State of Illinois be and the same are hereby authorized to appoint in the month of January in each year, persons who shall act as expert witnesses in the medical and other sciences in giving opinion upon the evidence as presented in a hypothetical form on criminal causes that may be on hearing in the courts presided over by the said judges. Said expert witnesses shall hold their said appointments for one year or until their successors are appointed and qualified. * * * When expert opinion is desired in any cause pending in a criminal court, the trial judge presiding in any such case may, at his discretion, summon for duty under this act such expert witnesses to the number of three. Such expert witnesses shall be paid for their services by the county in which the trial for which they are summoned is held in such sums as may be named by the judge."

An attempt has also been made in Pennsylvania to pass a statute on the subject of expert testimony, but thus far without success. The State Bar Association of Michigan recently adopted a resolution recommending the appointment of legal expert wit-

nesses by the trial judges and providing for their compensation by the court, and that such expert witnesses should have abundance of opportunity to investigate the facts of the case on trial as far as they had a bearing upon the opinions they were expected to deliver.

The Hon. Seymour D. Thompson in an able lecture delivered before the Michigan State Bar Association on "Damage Law and Damage Lawyers" made a suggestion in relation to contingent interests in damage cases held by lawyers, viz., that in all cases where the attorney had an interest in the result of a lawsuit, that he should be obliged, in order to preserve his lien, to file a statement of his claim in the particular case.

It seems to me, however, that a more complete and radical remedy should be applied, and that remedy is the re-enactment of the old common-law prohibition against maintenance and champerty. It is true that some inconvenience and suffering might result therefrom, but the law cannot take care of every ill, and the greatest good for the greatest number should be the rule; in that way our courts would be purified and the terrible incentive to the perpetrator of fraud on corporations, and the commission of perjury in the trial of cases would be removed.

THE RIGHT OF WAY.

By H. H. Vreeland, President Interurban Street Railway Co., New York City.

It has always seemed to me, when the question of the right of way of street cars has been under discussion in our societies, that it has been approached from the wrong point. This defect in the discussion seems to arise from a lack of clear statement of what is meant by "right of way." Street railroads, in the sense that steam railroads enjoy this privilege, have no "right of way." A steam railroad operates along a strip of land, owned in fee, which it holds and uses for its special purposes against all intruders, and it can only be obstructed by trespassers. The case of a street railway is entirely different. It has a franchise to go along a rigid and appointed route on thoroughfares which are used in common by pedestrians and vehicles of every description.

This being the case, the question of "right of way," in so far as it is applicable to street railroads, becomes one not of right of way but of precedence, since the general public has equal rights on the road. These roads or streets being dedicated to public use, it is the duty of the authorities to see that they are so policed as to obtain for the greatest number of people the fullest and freest use of the facilities which they afford. If street railroad men would view the topic from this point of view and insist that the streets are for the use of the people instead of corporations or individuals, the whole question, in a short time, would take on a different aspect. A railroad company is permitted primarily to exist, not for the aggrandizement of its owners or operators, but for the accommodation of the public. An individual citizen who enters and pays a fare does not thereby relinquish any of his rights to free passage along a public street, and there is hardly an hour of the day or night in which he can enter a car on a street anywhere in a city without finding company, so that the vehicle in which he rides represents not only his individual right, but the assembled rights of all his fellow passengers; and so it has always seemed to me, viewing the question from the standpoint I have indicated, that a crowded car, full of people, should, by mere preponderance of the number of individuals it contained, have a superior right of passage to a vehicle with a single individual in it, or to a van containing merchandise. If, before public bodies, it was unanimously insisted by railroad men that the reason they demanded "right of way" was because of their passengers, I think it would disarm much of the resistance which has met the attempt to secure police co-operation.

A good analogy between the rights which all street railroad operators claim for their vehicles is to be found in the rules of the road concerning United States mail vans. These have the right of way everywhere, and it is a misdemeanor to obstruct

their free movements. The reason of this is not because the wagon is labeled "United States Mail" or because of any superior authority vested in the driver, but because the vehicle contains hundreds— it may be thousands— of business communications involving complicated business interests. For the same reason, I have always held that a street car containing a crowd of people, necessarily in haste or they would find a cheaper and more leisurely way of reaching their destination, had rights superior to other vehicles on street surfaces.

Added to all this is the fact that these public conveyances are restricted in their movements to a fixed way, whereas the others, in addition to being lighter and more easily moved, have a flexibility of route denied to trams.

TRAIN ORDERS AND TRAIN SIGNALS FOR INTERURBAN ROADS.

By Charles A. Coons, Supt. of Transportation, International Railway Co., Buffalo.

It is but stating a self-evident truth to say that the first and paramount consideration in the operation of any high speed suburban or interurban electric road must be the safety of passengers and trains. To this element all others must be subserved even at the expense of the prescribed schedules, but it must be clearly borne in mind also that complete safety is dependent very largely upon the maintaining of schedules and the regularity and punctuality with which trains move. Rules and regulations that are drawn so conservatively as to interfere needlessly with the movement of trains may very easily introduce a new element of danger to say nothing of defeating the purpose for which the road is operated, namely, the moving of passengers and merchandise with promptness and dispatch.

Inasmuch as the conditions under which electric interurban railways operate are beginning to approach very closely the conditions pertaining to steam railroad operation, and, taking into consideration that steam railroads have been running many years before

Time will not be taken here to review in detail the rules as commonly accepted by the prominent roads for the management of the operating department. The members of the convention are doubtless familiar with their general tenor and to those who care to continue the study into details, it is suggested that copies of the book of rules as used by the Pennsylvania, New York Central, or any of the other large systems, can probably be obtained by application to the respective operating departments. Attention is also directed to the fact that the code of interurban rules presented to this convention by the Committee on Standard Rules is patterned very closely after the rules in vogue on the best managed steam roads.

For the handling of train orders, the steam roads almost universally employ two blanks, known respectively as Form 19, and Form 31. Form 19 is a blank upon which the operator writes the order as he receives it from the dispatcher, which is at once repeated back and the "O K" of the dispatcher is then given and proper notation, with time, noted thereon; a copy of this order is handed by the operator to the train crew to whom it is addressed. With order blank, Form 19, no receipt is obtained from the train crew and no means are provided for knowing absolutely that the order has been received and understood by those who are to execute it.

Form 31 is a blank upon which the operator writes the message as he receives it from the dispatcher. After the message has been repeated back and the dispatcher's "O K" received, those to whom the order is addressed must sign their names to the blank, after which the operator must again repeat the message back to the dispatcher in the presence of the waiting trainmen, and in addition must transmit the signatures of the trainmen and secure the dispatcher's "Complete" before the order becomes operative. The use of this form gives a considerable element of security, but it is not recommended for electric railway service owing to the delay caused by compelling the trainmen to wait at the station until their signatures have been transmitted and the "Complete" response received. With a frequent service of many small units, the delays from this source would be very considerable and render the method prohibitive.

As a compromise between Form 19 and Form 31, a modification of both is suggested for use on interurban electric roads. This blank is here designated as Form 21. With this blank the trainmen sign their names to the order at the operator's office; they then each take a carbon copy of the order and immediately proceed with their car, without the delay incident to the transmitting of their signatures as required with Form 31. In detail the method of using the form is as follows: Dispatcher telegraphs order for trainmen to operator. The operator takes down the message on Form 21, making at the same time— by means of carbons— as many copies as may be necessary; the operator repeats the message back to dispatcher; if correct, dispatcher wires "Complete" and operator marks the blank "Complete." All this is done prior to the arrival of train. When the train arrives the crew thereof goes to the operator's office and fills in on the blank, in places provided, the following information: Number of section of train is being operated in more than one section, number of run, number of train, and time. The order is then signed for by both conductor and motorman, who must each take a copy of same, with their names thereon, in places provided as a receipt therefor, before they depart. The operator retains one of the copies for file in his office. If one or more units are being operated as sections of a single train number, the operator makes a sufficient number of copies to give each conductor and motorman of all the sections a copy thereof. This blank is being used with excellent results by the International Railway Co. on its interurban lines, including one single track line 37 miles in length, on which cars are operated at a maximum speed of 55 miles per hour, with cars operating in each direction at intervals of thirty minutes, together with a large number of freight and express trains between regular cars.

It is not out of place to say here a few words concerning the relative merits of the telegraph and the telephone as the medium for transmitting messages from the dispatcher to the operators along the line. It is true that most steam roads use the telegraph and most electric roads use the telephone for dispatching purposes and for electric railway operation opinion appears to

INTERNATIONAL RAILWAY COMPANY

TRAIN ORDER NO. _____

Superintendent's Office

190

| FORM 21 | For | to | of | FORM 21 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|-----|-------|-----------|----------------------|----------|------|------|----|---|----------|------|-----|-----|-------|-----------|----------------------|------|--|--|--|--|--|--|--|----|--|--|--|--|--|--|----|--|--|--|--|--|--|----|--|--|--|--|--|--|----|--|--|--|--|--|--|----|
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| LET | RUN | TRAIN | CONDUCTOR | ENGINEER OR MOTORMAN | TIME | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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CONDUCTOR AND MOTORMAN OR ENGINEER MUST EACH HAVE A COPY OF THIS ORDER WITH THEIR NAMES THEREON
IN PLACE PROVIDED AS A RECEIPT THEREFOR

(Size of original, 7 x 10 in.)

electric traction was introduced, it would appear that electric railway managers could profit by studying and adopting many of the rules and methods of operation which have been adopted as standard on the steam roads and which may be considered the acme of the fittest after years of evolution. This is particularly true as regards methods of dispatching trains. Years of study and experiment on the part of those responsible for the operation of steam roads in this country have resulted in the adoption by practically all of the prominent trunk systems of certain rules and methods which, it is suggested, are in the main applicable to electric railway operation.

be divided as regards the relative merits of the two systems. The management of the International Railway Co. believes there is no choice as between the two systems, and that either one will prove adequate if properly installed and properly maintained. The cost of wire and instruments of either system will be about the same and either system is liable to disarrangement if not properly watched, although the telephone is perhaps more susceptible to disturbing influences than the telegraph. With either the telephone or telegraph system it is desirable to have operators at every regular meeting place to receive and record messages, or in lieu of operators, at least some method of recording and checking of messages as they are received by the train crew.

In further elucidation of the method of dispatching with the use of Form 21, the following is added:

All orders issued by dispatcher are copied in a book kept by him for that purpose in the following manner: Order when repeated back by operator is copied in this book word for word. All operators receiving an order repeat it back, the dispatcher entering it in this book word for word as it comes back from the first operator, and underscoring each word as it comes back from the second operator and so on until all operators receiving the order have repeated it back.

Dispatchers and operators are supplied with a form known as a train sheet to assist them in keeping track of the movement of all trains.

A daily register is kept at all single track terminals for the purpose of trainmen registering their trains therein. On one page northbound trains are entered; on the opposite page, southbound trains. Trainmen, in places provided, fill in the following information: Section number, run number, train number, signals carried, time, signature of conductor and motorman (or engineer).

All regular movements of trains are governed by the printed time-table which is defined as "The authority for the movement of regular trains subject to the rules." The time-table contains the classified schedules of trains with special instructions relating thereto. All movements of extra and special trains and of regular trains when off schedule are governed by special orders issued by dispatcher in the regular way.

The system of train signals in use by the International Railway Co. is practically the same as that presented to this convention by the Committee on Standard Rules, and it is not necessary to repeat them in this connection.

In the matter of signals, the International Railway Co. adheres very closely to the methods accepted by steam railroads. In the adoption of signals, etc., we have considered the fact that steam railroad managements have been advancing in the science of railroading for many years, while the electric road is in its infancy. We naturally felt therefore in availing ourselves of their knowledge and experience, we were making a wise move, in any event until something better and newer develops.

It should also be noted that the International Railway Co. does not use flags as markers. It has been observed that when a train is running at speed, the movement thereof causes the flags to hang straight to the rear, consequently, they are not plainly discernible by the crew of an opposing train, in place of flags for designating a car following, run numbers, etc., a metal dash sign is used, these signs being about 8x8 in. They have been found very satisfactory.

After all has been said and done, safety, together with regularity and punctuality in the operation of any electric railway system, do not depend so much upon the methods of dispatching, or the rules adopted for the management of employees, as they do upon the way in which the rules are observed by every individual in the organization from the manager down to the switch boy. An indifferent set of rules rigidly and consistently enforced and observed is far better than the best code of regulations, half-heartedly or inconsistently enforced. The operating organization constitutes a huge and complicated machine and the integrity of the whole depends solely upon the smoothness and accuracy with which each of the individual cogs fits into its allotted place and performs its allotted functions. A rigid, never ceasing, never relenting inspection of every cog is the first requisite to the efficient, economical and safe operation of the huge mechanism in the modern interurban electric railway.

A. R. M. & E. A. CONSTITUTION.

When the American Railway Mechanical and Electrical Association was organized in February last the draft of the Constitution and By-Laws reported by the committee appointed to consider the subject was not formally adopted by the Association, but postponed to the time of the annual convention. Accordingly the Association held an evening session on Tuesday, at which after full discussion the Constitution and By-Laws were adopted. The changes made affected principally the classification of members. The articles amended now read as follows:

Constitution.

III. MEMBERS.

1. The heads of mechanical or electrical departments of railway companies may be elected active members of this Association, and shall be entitled to one vote each and to all privileges of this Association.

2. The associate members of the Association shall consist of American Railway Companies or lessees, or individual owners of railways, and each member shall be entitled to one vote by delegates presenting proper credentials.

3. Other employees of mechanical and electrical departments, not eligible as active members, may become eligible to Junior membership upon the recommendation of at least one member, and shall be entitled to all privileges except that of voting.

4. Technical periodicals shall be eligible to honorary membership upon recommendation of the Executive Committee, and their representatives shall be entitled to all privileges excepting that of voting.

By-Laws.

1. APPLICATIONS.

Every applicant for membership shall signify the same in writing to the Secretary, enclosing the requisite fee, the matter to be acted upon by the President and Secretary.

2. OFFICERS AND EXECUTIVE COMMITTEE.

The Officers shall consist of a President, three Vice-Presidents, a Secretary and Treasurer, and four others, who shall constitute the Executive Committee. The Executive Committee shall have the entire charge and management of the affairs of the Association. The Officers and Executive Committee shall be elected by ballot at each regular meeting of the Association, and shall hold office until their successors shall be elected. The duties of Secretary and Treasurer may be performed by the same person.

7. MEETINGS.

The regular meetings of this Association shall convene at the same place as the American Street Railway Association, and two days in advance of the meeting of that Association, three sessions to be held each day. Notice of every meeting shall be given by the Secretary in a circular addressed to each member at least thirty days before the time of meeting. Ten members shall constitute a quorum of any meeting.

11. EXECUTIVE COMMITTEE.

The Executive Committee shall meet in advance of each annual meeting of the Association, and on other occasions when the President shall deem it necessary, upon such reasonable notice, specifying the business to be attended to as the committee shall by vote determine. A vote of the Executive Committee may be taken by mail when deemed advisable.

13. READING OF PAPERS.

All papers read at the meetings of the Association must relate to matters connected with the objects of the Association and must have the approval of the Executive Committee before being read. Persons to whom subjects are assigned must signify in writing their intention to prepare the paper and forward it to the Secretary at least ninety days previous to the date of the meeting so that advance copies of the paper may be printed and forwarded to the members.

15. FEES.

Active members shall pay annual dues of \$5.00. Associate members \$20.00, and Junior members \$3.00, all payable in advance. The Executive Committee shall have no power to expend for any purpose whatever, an amount exceeding that received as hereinbefore provided for.

FREIGHT AND EXPRESS ON ELECTRIC RAILWAYS.

By J. B. McClary, Manager Railway Department, Birmingham (Ala.)
Railway Light and Power Company.

When I commenced work on this paper I learned a valuable lesson. I sent out about 500 inquiries for data on freight and express handling by electric railways, and received 182 replies. The lesson is this: Hereafter when a circular letter comes to my desk from another road I will answer it promptly. We are apt to become so engaged in our work that we often neglect opportunities to aid our friends in the railway business, when they ask us for information.

We hand a letter or circular from another road to a clerk and tell him to get up the data, and then we forget about it and that is the end of it; and our friend thinks his letter was miscarried by the post-office department.

There is no more vital subject before the street railways of the country today than the one assigned to the writer by this association, that is, "Freight and Express on Electric Railways." The main idea of the railway business is to make money, and



J. B. McCLARY.

any manager who attempts to operate a line without taking on everything he can find or think of that is permitted by his charter to increase his earnings, is standing in his own light. Some of the answers to my circular letters were amusing, among them several underscoring "No's" in answer to the question, "Do you handle freight?" and followed by reasons which would indicate that the parties making the answers had a supreme contempt for the idea. Others would answer that they did not, but were deeply interested in the subject and would await the publication of this paper with much interest.

Several requested advance copies of any table which might be compiled from the answers to the circulars, as they were themselves seeking information on the subject.

One enthusiastic manager courteously answered all questions, even to the figures showing his profits, and added, "This is velvet," and his "velvet" amounted to many thousands of dollars. Right here I want our people to stick a pin. It is in the word used by our enthusiastic friend.

That it is "velvet" there is no doubt, if you would engage in the business and not let expenses eat it up. There is no excuse for this, for almost under any conditions now known to the fraternity, freight and express can be cheaply hauled on the electric railway, that is of course where it is permitted, or rather not prohibited by charter or statute.

From the timid requests of a passenger to the conductor or motorman to "Please let me carry this box on the platform," to magnificent freight trains operated separately from passenger service or trailers attached to passenger cars, is the evolution of the freight and express business on electric railways in the past dozen years. The electric railway is responsible for more suburban towns than any other factor. Civilization itself has no more potent aid than the trolley car. Indeed, the electric motor is civilization's maid of honor, and when with the trolley cars we administer to man's need and comfort, we should not neglect anything that man wants that is within our range. From observation and research, I am sure of one thing, and that is that the personal opinions and characteristics of a railway manager

directly or indirectly affect the happiness and comfort of the community served by his road. The relations of a railway to the public are varied and complex. Let a car break down and it will be very interesting to know how much each individual passenger was discommoded and the real cause of his discontent. Hence, I say we can add to the comforts or discomforts of our customers by merely following to a certain extent our personal inclinations, or be bound by our prejudices in doing or not doing things that are requested or demanded by our patrons. I am led to these remarks by the answers of over fifty managers that they did not handle freight, when I know or believe they would profit by it if they should engage in the business. The deduction follows that they would please the community if they did. Of course local conditions have a great deal to do with this matter; in fact, no general rule can be laid down for the guidance of the street railways, except that of expediency. There is only one general proposition in connection with this question, and that is that the people want everything good that can be had. That electric railways can serve the public in transporting passengers to their satisfaction is proof that they can surely serve the same people in hauling freight and express matter, and do it safely and profitably.

Upon investigation of 182 roads, we find that 71 roads handle freight and express, 45 roads admit that it is profitable and that they intend to increase their facilities for handling their business, 37 say that this is a very attractive feature of electric railroading, while 9 answer that while they carry freight, they do not think well of it. Thirty-five roads use the steam railroad classification of their states or railroad districts, others have rate sheets of their own based upon local conditions and generally much lower than the steam railroads; 38 have depots at terminals and along their lines, and 9 say they have none; 24 are silent on this subject; 18 handle steam railroad cars on their line. This is particularly a fine feature, provided the track is good and the special work will allow it. Of course this cannot be done in many cities and towns, but on the outskirts and suburbs, where factories and mills are located, it can be made to pay handsomely. Fifty roads have separate freight cars or trains, three have trailers attached to passenger cars, and eight handle packages on passenger cars; 111 answered that they do not handle freight at all; 17 of these admit that they believe it should be done, and four of the 111 request information, stating that they are interested in the idea. Compiling our 182 letters, we have the following:

| | |
|--|-----|
| Handle freight and express on electric railways..... | 71 |
| Do not handle freight and express | 111 |
| | 182 |
| Profitable | 45 |
| Doubtful | 9 |
| Lensed to local express companies | 5 |
| Non-committal | 10 |
| Non-profitable | 2 |
| | 71 |
| Attractive | 37 |
| Steam railroad classifications | 35 |
| Depots | 38 |
| Handle steam cars | 18 |
| Separate freight trains | 50 |
| Trailers | 3 |
| Use passenger cars | 8 |

Thirty-three freight carrying roads do not handle steam cars. Six have flat rates. The biggest development seems to be in the middle west. Thirty-seven roads reported the gross earnings from freight and express for 1902 as aggregating over \$1,000,000. The amounts ranging from \$1,000 to \$100,000 in round numbers, or an average of over \$27,000 per road. The operating expenses of the freight department do not seem to be very accurately kept, or at least the same details in accounting are not adhered to as are other features of the business. This is of course a matter of private concern to each company, but our Accountants' Association will get this straight pretty soon, as they do all other important matters connected with railway work.

The most expensive plan we find is that of running wagons

to collect parcels from shippers and to deliver them to the consignees. We are unable to find that this pays as great a profit as where it is not attempted. In a large city the most attractive plan, it would seem, would be to let a separate express or parcel company do this and pay the railroad company a certain amount for cars or space, or a percentage of the gross receipts and the railroads have nothing to do with it, except to merely haul the goods for the express company. Something on this order is done in St. Louis, Baltimore, Cleveland, New Haven, Portland (ore.), and New York. Figures, however, that would be of interest to the association are not available from these cities, but it seems to be a safe proposition and everybody satisfied with the results.

This is very good. Tickets or tags are sold to merchants, farmers and others, and when a package is to be shipped by express or freight, the shipper merely consults a schedule of rates and attaches to his package a ticket that will carry the package to its destination. These tags are sold in certain quantities, having values of different denominations, and work satisfactorily, the tag going to the auditor in the place of cash.

The Rockford, Ill., road has a nice system in use. This was described in a recent issue of the "Street Railway Review."

[The description of the system and the forms used will be found in the "Street Railway Review" for June, 1903, pages 312 to 314.—Ed.]

We find a good form of receipt to shippers is that used by the Schenectady road shown in Fig. 1.

The Schenectady receipt from consignees, Fig. 2, is a most excellent form and is appended for the guidance of roads seeking information as to forms.

Continuing the Schenectady description below find a very attractive circular used by "The Electric Express Co.," which is supposed to be an organization inside of the railroad company:

Electric Express Company.

INSTRUCTIONS FOR SHIPPING.

This company is doing both an express and freight business and our charges are based on the kind of service desired. We have therefore classified our service as follows:

"Class A"—Express service, includes collection and delivery.

"Class B"—Freight service, no wagon service whatever.

"Class C"—Freight service, includes wagon service one end.

In order that we may determine what class of service is desired it is very necessary that shippers enter on shipping orders the class under which goods are to be handled.

Unless specified on shipping order, Class "B" or "C," all shipments brought to our office or collected by our wagons will be treated as express and charged for under "Class A."

It should be understood that express matter receives first attention at our hands, and while freight service is just as fast, preference in loading and delivery will be given to express business.

Receipt books will be furnished on application, and we respectfully request shippers to make out their own shipping orders, entering on the duplicate the class of service wanted, as per schedule given above.

Special attention should be given to blank spaces headed "Charges," crossing out "Collect" space when prepayment is desired.

Rates and further information will be furnished by agents or communications may be addressed to

ELECTRIC EXPRESS CO.,

E. J. Ryan, Manager.

Schenectady, N. Y., Mar. 25, 1902.

The Citizens' Railway & Light Co., of Muscatine, Iowa, uses a stamp system, one of the stamps being shown in Fig. 3.

The Elmira Water, Light & Railroad Co. also uses the tag and stamp system.

The tariff sheet of the Des Moines, Iowa, Interurban Railway is reproduced in full, Fig. 4, as one of the simplest, yet most complete in use.

The list of commodity rates of the Camden Interstate Railway Co. is as follows:

Between Huntington and all points west to Ashland.

Rates subject to change without notice.

| | |
|------------------------------------|---------|
| Apples, per bbl. | \$0.10 |
| Beer, per bbl. | .20 |
| Beer, per half bbl. | .10 |
| Beer, per case | .10 |
| Baby buggies, each | .25 |
| Bicycles, each | .25 |
| Bread, per basket | .25 |
| Bananas, loose, per bunch | .03 1/2 |
| Bananas, packed, per case | .25 |
| Bananas, packed, per 1/2 case | .15 |
| Brick in flour bbls. | .25 |

ORIGINAL

BY ELECTRIC EXPRESS CO.

Received from.....
The property described below, in good order, marked, consigned and destined as indicated hereon, which said Company agrees to carry to said destination, it on its usual, otherwise, freight service, to be carried on the route to said destination, charges to be collected in accordance with schedule of rates fixed or agreed for service designated by shipper under Class A, B or C, as explained below.

| CLASS A Express Wagon Service both ends of line | | CLASS B Freight No Wagon Service | | CLASS C Express Wagon Service one end of line | |
|---|------------------|--|--|---|-----------------------------------|
| Consignee..... | | | | | |
| Street and No..... | | | | | |
| Destination..... | | | | | |
| Marks..... | | Value or C. O. D. \$..... | | | |
| No. Packages..... | DESCRIPTION..... | | | | Weight Subject to Correction..... |

The delivery of said article to and its receipt for transportation by the ELECTRIC EXPRESS CO. are on the express conditions, as printed on the back hereof, which are accepted and approved by the shipper.

Name of Shipper.....

PREPAID

COLLECT

ON ACCOUNT

The conditions upon which the above mentioned property is received for transportation are printed on back hereof.

ELECTRIC EXPRESS CO.,

Per.....

FIG. 1. RECEIPT USED BY SCHENECTADY RY.

The method of handling freight and express on electric rail ways is the next thing to be considered. The data obtained form the most interesting part of this paper. As to rates, we have mentioned that 35 roads heard from use steam railroad classifications. There may be some very good reason for this, but it seems to the writer that if otherwise practicable, this need not be done. In Indianapolis and some other places the tag system is in use.

SHIPPING ORDER

TO ELECTRIC EXPRESS CO.,

Please ship the packages enumerated below, which are in good order, marked, consigned and destined as below, to be carried to said destination, it on your usual, otherwise, freight service, to be carried on the route to said destination, charges to be collected in accordance with schedule of rates fixed or agreed for service designated by shipper under Class A, B or C, as explained below.

| CLASS A Express Wagon Service both ends of line | | CLASS B Freight No Wagon Service | | CLASS C Express Wagon Service one end of line | |
|---|------------------|--|--|---|-----------------------------------|
| Consignee..... | | | | | |
| Street and No..... | | | | | |
| Destination..... | | | | | |
| Marks..... | | Value or C. O. D. \$..... | | | |
| No. Packages..... | DESCRIPTION..... | | | | Weight Subject to Correction..... |

The delivery of said article to and its receipt for transportation by the ELECTRIC EXPRESS CO. are on the express conditions, as printed on the back hereof, which are accepted and approved by the shipper.

Name of Shipper.....

PREPAID

COLLECT

ON ACCOUNT

FOR CONSIGNEE
Received from the ELECTRIC EXPRESS CO. In good order, the packages referred to and set forth in the foregoing shipping order.

FIG. 2. SHIPPING CARD USED BY SCHENECTADY RY.

| | |
|--|-------|
| Boots and shoes, per lb. | .15 |
| Cabbage, per flour bbl. | .10 |
| Cabbage, per sugar bbl. | .15 |
| Calves, each | .50 |
| Cement, per 100 lb. sack | .08 |
| Cement, per Louisville bbl. | .20 |
| Cement, per Portland bbl. | .25 |
| Cider, per bbl. | .35 |
| Coffee, per case | .08 |
| Canned goods, per 100 lbs. | .06 |
| Dry goods, per 100 lbs. | .15 |
| Dynamite, 400 lbs. or less | 2.00 |
| Eggs, per crate | .05 |
| Empty crates returned | .03 |
| Empty pop crates returned | .05 |
| Empty beer cases returned | .05 |
| Empty beer kegs returned | .05 |
| Fertilizer, per bag | .20 |
| Flour, per bbl. | .10 |
| Feed mill, per ton | 1.00 |
| Grapes, per basket | .02 |
| Glass, packed, per 100 lbs. | .15 |
| Groceries, assorted, packed | .15 |
| Hay, per bale of 100 lbs. | .15 |
| Hay, per ton | 2.00 |
| Hardware, per 100 lbs. | .08 |
| Ice, per 100 lbs. | .10 |
| Lime, per bbl. | .15 |
| Lime, per ton | 1.25 |
| Laundry, per basket | .25 |
| Liquor, per bbl. | .35 |
| Liquor, per case | .10 |
| Mead, per 100 lb. bag | .05 |
| Meats, fresh, per 100 lbs. | .25 |
| Meats, cured, per 100 lbs. | .08 |
| Meats, per 200 lb. box | .15 |
| Meats, per 300 lb. box | .20 |
| Molasses, per bbl. | .50 |
| Nails, per keg, 5 and over | .05 |
| Nails in 300 keg lots | .04 |
| Notions, per 100 lbs. | .20 |
| Oil, per bbl. | .35 |
| Oranges, per box | .10 |
| Organs, each | 1.00 |
| Pianos, each | 12.00 |
| Plaster (same as cement) | |
| Potatoes and all vegetables, per flour bbl. | .10 |
| Potatoes, 10, 15 and 20c. per bag. | |
| Pop and seltzer, per case | .10 |
| Sewing machines | .25 |
| Sugar, per 100 lbs. | .07 |
| Shingles, per M. | .50 |
| Salt, per bbl. | .15 |
| Stoneware, per 100 lbs. | .15 |
| Trunks, each | .25 |
| Tar, per bbl. | .35 |
| Varnish, per bbl. | .35 |
| Varnish, in 100 lb. cans | .10 |
| Vinegar, per bbl. | .35 |
| Wire Cable, per 1,000 lb. reel | 3.00 |
| Wire, barbed, per 100 lbs. | .06 |

No single package shipment less than 25 cents.

Special prices on car lots upon application to E. R. Cole, G. F. A., or T. H. Clay, Agt.

In closing this paper it might be interesting to learn how the freight and express is handled in Birmingham.

The company maintains a large and commodious depot at a convenient distance from the heart of the city, where all freight for the suburban lines is received. Besides this central depot, there are five other depots with agents along the lines and at terminals. The business at the terminals is so heavy that the agents have to have an assistant and a freight handler. At the central station, the help required is an agent, a bill clerk and five freight handlers.

Anything is received for shipment from a package of yeast cakes to a hogshhead of sugar, and if shippers desire to do so, they may prepay shipment, and if not, goods are sent collect; that is, where they are going to an agency station, and shipments are always prepaid when shipped to stations where there is no agent, and the bill of lading is stamped as in Fig. 5.

This, of course, renders the company not liable should the shipments be stolen or molested after they are put off.

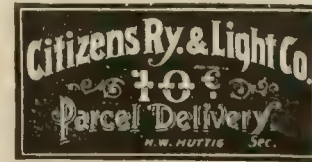


FIG. 3.

No C. O. D. business is done, and we take this occasion to warn our friends against it, as it will be a never-ending source of expense and annoyance. This is particularly true in instances where perishable goods are shipped C. O. D. If there is any contention about it so that the goods cannot be delivered promptly they may spoil, and then someone will want the railroad company to pay for them.

| MILES | MERCHANDISE IN CENTS PER 100 LBS. | | | | | SPECIAL CAR LOAD CLASSES IN CENTS PER 100 LBS. | | | | |
|-------|--------------------------------------|------|------|-----|------|---|------|------|------|------|
| | 1 | 2 | 3 | 4 | 5 | A | B | C | D | E |
| 5 | 12 | 10 | 8 | 6 | 4.7 | 1.8 | 4.7 | 4 | 3.3 | 2.71 |
| 10 | 12.5 | 10.5 | 8.5 | 6.5 | 4.97 | 5.2 | 4.97 | 4.22 | 3.51 | 2.75 |
| 15 | 13 | 11 | 9 | 7 | 5.23 | 5.38 | 5.23 | 4.44 | 3.7 | 2.96 |
| 20 | 14 | 11.5 | 9.5 | 7.5 | 5.51 | 5.56 | 5.51 | 4.67 | 3.85 | 3.09 |
| 25 | 14.5 | 12 | 10 | 8 | 5.71 | 5.82 | 5.71 | 4.84 | 4.04 | 3.23 |
| 30 | 15 | 13 | 10.5 | 8.5 | 5.91 | 5.95 | 5.91 | 5.06 | 4.18 | 3.34 |
| 35 | 15.5 | 13.5 | 11 | 9 | 6.12 | 6.14 | 6.12 | 5.34 | 4.32 | 3.46 |

NOTE 1. Minimum charge, 25 cents.

NOTE 2. Stations where there is no agent, charges must be prepaid.

| MILES | CAR LOAD CLASSES IN CENTS PER 100 LBS. | | | | | LIVE STOCK IN CENTS PER 100 LBS. | | | | | IN CENTS PER TON OF 2,000 LBS. | | |
|-------|---|--|---|---|--|--|--|---|-----------|----------------------------|--------------------------------------|----|----|
| | Wheat, Flour, Millet, Flax Seed and Hud- gum. | Corn, Oats, Barley, Other Grain and Mill Stuffs. | Hard and Soft Lumber, Lath, Shingles, Sash, Doors and Blinds. | Salt, Lime, Cement, Plaster, Stucco. | Horses and Mules in Car Loads, Minimum 31-foot car inside. | Fat Cattle in Car Loads, 10,000 lbs.; 31- foot car inside. | Hogs in Car Loads; Weight, 10,000 lbs.; 31- foot car inside. | Sheep in Car Loads; Weight, 10,000 lbs.; 31- foot car inside. | Hard Coal | Soft Coal—Lump and Nut. | Soft Coal—Pea and Slack. | | |
| 5 | 4.27 | 3.50 | 3.33 | 3.00 | 5.1 | 4.87 | 5.30 | 8 | 57 | 28 | 24 | | |
| 10 | 4.16 | 3.73 | 3.18 | 2.22 | 5.40 | 5.25 | 5.7 | 8 | 60 | 32 | 27 | | |
| 15 | 4.05 | 3.88 | 3.62 | 2.35 | 5.81 | 5.62 | 6 | 8 | 74 | 61 | 30 | 29 | 29 |
| 20 | 4.81 | 4.04 | 3.78 | 3.18 | 6.18 | 6 | 6.34 | 9.12 | 68 | 40 | 32 | 44 | 35 |
| 25 | 5.03 | 4.20 | 3.93 | 3.61 | 6.62 | 6.37 | 6.05 | 9.5 | 72 | 44 | 35 | 48 | 38 |
| 30 | 5.22 | 4.37 | 4.08 | 3.75 | 6.80 | 6.75 | 6.96 | 9.88 | 76 | 48 | 38 | 50 | 41 |
| 35 | 5.41 | 4.53 | 4.04 | 3.88 | 7.24 | 7.12 | 7.20 | 10.26 | 80 | 50 | 41 | | |

Approved:

H. H. POLK, President.

J. F. JOHNSTON,

General Freight Agent.

FIG. 4. FREIGHT TARIFF OF DES MOINES INTERURBAN RY.

The towns where the most freight is shipped have four trains per day, others three and the smaller ones only two. The smallest towns are served by freight trains, consisting of two, three or four cars as the needs demand. The cars are drawn by large motor cars built in the company's shops, and on these trains the motorman serves as conductor and checks out the freight, which is handled by the brakeman.

Bessemer, a large suburban town 14 miles from Birmingham, gets its daily supply of meat, bread, fruit and vegetables from Birmingham every day, and a train is run out of Birmingham every morning at five o'clock known as the "Fresh Meat Special."

The company has several connections with steam railroads and handles solid car load shipments to the suburban towns. This

Form

BIRMINGHAM RAILWAY, LIGHT AND POWER CO.
DIVISION

LEWIS, HAY, AVE.

Station

Goods to be shipped, in full or in part, in a freight car, loaded

| Items | Quantity | Weight | Charges |
|--|----------|--------|---------|
| <p>The receiving agent of this division station (The Birmingham Railway, Light & Power Co.) will not be responsible for the goods shipped in this receipt after they are released.</p> | | | |
| Agent | | | |

No liability will be assumed for wrong carriage or wrong delivery of goods, marked thereon, until receipt is made. The only signed receipt is that this is not responsible for goods shipped in full or in part, in a freight car, loaded. All goods shipped in this receipt after they are released.

AGENT.

FIG. 5.

pays exceedingly well, as there is practically no expense attached to it.

The forms and office method of handling freight are the same as used by standard railroads.

When a package or packages are offered for shipment a bill of lading in duplicate is presented and the goods checked; the bill of lading is signed, one copy being retained by the consignor and the other by the agent. These bills of lading are made up in books of one hundred each and these books are distributed among the shippers. From the stub retained by the agent the way bills are made up and a copy of the same is made on tissue paper. This copy goes to the auditor who checks it up and charges to each agent the amount due from each agent, a separate account being kept with each agent. The agents remit their receipts daily to the auditor, and he checks the accounts of each agent to see that everything has been remitted.



EXPRESS TRAIN, BIRMINGHAM.

The receiving agent takes his way bills, which are sent out in advance of the freight train, and makes out a combination freight bill and receipt, the two being a folded sheet perforated in the middle. When the consignee calls for his freight the agent signs the bill, which shows the receipt for the money and the consignee signs the receipt which the company holds to show delivery of goods.

In addition to these forms the agent at the central station makes out a recapitulation sheet, showing total amount of business transacted on all lines during the day, and each agent makes out one of these sheets and these are forwarded to the auditor, who by this means can keep an accurate record of all business done.

The central depot agent also sends daily a recapitulation sheet, itemized as to divisions, to the manager of the railway department. The sheet each day covers all business for the previous days of the month, and the sheet for the last day of each month of course shows the total business for the month.

Rates.

| | |
|---|------------|
| Bar Finishes, per 100 lbs. | \$0 15 |
| Billiard Tables, per 100 lbs. | 15 |
| Beer, per 100 lbs. | 06 |
| Beer, Bottled, in Casks or Boxes, per 100 lbs. | 08 |
| Buggies, crated, per 100 lbs. | 1 00 |
| Bellows, per 100 lbs. | 15 |
| Boots and Shoes, per 100 lbs. | 08 |
| Coffins, per 100 lbs. | 15 |
| Crockery, per 100 lbs. | 15 |
| Chickens and other poultry, per coop | 25 |
| Chickens and other poultry, per coop, extra large coop | 35 |
| Corpses | 50 |
| Carpets, per 100 lbs. | 15 |
| Cider and Vinegar, in kegs or barrels, per 100 lbs. | 08 |
| Clothing, per 100 lbs. | 08 |
| Dry Goods, Notions, etc., per 100 lbs. | 08 |
| Empties, each | 05 |
| (Except empty Beer Kegs, 2½c. each.) | |
| Eggs, per 100 lbs. | 08 |
| Fish, Fresh Meat, etc., per 100 lbs. | 08 |
| Fruits, per 100 lbs. | 08 |
| Furniture, per 100 lbs. | 15 |
| Glassware, per 100 lbs. | 15 |
| Groceries, per 100 lbs. | 08 |
| Grain, per 100 lbs. | 05 |
| Hats, per 100 lbs. | 08 |
| Hay, per 100 lbs. | 05 |
| Hardware, per 100 lbs. | 08 |
| Household Goods, Owner's Risk, released, per 100 lbs. | 15 |
| Harness, per 100 lbs. | 08 |
| Iron and Iron Pipe, per 100 lbs. | 08 |
| Iron Safes, per 100 lbs. | 08 |
| Jugs, Jars, etc., crated or boxed, Owner's Risk, released, per 100 lbs. | 15 |
| Loaded Shells, per 100 lbs. | 08 |
| Lumber, per 100 lbs. | 08 |
| Lime, Cement and Plaster, per 100 lbs., Bessemer Division. | 08 |
| Lime, Cement and Plaster, per 100 lbs., other Division. | 05 |
| Mattresses, per 100 lbs. | 08 |
| Meat, in bulk or box, per 100 lbs. | 08 |
| Melons, each | 02½ |
| Marble, crated or boxed, Owner's Risk, released, per 100 lbs. | 15 |
| Organs, crated or boxed, Owner's Risk, released, per 100 lbs. | 15 |
| Organs, not crated or boxed, each | 50 |
| Oils, in barrels or cans | 08 |
| Produce, Fruit, etc., per 100 lbs. | 08 |
| Pianos, boxed, Owner's Risk, released, per 100 lbs. | 15 |
| Sewing Machines, crated, Owner's Risk, released, each | 15 |
| Sewing Machines, not crated, each | 25 |
| Soda Water, in cases, per 100 lbs. | 10 |
| Stoves and Stoveware, per 100 lbs. | 15 |
| Split Baskets, per 100 lbs. | 25 |
| Tinware, per 100 lbs. | 15 |
| Trunks, each | 10c. to 25 |
| Terra Cotta Pipe, Owner's Risk, released, per 100 lbs. | 08 |
| Terra Cotta Pipe, not released, per 100 lbs. | 15 |
| Wagons, per 100 lbs. | 15 |
| Whiskey, Wines, etc., in bbls. or kegs, per 100 lbs. | 08 |
| Whiskey, Wines, etc., in bottles or boxes, per 100 lbs. | 15 |

All empties must be prepaid. All goods must be marked by consignor. No package for less than 10 cents.

Car load shipments, \$2.00 per car to Cotton Factory, Elyton and Greens, \$5.00 per car to points beyond.

\$7.50 per car Bessemer to Birmingham and all intermediate sidings, except Wilkes.

On Ensley Division, \$2.00 per car switching in Pratt City from Birmingham Southern Railway.

\$7.50 per car Birmingham to Ensley or Pratt City.

On East Lake Division no freight will be handled in car load lots except from Wauhoma to East Lake. Price \$2.00 per car.

On Gate City Division loaded cars are handled at East Birmingham only, at \$2.00 per car.

Form 55
BIRMINGHAM RAILWAY, LIGHT & POWER CO.
Division.
Birmingham, Ala. 190
Received from
consigned to
Station
the following packages (contents and value unknown), in apparent good order:

| Marks | Articles | Weight | Charges |
|-------|----------|--------|---------|
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

No liability will be assumed for wrong carriage or wrong delivery of goods marked incorrectly, or with initial or number. The undersigned expressly state that they are not responsible for goods put off at way stations, and all goods to way stations must be prepaid. All goods shipped released unless otherwise specified.

Agent.

Form 58
BIRMINGHAM RAILWAY, LIGHT & POWER CO.
Division.
Birmingham, Ala. 190
Received from
consigned to
Station
the following packages (contents and value unknown), in apparent good order:

| Marks | Articles | Weight | Charges |
|-------|----------|--------|---------|
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

No liability will be assumed for wrong carriage or wrong delivery of goods marked incorrectly, or with initial or number. The undersigned expressly state that they are not responsible for goods put off at way stations, and all goods to way stations must be prepaid. All goods shipped released unless otherwise specified.

Agent.

Ala. 190
To
Ala.
DEAR SIR:
Hereafter you will please route all shipments to me via the last freight line of the BIRMINGHAM RAILWAY, LIGHT & POWER COMPANY's last freight line.

Ala. 190
To
DEAR SIR:
Hereafter you will please route all shipments to me via the last freight line of the BIRMINGHAM RAILWAY, LIGHT & POWER COMPANY's last freight line.
Respectfully,

Division
BIRMINGHAM RAILWAY, LIGHT AND POWER CO.

DAILY REPORT OF FREIGHT.

Station. 190
No. of Way Bill To Prepaid To be Collected Total
Agent.

FREIGHT BILL

Slip No.

M. Station. 190
To BIRMINGHAM RAILWAY, LIGHT & POWER CO., Dr.
For Transportation on the following Articles of Freight, viz:
Way Bill 190
Consignor
Original Point of Shipment
All Bills Payable in Bankable Funds
Received Payment for the Company, Agent.

| Weight | Rate | Freight and Charges |
|--------|------|---------------------|
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |

FREIGHT RECEIPT

Slip No.

M. Station. 190
Received of the BIRMINGHAM RAILWAY, LIGHT & POWER CO.,
In Good Order, the following Described Property:
Way Bill 190
Consignor
Original Point of Shipment
All Bills Payable in Bankable Funds

| ARTICLES | Weight | Rate | Freight and Charges |
|----------|--------|------|---------------------|
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

BIRMINGHAM RAILWAY, LIGHT & POWER COMPANY

Division No. 190
Local Freight Way-Bill To Date
Consignor Marks Consignee Articles Weight Rate per 100 lbs. Charges Prepaid Collect

Form 150

Railway Department

BIRMINGHAM RAILWAY, LIGHT AND POWER CO.

Daily Recapitulation of Freight Received and Forwarded

Birmingham, Ala. 190

| | To Bessemer | To Woodward | To Emer Div Locally | To Ensley | To Ida | To Wylam | To Ensley Div. Locally | To | To | TOTAL |
|--------------------|-------------|-------------|---------------------|-----------|--------|----------|------------------------|----|----|-------|
| Freight Forwarded | | | | | | | | | | |
| " Delivered | | | | | | | | | | |
| Previously Rep't'd | | | | | | | | | | |
| Total to Date | | | | | | | | | | |
| Tonnage Forward'd | | | | | | | | | | |
| " Delivered | | | | | | | | | | |
| Previously Rep't'd | | | | | | | | | | |
| Total to Date | | | | | | | | | | |
| Articles Forwarded | | | | | | | | | | |
| " Delivered | | | | | | | | | | |
| Previously Rep't'd | | | | | | | | | | |
| Total to Date | | | | | | | | | | |
| Steam Cars Hand'd | | | | | | | | | | |
| Previously Rep't'd | | | | | | | | | | |
| Total to Date | | | | | | | | | | |

Numbers and Initials.
Gen'l Frt. Agt.

Special rates are made on car load shipments. All rates are subject to change without notice.

Trains for Ensley, Pratt City, Thomas and Wylam, leave Birmingham 6 a. m., 9 a. m., 1 p. m., 4 p. m.

For East Lake, leave Birmingham 10:45 a. m., 3:15 p. m.

For Bessemer, leave Birmingham 5:30 a. m., 10:45 a. m., 2:45 p. m.

For Gate City, leave Birmingham 10:45 a. m.

An attractive card advertising the freight business and naming the rates on the principal articles for shipment, is tacked up in the warehouses and offices of the various merchants.

A freight solicitor is employed, who is provided with an advertising card and a stub book which contains requests signed by suburban merchants requesting their freight shipped by the Birmingham Railway Light & Power Co.'s fast freight.

The freight business is steadily on the increase and new facilities have to be brought into service from time to time to take care of the business.

The freight business pays very well indeed, as only about 20 per cent of the gross receipts are necessary to conduct the department.

Owing to the careful system of checking, very little freight is lost or damaged.

Summing up our conclusions, we make the assertion that if it pays now in a great many instances, it can be made to pay in a great many more where it is not now paying, and that many roads that are not giving it any attention at present will soon adopt it.

DECORATED CAR FEATURE OF CELEBRATION.

There was an "old-home week" celebration at Stow, Mass., the last of July, the success of which was augmented by the facilities afforded by the Concord, Maynard & Hudson Street Railway Co., especially on the occasion of a trolley ride on the evening of July 29th. A novel feature of the trolley trip was the car on which the band rode. This was a flat construction car which had been artistically decorated at the company's barn, with bunting, shields, rosettes and spread eagles, by the superintendent, Mr. John W. Ogden. At the top of each side of the car a strip bore the inscription, "Stow Old Home Week." Mr. Ogden states that the result proved that a little effort put forth in this way will bring many dollars in return, at the same time showing the public that the railway company is anxious to cooperate with it for mutual benefit. On the occasion in question the trolley procession comprised a special parlor car, the band car and five others, brilliantly illuminated. About 400 persons enjoyed the ride. The residents of Stow were enthusiastic in praise of the company's endeavors and acknowledged that the trolley trip contributed more than one-half to the week's enjoyment. For a souvenir the company issued half-tone pictures of the decorated band car.

W. R. Kerchner, second vice-president of the Columbia Machine Works & Malleable Iron Co., of Brooklyn, was in evidence.

THE PRODUCTION AND DISTRIBUTION OF ALTERNATING CURRENT FOR LARGE CITY SYSTEMS.

By Richard McCulloch, Assistant General Manager, Chicago City Ry.

The large city street railway system of today is due to a process of evolution. In most cities twenty years ago the business of transporting passengers through the streets on rails was divided up among several companies operated with more or less skill, each independent of the other, and each striving after the other's business and paralleling its tracks. When the electric era came on, motive power was changed, and a new equipment selected according to the judgment of the manager, with no particular regard for standardization of apparatus, and without any thought toward a unity of purpose in the operation of the



RICHARD MCCULLOCH.

several properties. And so it comes about that when the several roads are consolidated into one system, as has happened in all except a few of our large cities, the manager of the consolidated property finds himself in possession of all sorts and styles of equipment, chosen with a greater or less amount of wisdom, and an aggregation of power plants and feeder systems which, how-

systems is the task of today. The question of power plants and distribution is the most difficult of solution, and in taking it up several plans suggest themselves.

(1) To keep the best of the present plants, add to them as necessary, and adjust the distribution systems from them.

(2) To abandon the present plants, constructing an entirely new plant with a new distribution system leading from it, using the old plants as sub-stations if they are suitably located.

(3) A combination of these two systems, which consists in the beginning of a new plant, the plans of which contemplate the operation of the entire system from it at some future date; at the present time, however, only putting enough apparatus in the station to take care of the growth of the system and adding to it from year to year as other stations are abandoned.

Either of the latter schemes would lead us to consider the generation of alternating current and its transmission to sub-stations, and any change in the power plant system involves a discussion of the relative advantages of power generation in one or several power plants. This question has lately received a great deal of attention in the engineering world, and has been thoroughly discussed from an engineering standpoint.

The great and all-important question which confronts the manager and which the engineer should assist him in solving, is how to transport passengers with the greatest degree of safety, reliability and economy. The power plant and transmission system constitute only two links in the chain of many devices necessary to accomplish this task, and should not be given undue importance in the laying out of the general scheme. Economy of generation or transmission of power should never be sought after at the expense of safety or reliability of operation. True engineering should take into account the financial questions involved in the operation of the property, but unfortunately there are fads and fashions in engineering, just as in matters of dress. Large questions of policy which should be solved by sound engineering have sometimes been settled from a desire to be in the prevailing fashion or to have a power plant which will eclipse in daring the last one built. This cannot always be laid at the door of the engineer, who is sometimes called into consultation only after the great fashions have been disposed of, leaving him only the details. All this, perhaps, has little to do with the subject of this paper, but it is given as a preface, because, after all, more important than the question of how to generate and

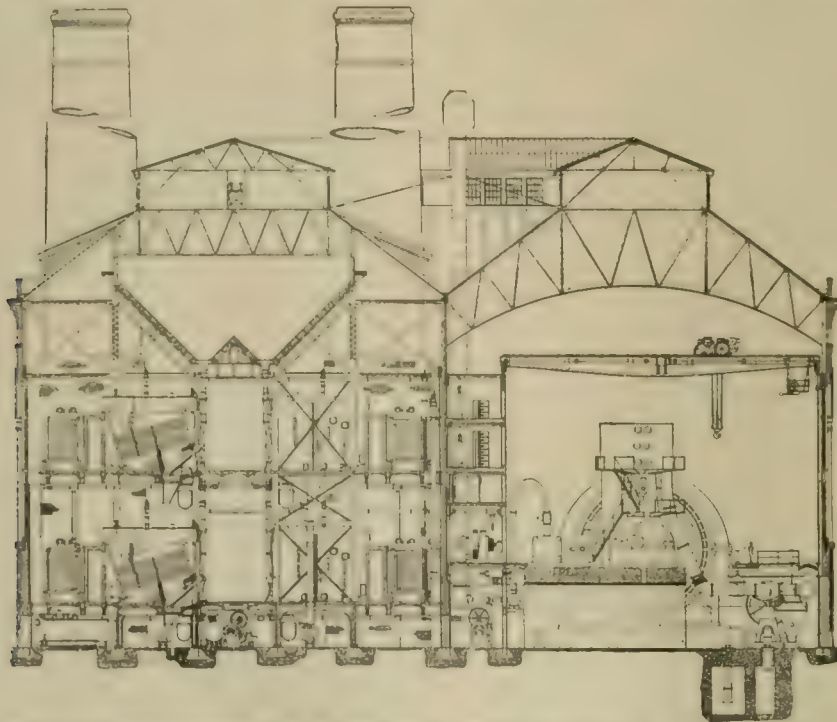


FIG. 2.—CROSS SECTION OF MANHATTAN POWER STATION. CAPACITY, 40,000 KW.

ever suitable they might have been for the individual roads, do not lend themselves readily to an economical operation of the property as a whole. The weeding out and the standardization of apparatus, and the adjustment of generation and transmission

transmit alternating current is whether or not to generate it at all.

In this paper the alternating current will be considered to be made by steam power at a central power station, transmitted at

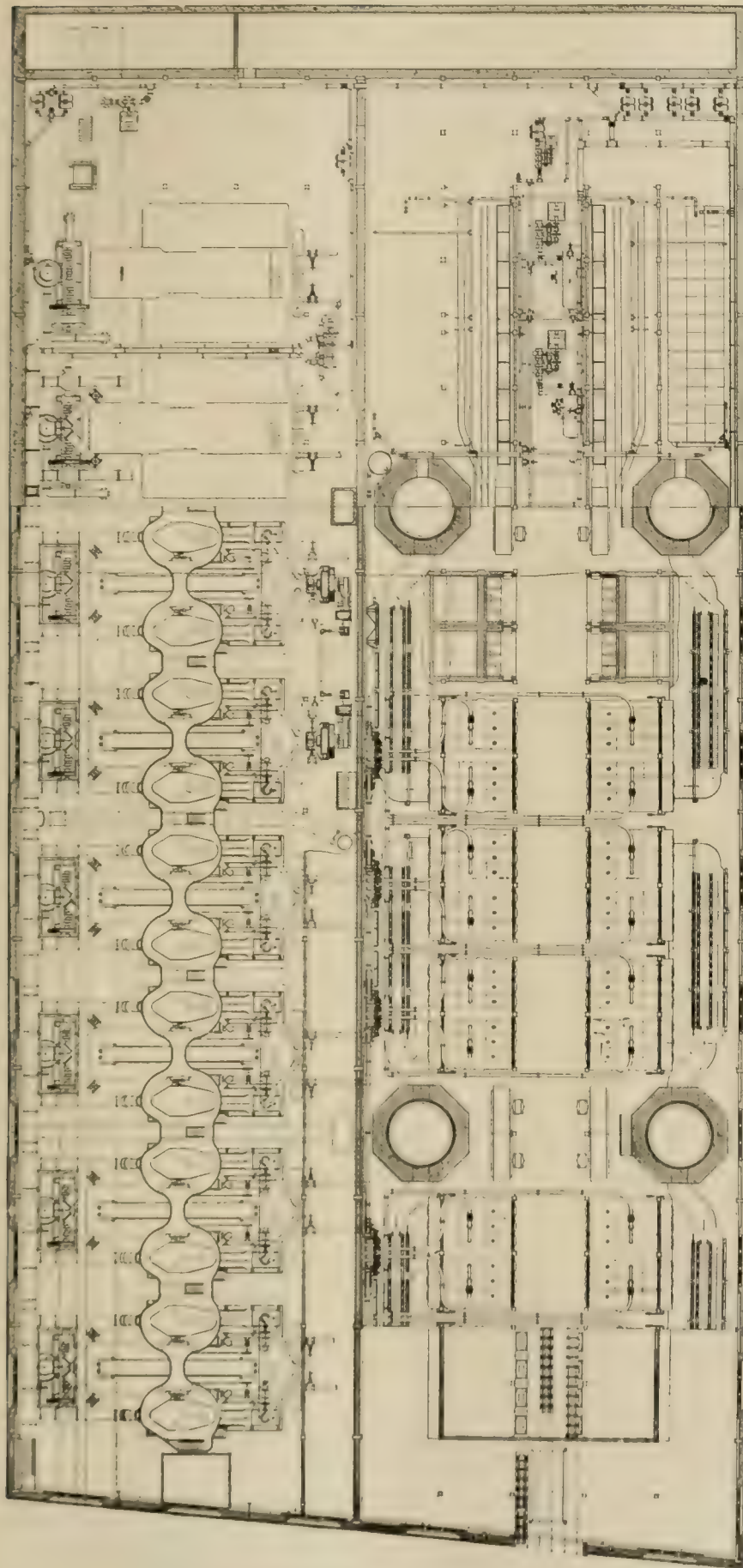


FIG. 1 - PLAN OF MANHATTAN POWER STATION. CAPACITY, 40,000 KW.

a high voltage to sub-stations located in different parts of the territory to be served, there converted into 575 volt direct current and distributed by means of feeders to the trolley sections in the usual way.

The use of alternating current motors for street cars, although the subject of a great deal of experimenting, has not yet been successful. In Switzerland on an interurban road and in northern Italy on a steam road which has been converted to electric traction, alternating current motors are used, and their use was seriously considered in the electric equipment of one of the London underground roads formerly operated by steam locomotives. Where the stops are frequent, however, as is the case in city service, in the present state of the art the use of alternating current motors is impracticable.

For railway and power transmission work, the advantage of transmission by alternating current is that small high-tension feeders from the central station and short direct current feeders from the sub-stations are substituted for the long, heavy lines of feeders leading from the central direct current station. The problem is more one of current transmission than of current production.

The discussion will be taken up under the following headings:

The Production of Alternating Current.

The Transmission of Alternating Current.

The Relative Advantages of Alternating and Direct Current Transmission.

As a complete description of an alternating current station, transmission line and sub-station would be very lengthy, and of no great novelty, the following discussion will call attention only to those general points which are most remarkable in present practice and those which should be especially looked after in the design:

The Production of Alternating Current.

Site of Station. The central station should be located where coal may be obtained by rail or water, or both, and where large quantities of water may be obtained for condensing purposes. If a location fulfilling these requirements may be obtained in any large city near the center of gravity of the load, well and good; if not, it is not so serious as it would be if the plant were designed to furnish direct current. The location should not be in a residence district where the plant is apt to become a nuisance, and physical obstacles to the laying of feeder mains, such as rivers, bridges, etc., should be avoided if possible in the selection of the site.

In the general principles of its construction, the alternating current plant does not differ from the direct current plant, except that the amount of power installed and the size of units usually warrants a magnitude of construction rarely attempted in direct current plants. We have the same boiler plant, the same engines, similar generators, and a switchboard which transmits alternating current to feeders instead of direct current.

Coal Supply.—There is no point more important to the continuous operation of a power plant than regularity and infallibility in the delivery of coal. The amount of coal coming to one of our large power plants is such that extraordinary means must be taken for quickly unloading and handling it. If coal is delivered by rail, a large switch-yard must be provided for handling the cars, and if bottom dumping cars cannot be depended upon, some form of a car tippie for quick unloading should be installed. The tippie used on the ore docks suggests itself for this purpose. If coal is delivered by water, clam shell drop buckets are used for unloading the barges. Those of us in the west learned by last winter's experience that we must expect at times to be obliged to burn all sorts of coal in all sorts of conditions. It is, of course, preferable that the coal should be delivered crushed ready for the automatic stokers, but provision should be made in the lay-out of the station for a coal crushing plant to handle lump and mine run coal. The quantity of coal burned in the large stations is such that if an attempt is made to furnish storage capacity within the plant for even a modest period of time, the size and cost of the building is enormously increased by the large coal tank perched high in the air above the boilers. It is perhaps a better plan if the location of the power plant permits it, to carry only a few days' supply in the tank in the boiler room, and provide a separate building for the coal reserve, connected by conveyors to the boiler room, where the coal may be kept nearer the ground, and the cost of the iron work for its storage diminished.

The large power plants in the eastern cities burn buckwheat anthracite while those in the west burn bituminous screenings, which term includes all that will pass through the $1\frac{1}{4}$ -in. screen at the mine, including the dust and fine coal made by the cutters. The plant should be laid out for the kind of coal it is intended to burn, and in cases where the cities are located so far from the mines that the cost of transportation becomes a large factor in the cost of the coal, it would pay to devote a great deal of attention to a determination of what is really the most economical coal to burn, and not assume, as is often done, that that coal is the best which can be had at the lowest price per ton.

Building.—The power plant building should be substantial and fireproof and just as ornate as the directors of the company wish to authorize, it being remembered that although it is creditable to a railroad company to have a handsome power plant, the gross receipts are not increased nor the operating expenses decreased thereby. The plant should be entirely closed and should be constructed with the idea that all employees and visitors should enter by one door and be checked in and out, just as in a well managed factory. When this door is closed the plant should be impregnable, and conveniences should be arranged so that if necessary the entire operating force can be lodged and fed in the building.

Coal and Ash Handling Machinery.—The apparatus to handle the coal and ashes of a large power station constitutes a formidable plant in itself. It is, perhaps, better in a large installation to keep the coal and ash handling apparatus independent, as ashes are much more abrasive than coal, and it is better to leave either set of apparatus free so that it can be used at any time. Some form of the self-dumping bucket conveyor is in general use for coal, while various apparatus has been installed for handling ashes.

Mechanical Stokers.—The use of mechanical stokers in the large plants of today is universal. They are more efficient on low grade fuel, and by their use and that of coal and ash handling machinery, the employment of a large number of laborers in the boiler room is dispensed with, and the likelihood of labor troubles diminished. In fact, if it were necessary to handle the coal and ashes, and fire the boilers by hand, it would be difficult to get

men enough into some of our large plants to keep them going, and these men would be a constant source of annoyance.

Boilers.—Some form of water tube boiler is usually chosen for large plants because it may be made in large sizes without danger of explosion, and occupies less ground space per horse power than the fire tube boiler. There is nothing remarkable about the boiler installation for an alternating current plant except that the size of the plant and the size of the units is such that a two-story boiler room is usually required. This feature, however, has already been introduced in some of our large direct current plants. The question of pressure and superheated steam, while naturally belonging to boilers, will be taken up in the discussion of steam engines.

Engines.—Until quite recently the only prime mover for driving generators of large size in railway steam plants was the compound, condensing steam engine. The triple expansion engine has been used in no large installation. In one recent installation a duplex compound engine, with the two low pressure cylinders horizontal and the two high pressure cylinders vertical, drives the generator. This is a mammoth unit of 5,000 kw., and is the largest which has been built.

Steam Turbines.—Of late years, however, improvements in manufacturing facilities and our increased knowledge of the properties of steam have made possible the utilization of the steam turbine, which, remarkable to state, makes use of the principle upon which the first steps toward the application of steam as a prime mover was based. It seems as if we are on the verge of a radical change in the application of steam, as the introduction of the turbine makes an entire change in the usual layout of the power station. And, as in the case of all great inventions, necessity was the mother of this one. The steam engine has reached such a size that for large units it is heavy, clumsy, delicate of adjustment and requires constant skilled attention. On account of the inertia of the valves and reciprocating parts, the speed of the steam engine must be kept so low that the cost of the electric generator is greatly increased. In fact, it would seem that the limit in the size of steam engines for driving electric generators is about reached. If the claims of its advocates are only partly realized, the steam turbine is the ideal machine for driving alternating current generators. The efficiency of the steam turbine is claimed to be fully equal to that of the best steam engine; the turbine being a rotary machine, the thrusts caused by the reciprocating motion of the steam engine are avoided, thus relieving the foundation and frame of that strain, and facilitating the operation in parallel of alternating current generators; foundations and buildings for turbines are cheaper than for engines; as the electric generator is driven by the turbine at a much higher speed than by the engine, its cost is less; there being no valve gear and reciprocating parts in connection with the turbine, its maintenance is less, and there is no need of the skilled attendance during operation, so necessary with the engine; as no oil is needed for the lubrication of the turbines, the steam may be condensed in surface condensers and used over again in the boilers, thus affording practically distilled water for boiler use. All of these claims are being made for the turbine, and although all of them may not be fully realized, it is likely that there will be such advantages in the use of steam turbines that no large alternating current plant will be built in the future containing any other prime mover. One of the most important advantages of the steam turbine for electric work is that between half load and fifty per cent overload its efficiency is nearly constant, and that even at less than half load its efficiency is good.

Superheated Steam.—The amount which steam may be superheated when used for driving steam engines is limited on account of the carbonizing action of the steam on the cylinder and valve lubricants. With a special valve gear constructed for use with superheated steam, steam superheated 150 degrees Fahrenheit above the temperature corresponding to its pressure may be used. With steam turbines any superheat which it is practicable to obtain may be used, and great economy is effected by its use. Some of the makers of water-tube boilers now make an attachment to be placed in the path of the heated gases within the brickwork of the boiler for superheating the steam. The amount of superheat which can be obtained by this device depends upon its heating surface, but enough heating surface may

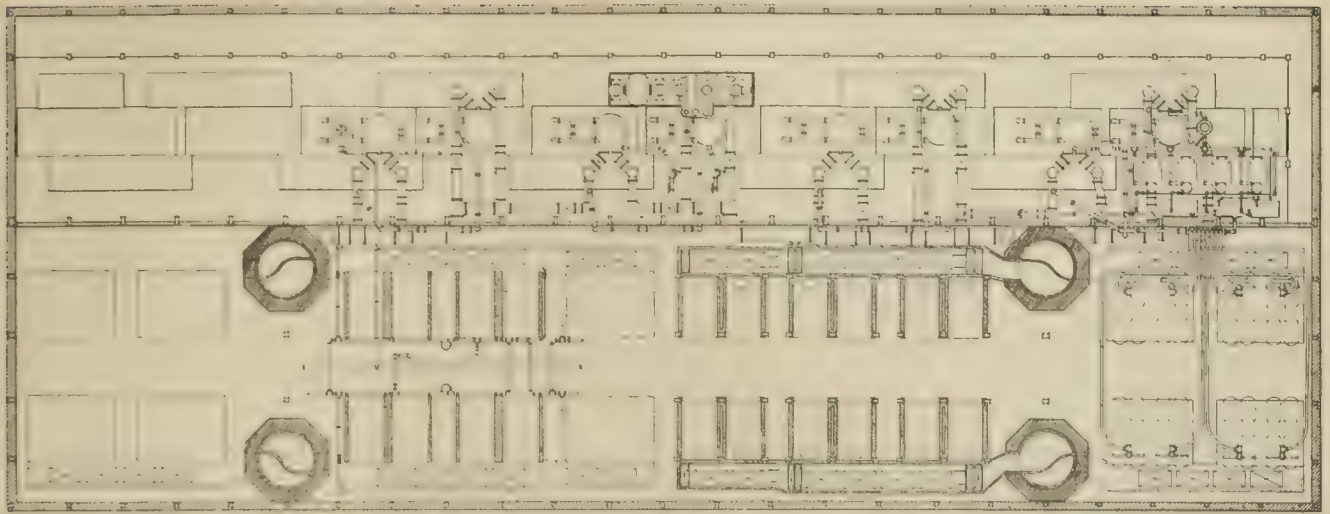


FIG. 3.—PLAN OF CHELSEA STEAM TURBINE STATION, LONDON. CAPACITY, 57,000 KW.

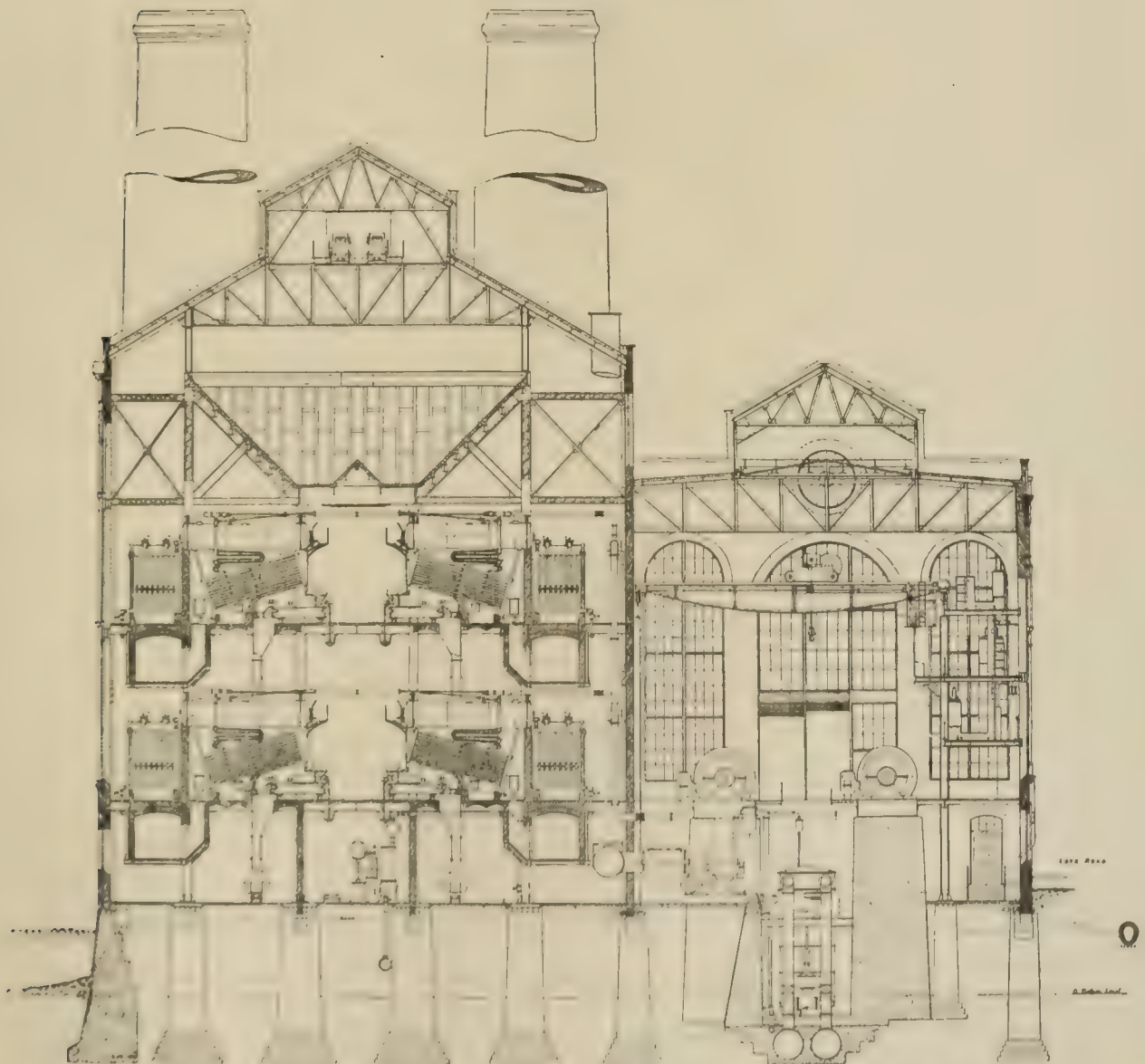


FIG. 1.—CROSS SECTION OF CHELSEA STEAM TURBINE STATION, LONDON. CAPACITY, 57,000 KW.

be placed within the brickwork of a boiler to obtain about 200 degrees of superheat. If it is desired to obtain a greater degree of superheat than this, it is advisable to use an external superheater.

Condensers.—In order to obtain the maximum economy by the use of steam turbines, as rare a vacuum as possible should be maintained by the condenser, the usual specification calling for 28 in. This necessitates a larger and more expensive condenser than is usually installed with the same capacity in steam engines. The economy of the steam turbine increases very rapidly, both with the quantity of superheat and the rareness of the vacuum, and the limit of 28 in. has only been set because it is the limiting vacuum which it is practicable to maintain.

Steam Pressure.—Economy in the use of steam also increases with the steam pressure. With compound condensing engines the common pressure in use is 175 lb., while with steam turbines the economical point seems to be about 200 lb.

Piping.—The design and installation of the piping in a large, high pressure plant necessitates the greatest degree of skill. The old fads of double-headers, auxiliary headers and loop systems have expired, and now the best practice is to make the piping as short and simple as possible, and make up in excellence of construction the security, which it was once sought to obtain by doubling the installation. In some of the large plants recently installed, the condensers have been set directly over tunnels connected with the water supply and the heavy piping necessary for the condensing water has been entirely done away with.

Auxiliaries.—The auxiliary apparatus, such as coal crushers, coal and ash handling machinery, stoker machinery, boiler feed pumps, condenser pumps, air pumps, cranes, exciters, elevators, etc., require a large amount of power for their operation, and the piping for the engines furnishing this power is expensive of installation and maintenance. It is recommended that these auxiliaries, so far as possible, be driven by motors, preferably induction motors. There will be a gain in economy over steam operation, and a large amount of high pressure steam piping will be done away with. Any machine which should run at a reasonably constant speed can be operated by means of an induction motor, and one which requires a variable speed can be run with a direct current motor.

For one large alternating current plant, the construction of which is now pending, it is proposed to furnish current for the auxiliaries and for the excitation of the generators as follows: Small alternating current generators, driven by turbines, are to be installed to furnish current of a voltage suitable for driving all the induction motors in the plant. Rotary converters, driven by this current, furnish the direct current, probably at 250 volts, for exciting the main generators, and for lighting the plant. A storage battery installed on this 250-volt circuit steadies any fluctuations and furnishes a reserve in case of a break-down. In this way the running of the auxiliaries, the excitation of the generators and the lighting of the plant are made entirely independent of the main current supply.

Division into Units.—Large alternating current city plants as at present installed represent a vast quantity of power under one roof. Any accident which might cripple the plant would have very serious results, and affect a large number of people and industries. The greatest care should be taken to avoid such a possibility. In order to prevent, as far as possible, the crippling of the entire plant by an accident to any part of it, some of the more recent installations have been divided into units, each unit consisting of a generator, engine and condenser, together with the necessary number of boilers to furnish steam for the engines and the auxiliaries in connection with the boilers. It is intended that each unit shall be independent of any other; in fact, there will be as many separate power plants as there are units. An emergency steam connection is made between the steam headers, but for emergency use alone. The unit method minimizes the danger of a complete shut-down of the plant, but the price paid for it is the greater amount of reserve apparatus necessary, and also a somewhat poorer economy if the unit idea is carried out in detail as to feeders and sub-stations.

Frequency.—By common consent a periodicity of 25 cycles per second has been adopted in the United States for alternating current power work. In Europe there seems to be no fixed standard,

each installation following the ideas of its designer. Rotary converters work better at low frequency, and in a combined railway and lighting plant where alternating current lighting is to be done it is best to generate at 25 cycles, use rotary converters at this periodicity for the railway and direct current lighting, and install motor generators to give a frequency of 60 cycles for any alternating current lighting.

Phase.—Where the generator voltage is used in transmission, it is the accepted practice to generate three phase current. Where the generator current is stepped up for transmission, it is the custom with some manufacturers to generate two phase current and in stepping up the current for transmission to change it to three phase. In most city installations the desired transmission voltage is less than 15,000, and as this voltage can be obtained with modern insulation in well designed generators, unquestionably the best practice is to generate at the transmission voltage, because this obviates the use of step-up transformers. Where the desired transmission voltage is above that which can be obtained in the generator, it is common to generate at a low voltage and raise to the transmission voltage by means of step-up transformers.

Operation of Generators.—For railway and power purposes there is no great difference between the running of alternating and direct current generators. If there is any difference it should be in favor of the alternating current machine, owing to the substitution of rings for the commutator, and the slightly greater efficiency owing to the absence of brush friction and losses. The large modern machines are made of the revolving field type, the revolving parts carrying low voltage current and the high voltage confined to the stationary parts with little risk of accidental contact with persons. With engines of good regulation and similar types of valve gear there is no difficulty in running engine driven alternating current generators in parallel, and with generators driven by turbines which have a constant impulse throughout the entire revolution, operation in parallel becomes a simple matter.

Switches.—The handling of high voltage current in large quantities is quite a serious question, and the switches and switching devices of a large alternating current station have become one of the most important parts of the plant. In the more recent installations, the switch contacts are broken in oil and each switch is built in a brick fireproof compartment. The bus bars are divided into several sections, so that in case of a short circuit any section may be isolated. All switches are opened and closed by means of a motor running on an auxiliary circuit controlled by the switch board attendant. No high voltage current is brought to the switch board.

Central Station Plans.—In order to indicate the general trend of modern practice in central station design, there are published with this article the following power station plans:

Figs. 1 and 2 are a plan and cross-section of the Manhattan Power Station, New York City. This installation is the latest large American installation and represents the highest development of an engine-driven station. It contains 40,000 kw., divided into eight 5,000-kw. units, and covers about 82,400 sq. ft., or 2.06 sq. ft. per kilowatt. The cubical contents of the building are about 8,580,000 cu. ft., or 215 cu. ft. per kilowatt capacity.

Figs. 3 and 4 show the plan and cross-section of the Chelsea Station, London, now under construction. This station is to be equipped with ten 5,500 kw. turbine-driven units and one smaller unit, making a total capacity of 57,000 kw. These turbines are of the horizontal shaft type, and this is the first large station to be entirely equipped with steam turbines. From a published report the ground area is 1.36 sq. ft. per kilowatt, and the cubical contents of the building 139 cu. ft. per kilowatt. These measurements include an office building adjoining the station.

Figs. 5 and 6 are sketches showing the proposed arrangement of a station to contain eight 5,000-kw. steam turbines of the vertical shaft type. This has the same capacity as the Manhattan and it would be interesting to compare the relative sizes of the two buildings. The turbine station covers an area of 58,800 sq. ft. or 1.47 sq. ft. per kilowatt. The cubical contents of the building are 5,403,000 cu. ft., or 135 cu. ft. per kilowatt. This station also contains space for 12,000 kw. sub-station capacity.

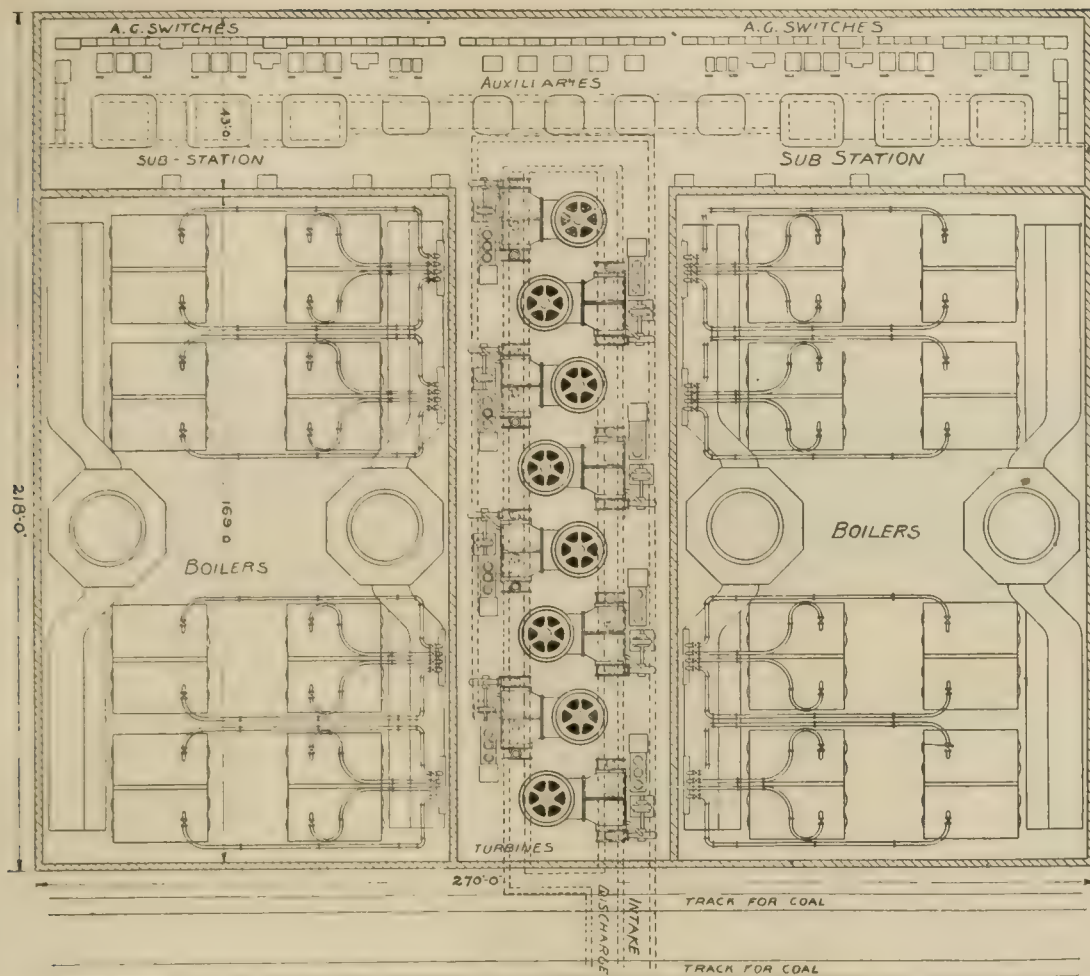


FIG. 5. PLAN OF PROPOSED TURBINE STATION AND SUBSTATION. CAPACITY, 40,000 KW. GENERATORS AND 12,000 KW. ROTARIES.

The Transmission.

Transmission Voltage. In a few words the advantages which alternating current transmission offer lie in the possibility of transmitting large amounts of power over long distances with comparatively small wire. Since the size of the wire necessarily decreases as the transmission voltage increases, there seems to

be no reason why for city use, where heavy loads must be transmitted, the limiting transmission voltage should not be the limiting voltage at which current can be produced in the generator, except that voltages above 15,000 require cables of high cost. It is unquestionably the best practice to carry the high tension cables underground in conduits. There are some large cities

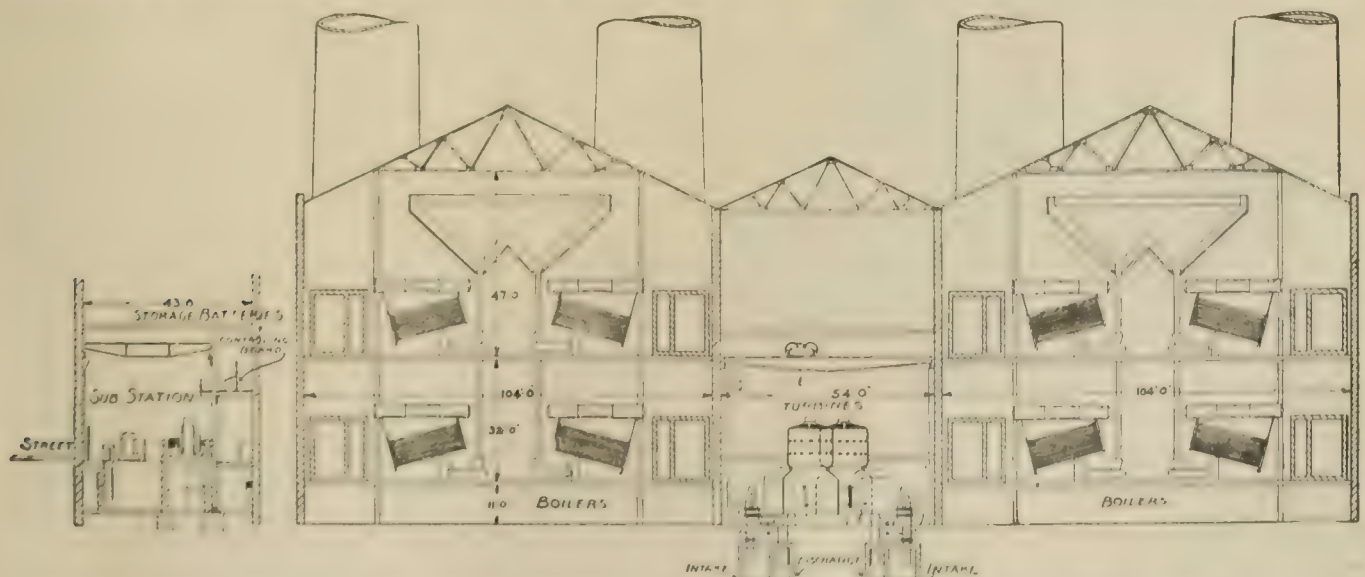


FIG. 6. PROPOSED TURBINE STATION AND SUBSTATION. CAPACITY, 40,000 KW. GENERATORS AND 12,000 KW. ROTARIES. SECTIONS THROUGH BOILER AND TURBINE ROOM, AND THROUGH ROTARY ROOM.

where alternating current at a pressure of 5,000 volts or higher is carried on overhead wires strung along city streets, but although quite a sum of money is saved in the initial cost of feeders, the true economy of such an installation is doubtful. Serious interruptions to traffic and perhaps injury to the central station and sub-station machinery are invited by short circuits and grounds from fires, storms, lightning and accidental crosses with other wires, while the danger to human life is such that the railway company is liable at any time on account of some fatality to be ordered to place the high tension wires underground at a greater expense than if it had been done in the first installation.

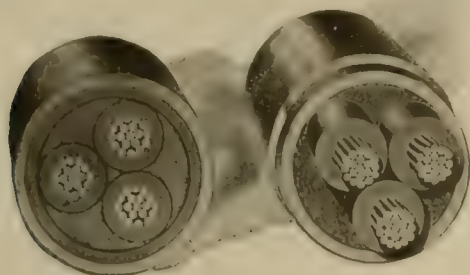


FIG. 7.

Transmission Cables.—As by three phase transmission a minimum of copper transmits a given amount of power with a given loss, this is the system which has been generally adopted for transmission. Where the feeders are placed underground, three conductor cables are used, the three conductors being separately insulated and then surrounded by a lead sheath. Formerly rubber was the insulation used for this purpose, but paper has come rapidly to the front and at present paper insulation is preferred by many to rubber. Paper does not soften under heat like rubber, and the cable has the advantage of being cheaper than rubber and of having a somewhat greater overload capacity. The weak part of any cable is the joint, and great care should

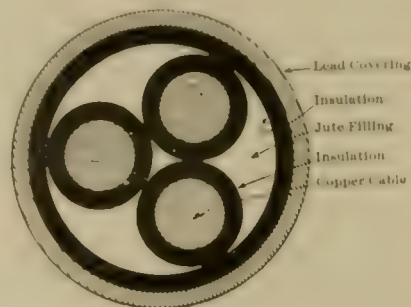


FIG. 8.

cable which it is advisable to install in an ordinary duct, is one in which each conductor has a No. 0000 section.

Tables Nos. 1 and 2 give data and cost of rubber and paper insulated three-conductor, lead-covered cables with No. 00 conductors, for voltages ranging from 5,000 to 20,000. It will be observed that above 10,000 volts for rubber and above 15,000 volts for paper insulated cables, the cost increases so rapidly as almost to make these the limiting voltages for underground distribution.

Figs. 7 and 8 illustrate a three-conductor, lead-covered cable.

In some installations one cable for each rotary has been run between the power plant and the sub-station. In other instances a standard size of cable has been adopted for the system, and a number of cables run to each sub-station corresponding to the estimated load. An extra cable should always be provided, so that the maximum load of the sub-station may be carried with one cable out of service.

Conduit.—Various forms of duct have been used for underground conduits. The old wooden pump-log ducts have been abandoned because the wood rots and the juices in the wood act chemically on the lead covering of the cable. The ducts at present laid are usually of cement-lined iron pipe, tile in either single or multiple duct, and concrete tubes. It pays to imbed the ducts well in concrete, so that an excavation under the conduit line will not cause settling. The spacing of the brick man-holes is usually determined by the obstructions met with in the street, but may be put down as averaging about 400 ft. apart. In some recent installations great precautions have been taken to avoid the danger of fire and damage to other cables, arising from a short circuit in one of the high tension cables. The high tension cables have been kept to themselves and at the manholes they have been wrapped with asbestos cloth. The destructiveness of a short circuit on underground high tension cables has not proved as great as was anticipated. In one instance a laborer drove a pick through a 6,000-volt three-conductor cable without experiencing any shock, or producing any great amount of pyrotechnics. It was fortunate for the laborer that the pick had a long wooden handle. The lack of destructiveness in the arc is probably due to the quick action of the automatic circuit breakers at each end of the cable, and also to the fact that although the pressure is of great intensity, the current flow is small. Fig. 9 shows various sections of duct for underground conduits.

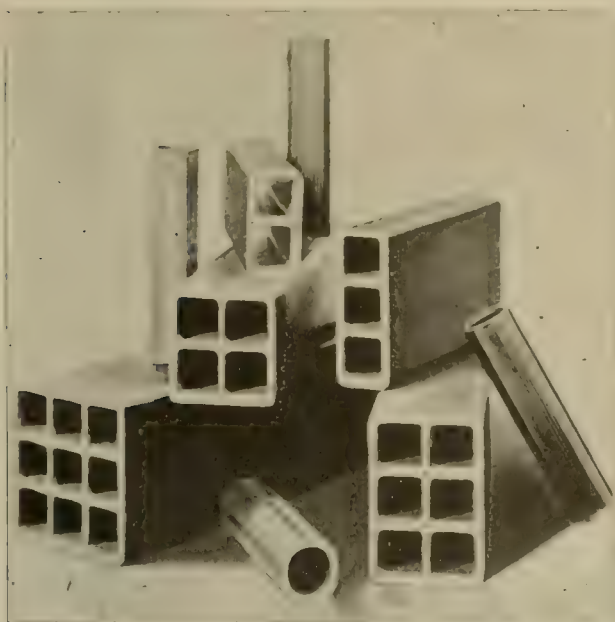


FIG. 9.—DUCTS FOR UNDERGROUND CONDUIT.

be taken in splicing to exclude all moisture. This is especially true of paper insulated cables.

In estimating the sizes of cables for carrying the high tension current it is usually necessary to figure the cable for ampere carrying capacity instead of for drop in voltage, as is customary in long distance transmission. This is on account of the short transmission distances as compared with the high transmission voltage. The amperes per phase for three phase transmission may

Sub-Stations.—The location and number of sub-stations might form the subject of an interesting discussion as to the relative costs of interest on feeder investment, sub-station equipment and maintenance and operation of the sub-station were it not for the fact that for city use the location of the sub-stations is pretty closely determined by a study of the density of the traffic. The congested points are closely marked, but where doubt exists as to the wisdom of several locations, an estimate of the costs

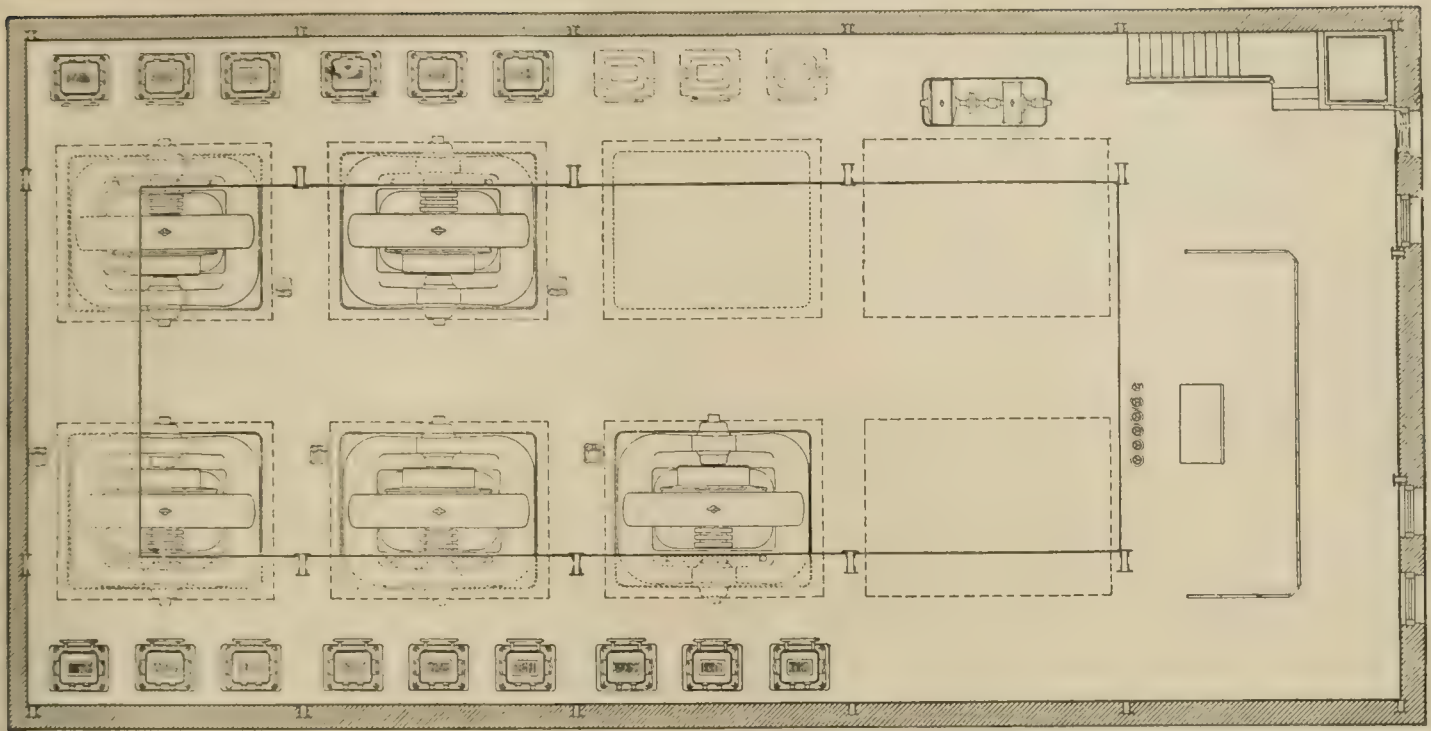


FIG. 10 PLAN OF SUBSTATION, MANHATTAN RAILWAY. CAPACITY, 12,000 KW.

in either case, together with the expense of maintaining and operating the sub-stations, will quickly determine which is the better plan.

In interurban construction there are two different opinions maintained regarding sub-stations. One is that sub-stations should be miniature power stations, contain a large quantity of apparatus, in charge of skilled attendants, and be spaced at rather long intervals along the road; the other idea is that sub-

stations should be frequent, contain little reserve, and should be taken care of by the station agent or some other employe, whose principal duties are not the caretaking of the sub-station. In city practice, however, there is no question but that the sub-station should be designed and built with as much care as that used in the power plant construction, that it should contain reserve apparatus enough to tide over any ordinary break-down, and that it should be constantly in charge of skilled attendants.

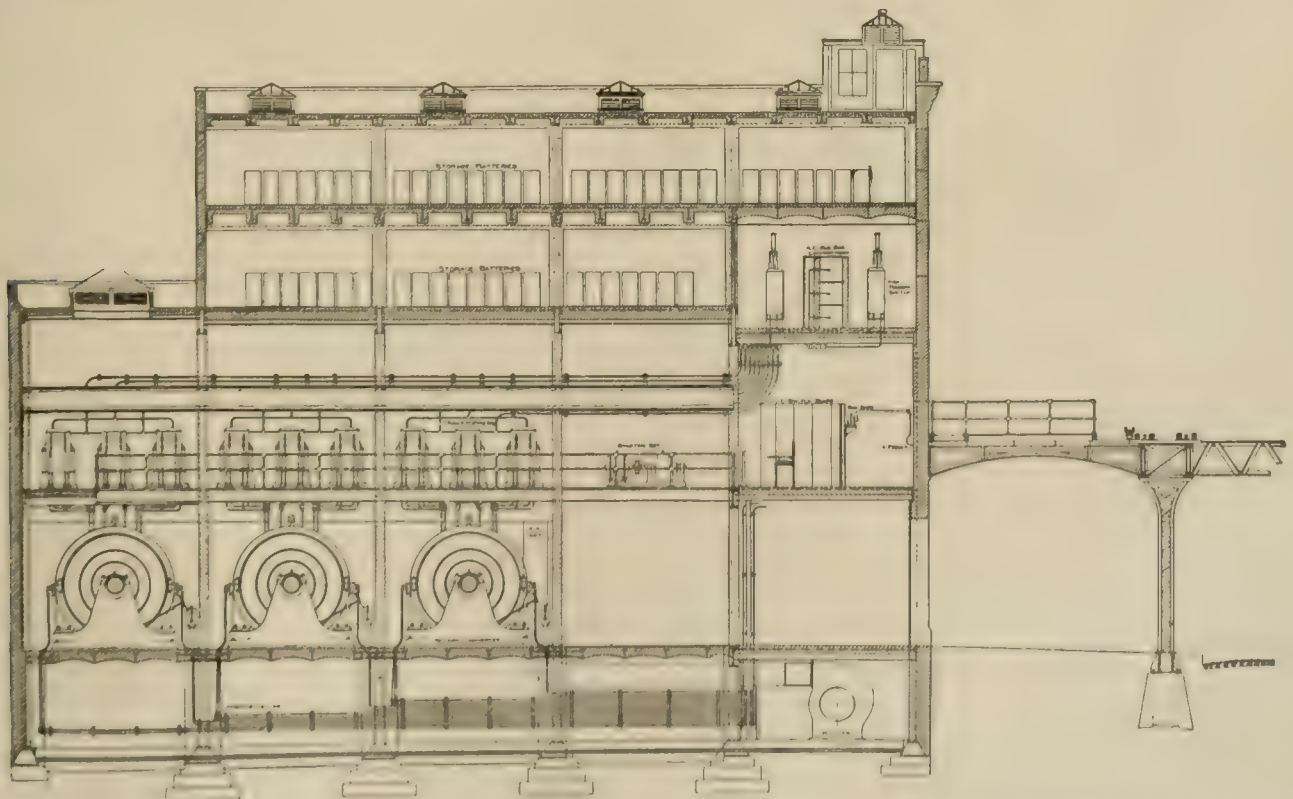


FIG. 11 LONGITUDINAL SECTION OF SUBSTATION, MANHATTAN RAILWAY. CAPACITY, 12,000 KW.

The high voltage current entering the sub-stations is handled by break-closed, oil break, motor-operated switches, just as in the power station. From the switches it passes to transformers, where its voltage is decreased to that suitable for driving the converters. This current, fed in at the alternating current end of the rotary converters, produces the 575 or 600-volt direct current which is sent to the direct current bus bar for transmission to the trolley wire. The transformers are cooled either by water circulating around the shell or by air blown through the windings.

Rotary Converters.—A size of rotary converter which has been largely adopted for city work is 1,000 kw., although one large

Storage Batteries for Sub-Stations.—Storage batteries have been installed in many of the large sub-stations for the purpose of steadying the load on the rotary converters, taking care of the peaks of the load and creating a reserve capacity in the sub-station in case of a break-down of the machinery. If it is possible, with any reasonable degree of accuracy, to draw the load curve for a proposed sub-station, the question of whether it is more economical to install rotary converters or storage batteries to take care of the peaks may be determined in advance. Most railway load curves show peaks in the morning and evening, some portions of which may be taken by batteries working up to their one-hour rate, provided the duration of the peaks is not too long. In case the shape of the peak is such that no portion of it is of shorter duration than three or four hours, the cost of a battery for handling it would probably be excessive. It should be taken into account that a sub-station battery carrying the peak of the load not only takes the place of a certain amount of rotary capacity, but exercises a valuable smoothing-out effect on the load, replacing an equivalent amount of station capacity at the central power plant; so that the investment in battery should be compared with the investment of rotaries, high tension feeders, and in generator and steam plant capacity thus dispensed with at the power plant. Figured at the one-hour discharge rate, the relative first cost of storage battery as compared with rotary converter, feeder and steam plant is approximately \$90 per kilowatt for the storage battery and \$130 per kilowatt for the converter plant, steam plant and transmission line, the latter figure being \$30 for the rotary plant and \$100 for the steam plant and transmission line. This estimate for rotary and steam plant is based on the nominal ratings of the machines and does not take into account their overload capacities. A battery worked on the peak at its one-hour rate is likely to cost about the same or somewhat less than the apparatus which it displaces.

The value of the storage battery as a reserve in heavy sub-station work depends upon the comparative amount of storage battery and rotaries which has been installed. If the sub-station contains a small amount of battery and a large amount of rotary, the reserve value of the battery is likely to be small; if, however, the short duration and sharp nature of the peaks has warranted a comparatively large battery installation, the battery may be of sufficient size to handle the entire load of the sub-station during the lighter hours of the day for a period long enough to tide over a break-down, provided that this period is not longer than half to three-quarters of an hour. While the battery may replace those rotaries which would be operated for an hour or two on the peak, it cannot be depended upon to take the place of those machines which run throughout the entire day. The reserve feature of a storage battery is especially valuable because it may be put into service immediately and in this it has the advantage of the steam plant, where time is required to get boilers ready for steaming.

In laying out a sub-station, it would be well to design the building with reference to the future installation of storage batteries, even if it is not intended to install them at once. No general statement can be made in regard to the advisability of their installation, as that should be figured out for each special case.

Low Tension Switchboard.—The feeder for the sub-station and the 500-volt feeders leading from it to the trolley sections are practically the same as those used in connection with a direct current station, and all of the devices installed in the best direct current stations for the detection and isolation of trouble on the trolley sections should also be placed in the sub-stations.

Sub-Station Plans.—Figs. 10, 11 and 12 show the plan and cross-sections of the sub-stations of the Manhattan Railway. These buildings were designed for the purpose of sub-stations and represent the best practice in sub-stations for heavy work. Unfortunately, in many recent installations, sub-station machinery has been stuck into any out-of-the-way place, and a good sub-station design is comparatively rare.

The Relative Advantages of Alternating and Direct Current Generation and Transmission.

With a desire of learning exactly what are the conditions in the cities of the United States, a circular letter was mailed to

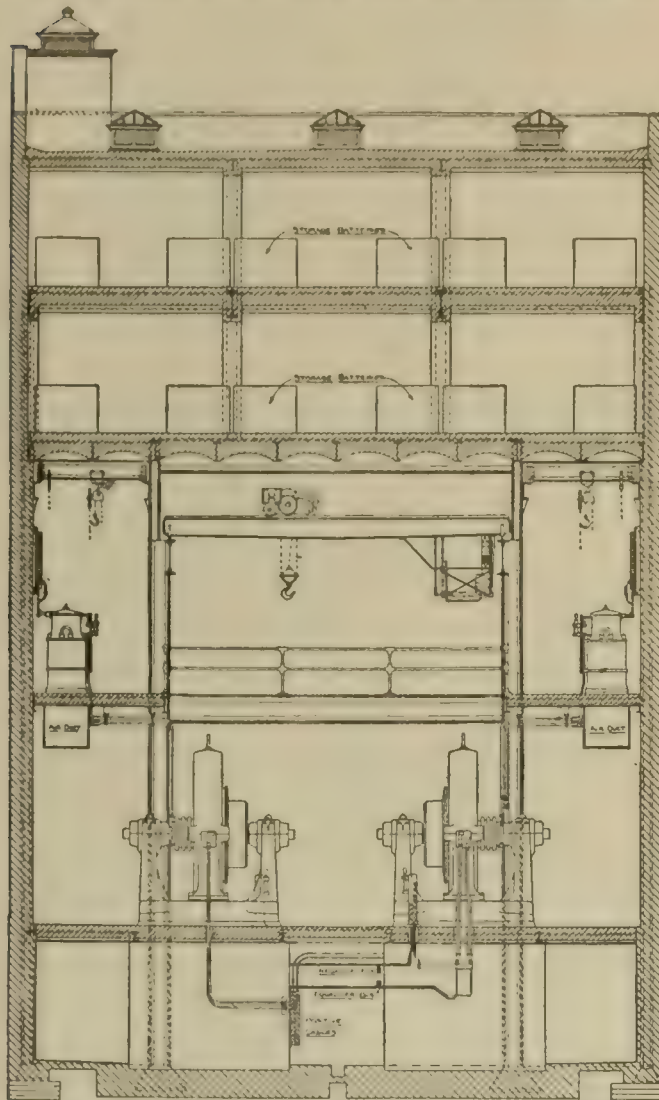


FIG. 12.—CROSS SECTION OF SUBSTATION, MANHATTAN RAILWAY.

installation has 1,500 kw. rotaries. There seems to be no reason why rotary converters should not be built in as large sizes as direct current generators, which have been successfully built in sizes of 2,500 kw. The rotary converter is just as reliable a machine as the direct current generator, and there should be about the same reserve capacity in a sub-station as is allowed in a direct current station; that is, one reserve machine to every three or four units. Where the load is subject to sudden fluctuations, it is customary to place a reactive coil in the transformers and provide the rotaries with series windings on the pole pieces, in addition to the shunt windings. For city use rotaries have simple shunt fields, and if they are kept well loaded at all times, their direct current voltage is uniform. The sub-station of a large city system has such a large output that the momentary fluctuations noticeable in a small system are lacking. The load varies with the time of day; the attendants usually have plenty of time to prepare for any change in load, and there is no reason why they should not keep the rotaries well loaded.

TABLE 1.

RUBBER INSULATED LEAD COVERED, THREE No. 00 CONDUCTOR CABLES.

For three phase, alternating current, underground distribution.

Cables to be carried in tile or concrete ducts, one cable in each duct.

| Working Voltage. | Outside Diameter of Cable. | Thickness of envelope of each conductor. | Thickness of envelope around conductors. | Thickness of lead covering. | Weight per foot. | Cost per foot. | Test voltage for 1 minute. | Minimum radius of bending. | Working capacity each conductor amperes per sq. in. of cross section Temp. rise 30° C. |
|------------------|----------------------------|--|--|-----------------------------|------------------|----------------|----------------------------|----------------------------|--|
| 5000 | 1 1/8 inches | 3/32 inch | 3/16 inch | 3/32 inch | 4.86 lbs. | \$0.64 | 15000 | 10 7/8 inches | 1150 |
| 7500 | 2 " | 3/16 " | 3/8 " | 3/16 " | 5.50 " | 0.91 | 22500 | 12 " | 1150 |
| 10000 | 2 1/8 " | 3/8 " | 7/16 " | 1/8 " | 7.24 " | 1.16 | 30000 | 13 1/8 " | 1150 |
| 12500 | 2 3/8 " | 7/16 " | 1 " | 3/8 " | 8.27 " | 1.37 | 35000 | 14 1/4 " | 1150 |
| 15000 | 2 7/8 " | 1 " | 1 1/16 " | 7/8 " | 9.29 " | 1.62 | 40000 | 16 5/8 " | 1050 |
| 17500 | 3 1/8 " | 1 1/16 " | 1 1/8 " | 1 1/8 " | 10.22 " | 1.79 | 45000 | 17 3/4 " | 1050 |
| 20000 | 3 7/8 " | 1 1/2 " | 1 3/4 " | 1 1/2 " | 11.15 " | 2.08 | 50000 | 19 " | 1050 |

TABLE 2.

PAPER INSULATED LEAD COVERED, THREE No. 00 CONDUCTOR CABLES.

For three phase, alternating current, underground distribution.

Cables to be carried in tile or concrete ducts, one cable in each duct.

| Working Voltage. | Outside Diameter of Cable. | Thickness of envelope of each conductor. | Thickness of envelope around conductors. | Thickness of lead covering. | Weight per foot. | Cost per foot. | Test voltage for 1 minute. | Minimum radius of bending. | Working capacity each conductor amperes per sq. in. of cross section. Temp. rise 35° C. |
|------------------|----------------------------|--|--|-----------------------------|------------------|----------------|----------------------------|----------------------------|---|
| 5000 | 1 1/8 inches | 7/64 inches | 7/32 inches | 1/8 inches | 5.5 lbs. | 54.8 cts. | 15000 | 15 inches | 1150 |
| 7500 | 2 " | 3/16 " | 3/8 " | 3/8 " | 6.52 " | 61.6 cts. | 22500 | 17 1/4 " | 1150 |
| 10000 | 2 1/8 " | 3/8 " | 7/16 " | 7/8 " | 7.26 " | 66.4 cts. | 30000 | 19 1/2 " | 1150 |
| 12500 | 2 3/8 " | 7/16 " | 1 " | 1 1/8 " | 8.04 " | 72.9 cts. | 35000 | 20 1/2 " | 1150 |
| 15000 | 2 7/8 " | 1 " | 1 1/16 " | 1 1/8 " | 8.84 " | 78.5 cts. | 40000 | 22 " | 1050 |
| 17500 | 3 1/8 " | 1 1/16 " | 1 1/8 " | 1 3/4 " | 10.60 " | 88.5 cts. | 45000 | 23 1/2 " | 1050 |
| 20000 | 3 7/8 " | 1 1/2 " | 1 3/4 " | 1 3/4 " | 11.28 " | 93.2 cts. | 50000 | 25 1/2 " | 1050 |

TABLE 3.

General data concerning power stations in the large cities of the United States.

| City. | Name of Railway Company | Population of City. | Square Miles of Territory. | Mileage in City Limits. | Mileage Outside City Limits. | Number of D. C. Power Stations. | Capacity of D. C. Stations, Kilowatts. | Number of A. C. Power Stations. | Capacity of A. C. Stations, Kilowatts. | Remarks. |
|---------------------------|--|---------------------|----------------------------|-------------------------|------------------------------|---------------------------------|--|---------------------------------|--|---|
| New York | Metropolitan Street Ry. Co. | 1,850,000 | 40 | 230 | — | 1 | 38,000 | 1 | 40,000 | Another A. C. station soon to be put in operation. |
| Chicago | Chicago City Ry. Co. | 1,698,575 | 110 | 80 | 50 | 3 | 115,800 | 1 | 17,200 | A. C. station proposed to replace present stations. |
| Philadelphia | Philadelphia Rapid Transit Co. | 1,293,697 | — | 415 | 30 | 2 | 315,000 | 2 | 17,000 | A. C. station under construction. |
| Brooklyn | Brooklyn Rapid Transit Co. | 1,196,582 | 200 | 520 | — | 6 | 281,600 | 1 | 16,200 | |
| St. Louis | St. Louis Transit Co. | 575,238 | 65 | 315 | 11 | 4 | 26,800 | 1 | 2500 | |
| Boston | St. Louis and Suburban Ry. Co. | — | 125 | 41 | 52 | 2 | 30,000 | 1 | 2100 | |
| Baltimore | Boston Elevated Ry. Co. | 560,892 | 116 | — | — | 8 | 36,844 | — | — | |
| Pittsburg and Allegheny | United Railways and Electric Co. | 508,337 | — | — | — | — | — | — | — | |
| Cleveland | Pittsburg and Allegheny Electric Ry. Co. | 451,512 | 375 | 224 | 150 | 6 | 10,000 | 2 | 13,050 | |
| St. Paul and Minneapolis | Cleveland Electric Ry. Co. | 381,708 | — | — | — | 3 | 10,150 | — | — | |
| Buffalo | Twin City Rapid Transit Co. | 330,350 | 150 | 212 | 20 | 6 | 15,000 | — | — | |
| San Francisco | International Railway Co. | 352,219 | — | 202 | 156 | 2 | 3,300 | 1 | 3,000 | Also rents power from Niagara Falls. |
| Cincinnati | United Railroads of San Francisco | 312,282 | 63 | 230 | 27 | 3 | 7,000 | 1 | 4800 | |
| New Orleans | The Cincinnati Traction Co. | 325,902 | 75 | 181 | 35 | 5 | 1,000 | — | — | |
| Detroit | New Orleans City R. R. Co. | 287,104 | — | — | — | — | — | — | — | |
| Milwaukee | Detroit United Ry. Co. | 285,584 | — | 180 | 311 | 6 | 12,000 | 2 | 20,000 | |
| Washington | Milwaukee Electric Ry. and Light Co. | 285,315 | — | 107 | 28 | 4 | 4750 | 1 | 600 | |
| Newark | Washington Ry. and Light Co. | 278,718 | — | — | — | — | — | — | — | |
| Kansas City, Mo. and Kan. | Public Service Corporation | 246,070 | — | 107 | 15 | 5 | 8950 | 1 | 3000 | A. C. station under construction. |
| Jersey City | Metropolitan Street Ry. Co. | 215,170 | — | — | — | — | — | — | — | |
| Louisville | Public Service Corporation | 204,741 | 20 | 122 | 18 | 1 | 1,000 | — | — | Combined A. C. and D. C. station under construction. |
| Providence | Louisville Railway Co. | 175,507 | 163 | 101 | 1 | 1 | 7500 | 1 | 3500 | A. C. for use on suburban roads. |
| Indianapolis | The Rhode I. and Co. | 160,104 | — | — | — | — | — | — | — | |
| Rochester | Indianapolis Street Ry. Co. | 142,435 | 68 | 93 | 59 | 2 | 2020 | 1 | 600 | |
| Denver | Rochester Railway Co. | 133,550 | 67 | 145 | 3 | 3 | 5000 | 1 | 1500 | |
| Toledo | Denver City Tramway Co. | 131,822 | 20 | 100 | 2 | 1 | 4000 | — | — | |
| Columbus | Toledo Railway and Light Co. | 125,900 | 82 | 25 | 2 | — | — | — | — | A. C. station proposed. |
| Worcester | Columbus Railway Co. | 118,144 | 90 | 80 | 4 | 1 | 7475 | — | — | Change to A. C. for suburban lines under consideration. |
| Syracuse | Worcester Consolidated St. Ry. Co. | 108,344 | 25 | 56 | 1 | 1 | 1000 | — | — | |
| New Haven | Syracuse Rapid Transit Ry. Co. | 108,037 | 65 | 47 | 53 | 2 | 2,675 | — | — | |
| Paderborn | Fair Haven and Westville R. R. Co. | 104,171 | — | — | — | — | — | — | — | |
| Full River | Public Service Corporation | 104,063 | 40 | 123 | 207 | 10 | 13,017 | 2 | 10,000 | Largely an interurban system. |
| St. Joseph | Massachusetts Electric Companies | 102,970 | — | — | — | — | — | — | — | |
| Omaha | St. Joseph Ry. L. Heat & Power Co. | 102,555 | 50 | 150 | 10 | 2 | 3700 | — | — | |
| Los Angeles | Omaha Street Railway Co. | 102,470 | 25 | 100 | 1 | 1 | 5000 | — | — | Suburban system run independently. |
| Memphis | Los Angeles Railway Co. | 102,320 | 50 | 58 | 11 | 1 | 3000 | 1 | — | |
| Scranton | Memphis Street Railway Co. | 102,036 | 140 | 32 | 45 | 2 | 2000 | — | — | |
| | Scranton Railway Co. | — | — | — | — | — | — | — | — | |

roads in all cities of more than 100,000 inhabitants. The information is tabulated in Table 3 for those railways from which answers were received. It will be observed that the use of alternating current for city work is at present largely confined to the operation of suburban roads from city power stations. With the exception of New York, most of the other cities have a mixed system, direct current being used for city work and alternating current for suburban work. Brooklyn and Philadelphia are now building alternating current stations and Chicago will probably soon begin the change to alternating current distribution. With the single exception of New York, all cities of more than 200,000 inhabitants have from three to eight power stations. Whether this condition is more economical or more desirable than distribution from a single power station is a problem which must be solved for each special case. The number of American roads using alternating current for purely city work is at present very small, but it is likely that within the next few years many city roads will change partially, at least, to the alternating current system.

In Table 4 are tabulated general data regarding the alternating current installations in the large cities. It is difficult to tabulate such data because special conditions exist in nearly every case. It will be noted that three phase distribution and a periodicity of 25 cycles per second is nearly universal.

A discussion of the relative advantages of alternating and direct current generation and transmission involves a discussion of:

TABLE 4.

Data concerning the use of alternating current in various large cities of the United States.

| Name of Company | Location | No. of Feeder lines to the A. C. station | Capacity of A. C. station K. W. | Current of A. C. phase | Per. delivery | Current of 1, 2, 3 phase | Transmission A. C. phase | Transmission 1, 2, 3 phase | No. of Sub-stations | Capacity of Sub-stations K. W. | Remarks |
|-----------------------------------|---------------|---|--|------------------------------|---------------|-----------------------------|--------------------------------|-------------------------------|------------------------|--------------------------------------|---|
| Metropolitan Street Railway Co. | New York | 1 | 3000 | 6000 | 25 | 1 phase | 6000 | 1 phase | 8 | 10000 | Second A. C. station under erection |
| Manhattan Railway Co. | New York | 1 | 4000 | 10000 | 25 | 1 phase | 10000 | 3 phase | 8 | 60000 | Change to A. C. trans- mission contemplated. |
| Philadelphia Rapid Transit Co. | Philadelphia | 2 | 10000 | 1420 | 25 | 1 phase | 1420 | 3 phase | Undetermined | Undetermined | Intended to use both A. C. and D. C. |
| Brooklyn Rapid Transit Co. | Brooklyn | 1 | 10200 | 6000 | 25 | 3 phase | 6000 | 3 phase | 6 | 22500 | |
| St. Louis Transit Co. | St. Louis | 1 | 100 | 6000 | 25 | 1 phase | 6000 | 3 phase | 1 | 2400 | |
| St. Louis and Suburban Ry. Co. | St. Louis | 1 | 2100 | 6000 | 25 | 1 phase | 6000 | 3 phase | 2 | 2400 | |
| Pittsburg Railway Co. | Pittsburg | 2 | 1100 | 2000 | 60 | 1 phase | 5000 | 1 phase | 8 | 3200 | |
| Twin City Rapid Transit Co. | Minneapolis | 1 | 5000 | 3000 | 34 | 1 phase | 1500 | 1 phase | 4 | 1800 | |
| International Railway Co. | Buffalo | 1 | 3000 | 11000 | 25 | 1 phase | 2500 | 3 phase | 8 | 10200 | A. C. also rented from Niagara Falls Co. |
| United Railway and San. Francisco | San Francisco | 1 | 6000 | 14200 | 25 | 1 phase | 1420 | 1 phase | 3 | 7000 | |
| Detroit United Railway Co. | Detroit | 2 | 5000 | 100 | 25 | 1 phase | 10000 | 1 phase | 7 | 35500 | |
| Washington Railway and Light Co. | Washington | 1 | 600 | 6000 | 60 | 2 phase | 6000 | 2 phase | 3 | 1200 | |
| Metropolitan Street Railway Co. | Kansas City | 1 | 2000 | 6000 | 25 | 3 phase | 6000 | 3 phase | 4 | 8000 | Ultimately one D. C. and one A. C. Station. |
| Rochester Railway Co. | Rochester | 1 | 100 | 375 | 25 | 1 phase | 14300 | 3 phase | 2 | 500 | |
| Denver City Tramway Co. | Denver | 1 | 1500 | 2500 | 25 | 1 phase | 2500 | 3 phase | 3 | 2000 | A. C. for use on subur- ban roads |
| Massachusetts Electric Companies | Boston | 2 | 14000 | 1000 | 25 | 1 phase | 13200 | 3 phase | 10 | 12750 | Change to A. C. trans- mission in progress |
| Rhode Island Company | Providence | 1 | 3000 | 10000 | 25 | 1 phase | 10000 | 3 phase | 5 | 1000 | A. C. for use on subur- ban roads |
| Louisville Railway Co. | Louisville | 1 | 3300 | 14200 | 25 | 3 phase | 14200 | 3 phase | 3 | 2000 | A. C. station under con- struction |

(1) The relative economy and reliability of generation and transmission, and

(2) The relative advantages of one and several power stations.

The transmission losses in the feeders and return circuit from a direct current station depend entirely upon the quantity of copper which it is deemed advisable to put into the feeders. For a city transmission where the feeders are long, and where concentrated loads are likely to occur at long distances from the power station, the transmission losses are probably between 15 and 20 per cent at maximum load in a well-installed system.

In an alternating current transmission, the losses at maximum load are likely to be about as follows:

| | |
|----------------------------|------------------|
| High tension feeders | 3 per cent |
| Transformers | 2½ per cent |
| Rotary converters | 5 per cent |
| Low tension feeders | 7 to 10 per cent |

making a total transmission loss between the generator and the trolley wire of 17½ to 20½ per cent, which is about the same as that estimated for the direct current transmission. From these figures it will be seen that if the generating plant in the direct current station is as economical as that in the alternating current station, alternating current generation and transmission should be no more economical than that by direct current.

As to the relative reliability of alternating and direct current transmission, the latter has many advantages, owing to its greater simplicity. In the direct current transmission the current is sent straight from the direct current switchboard to the trolley feeders, while in the case of alternating current transmission, there are interposed in the circuit, in addition to everything required in direct current transmission, the alternating current switches, the high tension feeders, the step-down transformers and the rotary converters. A failure of any piece of apparatus in this chain, or a mistake of any operator, is likely to cripple the system. With equal standards of workmanship and with equal quality of operating skill in the two cases, the direct current system would be the more reliable.

The real problem which confronts most railroad companies in large cities is the question of the substitution of an alternating current plant equipped with modern machinery in large economical units to replace several direct current plants badly located with reference to the load and containing more or less antiquated apparatus. It may be argued in favor of the operation of several power plants, as against one, that the power plants being located in different parts of the city there is little likelihood of the same, fire, flood, cyclone or other calamity destroying all of them, and thus entirely crippling the road. This, and the fact that the direct current system is the simpler and the more easily

comprehended by ordinary power plant men, are about the only arguments which may be advanced for the several power plant plan.

In a large city convenient locations for water, coal and railroad facilities are not easy to obtain near the center of load, and it is obviously much easier to obtain one good location for a central power plant than several good locations to supply different parts of the system. A central power station should be absolutely fireproof, and if the plant is constructed on the unit system, it would be a very great calamity which would cripple more than one unit. An accident throwing out of service one unit would not be so serious as an accident incapacitating one power station, and thereby crippling the service in one part of the city. It is likely, however, that the greatest advantages of the one central plant is the fact that better supervision may be obtained, as it is much easier to get one good set of operators than several, and in times of trouble it is much easier to keep one plant in operation than several. The economy of generation where the same quality of apparatus is installed, would not vary greatly, as the cost per kilowatt for the generation of power decreases very slightly after a large output has been reached, and it is assumed that in either case the plants would be of large size. To choose between the direct and alternating current systems of generation, very careful estimates of the cost of installation and operation should be made in each case, and decision should be reserved until after these estimates are compared.

In some of our largest cities, where heavy loads must be taken care of at long distances from the central station, or where the central station cannot be located near the center of the load, or where reasons exist, such as cheap coal, water transportation, etc., for locating the central station away from the center of load, alternating current distribution from a central station will probably be found the more economical; but if a location for an economical power plant may be obtained near the center of load, and the total city load is comprised within a radius of five miles from this point, as is the case in most cities of less than 250,000 inhabitants, it is probable that direct current generation and distribution from this central station will prove the more desirable. Where doubt exists, preference should be given to the direct current system on account of its greater simplicity, unless there is a likelihood of a great expansion of the system in the near future, when direct current transmission might prove burdensome. In case the direct current system is adopted, suburban lines too long or too heavy for 500-volt transmission may be supplied by alternating current generated in the power plant for their use, or by means of boosters. If the suburban lines are of moderate length or if they require normally only a small amount of power, and make unusual demands upon the power plant only at intervals, such as on holidays and pleasant Sun-

days, which is the condition on many suburban roads, these lines can best be taken care of by means of boosters, and the same boosting system may be useful in operating some of the city lines. A company which installs an alternating current transmission system on its heavy city lines merely to furnish power for a few light straggling suburban lines more economically, would place itself in the illogical position of allowing the tail to wag the dog.

It is difficult to make any recommendations as to the choice between alternating and direct current distribution in merely an abstract discussion. All that can be done is to give the arguments pro and con, with the advice that each case of generation should be figured out for itself, and no plan adopted until its advantages had been thoroughly demonstrated. The discussion in this paper has been on current generation and distribution for use in large cities. The question of long distance transmission has not been taken up, and no attempt has been made to discuss the question of the supply of current for interurban roads, or for cities where the principal part of the load comes from interurban or long suburban roads. For these cases, alternating current transmission unquestionably offers great advantages.



BRUCK OIL WON'T MELT.

One of the most enthusiastic supplymen on the grounds yesterday was J. N. Bruck, general manager of the Bruck Solidified Oil Co., of Boston, and the reason was that at the close of the convention, as he figured it out, Mr. Bruck found that he had taken many bona fide orders, besides a large number of sample orders. Incidentally he met many persons with whom he has been in touch by correspondence, and altogether he thinks it was a pretty good convention. Mr. Bruck demonstrated one quality of "Globe" solidified oil to the satisfaction of everybody, and that is that sun will not melt it. Several samples of the oil have stood unprotected on the sunny side of the Bruck booth all the week, but not a particle of it had run up to closing up time last night. It is equally impervious to cold. Among the orders received this week was one from an electric road in Columbus, O., it being a large duplicate order. When yesterday's orders are shipped and delivered "Globe" solidified oil will be in use on 33,000 cars in the United States.



COURT SAYS "NOT GUILTY."

Chief Judge Gummere, with the concurrence of Associate Judges Van Syckel and Dixon, sitting in the Essex County Court, Newark, N. J. at the trial, on indictment for manslaughter, of 11 officers and directors of the North Jersey Street Railway Co., yesterday granted the motion of the defense and instructed the jury to find for each of the defendants a verdict of "not guilty." The defendants were charged with causing, by criminal carelessness, the death of a Newark High School girl who was killed on the morning of February 19th last in a collision between a North Jersey trolley car and a Delaware & Lackawanna railroad train.



THE CONANT TESTERS.

R. W. Conant, of Cambridgeport, Mass., exhibited the Conant motor tester and the T pole bond tester, and gave daily demonstrations with most gratifying results. He also showed several specimens of defects that were picked out of motors after being located by a Conant tester. The T pole bond tester is an improved form of the Conant rail bond testing instrument. It has been in use on several of the prominent New England roads for a long time, and a satisfactory guarantee is furnished with each instrument. Only one operator is required and rail joints may be tested with it at the rate of about 100 per hour. The Conant motor tester is sufficiently well known not to require extended mention here.



A PARK DRAWING CARD.

The Ingersoll Construction Co.'s laughing gallery has been the leading evening attraction of the convention, even sharing the honors with Victor Herbert's orchestra. It being the fact that

a large number of persons have left the piazza where the music was dispensed and betaken themselves to the Ingersoll booth and its mirth-provoking mirrors. The Ingersoll mirrors are not like the old-fashioned concave and convex mirrors, but are built on new and original lines, resulting in an almost incalculable variety of reflections, each funnier than the other. Electric railway men who followed the crowd and the laughter obtained an object lesson that will likely result in more street railway parks being equipped with laughing galleries before next season, albeit a good many parks have them now. It is unquestionably a strong drawing card. The Ingersoll Construction Co. is a Pittsburg institution and it builds laughing galleries for others to operate, or will both build and operate, as desired.



A WONDERFUL FUEL.

Harold P. Brown's exhibit of "Brillium" was one of the features of the convention and the demonstrations of the efficacy of this new method of making fuel gas out of water, as shown daily in the boiler room of the Grand Union, were witnessed by a great many people. By the use of "Brillium" a water gas flame five feet long is produced. No apparatus is necessary, the mixture of which "Brillium" is a component being fired in the ordinary way. By the use of this new fuel one boiler is expected to do the work of two at about one-third the cost of running one. To show this a special test was given in the Grand Union boiler room last Wednesday. Two tons of coal were burned under boiler No. 3 at a cost of \$9.70. "Brillium" mixture was burned under boiler No. 4 at a total cost, including labor, of \$3.24, showing a saving of \$6.46 by the use of "Brillium." The mixture which composed the new fuel burned on that occasion was made up in the following proportions: 1,500 lbs. hard coal screenings, 1,500 lbs. Delaware & Hudson Ry. cinders, 375 lbs. water and 60 lbs. "Brillium" at 1 cent per pound. Mr. Brown is delighted at the interest shown in the new fuel, as well as in the results procured during convention week. Mr. Brown also exhibited his plastic plug bond for re-bonding roads. Assisting in caring for Mr. Brown's exhibits were James Hollowood, J. Maxwell Coote, William Temple, George Cannon and William B. Smith.



A DISAPPEARING WINDOW.

The O. M. Edwards Co., of Syracuse, N. Y., exhibited the special features of a disappearing car window designed especially for street car use. This window is lowered into the encasement and covered entirely by the sill cap. When it is desired to raise the window the sill cap is drawn forward and the window is automatically forced into a raised position by a spring roller, no counterweights being used. Other forms of automatic windows, there being 14 different styles in all, are made by this company and are used largely on steam railroads, although they are also designed for street car use.

The company is represented at the convention by O. M. Edwards, J. E. Simons and G. G. Norris.



THE BLISS CO. EXHIBIT.

The E. W. Bliss Co., of Brooklyn, had an exceptionally interesting exhibit of its pressed steel pinions and cut steel gears. To show how accurately the teeth of these wheels are made a large gear wheel was shown into the teeth of which were meshed those of nine pinions, equidistant, so that by turning the gear by means of a handle the pinions also revolved. They were adjusted with such nicety that it required no effort to move them by hand. Parts were shown to describe the process of manufacture, and several projectiles, symbolical of the "Projectile" brand of gears and pinions, adorned the booth, as did also large photographs of the company's works. C. E. Porter and R. W. Stone were in charge of the exhibit.



The Programme du Jour, which is published weekly for nine weeks each summer by the Grand Union Hotel, is a very useful publication, well gotten up and is believed to be the largest individual hotel paper published in this country. It contains 20 pages of hotel news, concert program and hotel arrivals and advertisements. Fred M. Waterbury is its editor.

TWENTY-SECOND ANNUAL MEETING AMERICAN STREET RAILWAY ASSOCIATION

Saratoga, N. Y.—Sept. 2—4, 1903.

FRIDAY, SEPT. 4, 1903.

Vice-President Ely called the meeting to order at 9 o'clock, and requested Mr. H. H. Vreeland to preside.

The Chair: The first business to be considered this morning is the paper on "Electric Welded Joints," by William Pestell, superintendent of motive power and machinery of the Worcester Consolidated Street Railway Co. Inasmuch as this paper is printed and has been distributed to the members of the association, it will not be necessary to have it read. I learn that Mr. Pestell, the writer of the paper, is not present. I intended to ask him to make a brief statement of the points contained in his paper.

[For Mr. Pestell's paper, see page 637.]

The Chair: As Mr. Richard McCulloch, the author of the paper on "The Manufacture and Distribution of Alternating Currents for Large Cities" is present, we will have that paper now. As the paper has been distributed to the members, I will ask Mr. McCulloch to open the discussion of the paper, calling attention of the members to such points as he particularly desires to emphasize.

[For Mr. McCulloch's paper, see page 672.]

Mr. McCulloch: As the paper is pretty long, I will not attempt to read it at length. The paper consists of a description of the general practice in large city power plants of producing alternating current, with limited discussion of the advantages of some of the newer forms of producing the current. I will state that in general terms the conclusion of the paper is that in cities of perhaps less than 250,000 inhabitants, unless special conditions are found to exist, the best practice would be to generate direct current; and that the alternating current will be serviceable more particularly to the very large cities and for cities where the greater part of the load comes from the inter-urban or suburban places. I do not think it is necessary to read the paper, because it has been printed, and any one who is interested in the paper has had an opportunity to read it.

Vice-President Ely resumed the chair and invited discussions.

Mr. Mailloux: The paper is primarily a statement of facts—an analysis of the present state of the art of producing and distributing alternating current. It is a paper that will be very useful to the members as a work of reference, because it so concisely, and yet comprehensively, gives a résumé of the entire situation.

Mr. W. O. Gotshall, Portchester, N. Y.: I have read Mr. McCulloch's paper and agree that it is a piece of work well done. Some data are given as to the relative areas and cubical contents of stations designed to use the existing reciprocating engines and also to use turbines. I have no doubt Mr. McCulloch got considerable information while he was gathering the data for his paper, as to the cost of some stations which have been in operation for a short time producing power by turbines and the details of the cost. It occurred to me that he must have obtained some data of the cost of producing a unit quantity of energy, and the distribution of cost for those places.

Mr. McCulloch: In answer to Mr. Gotshall's question, I will state that I made no effort to incorporate in the paper any data in regard to the cost of power, because that depends largely on local conditions. The cost in most of the large stations is not a secret at all and is pretty generally known, so that I made no effort to put anything of that sort in the paper.

The Chair: This paper, as has been observed by one of the gentlemen who spoke, is certainly a very complete and careful presentation of this matter, and we are certainly very much indebted to Mr. McCulloch for the great care and pains that his paper reveals in its preparation. It must have taken a good deal of time, and it is an example to all of us of the thorough performance of work assigned to us. We will now pass to the paper entitled "The Evils of Maintenance and Champerty in Personal Injury Cases," by Michael Brennan, counsel of the Detroit United Railway.

[For Mr. Brennan's paper, see page 663.]

The Chair: The Chair will say that the committee in selecting this topic, were actuated by the feeling that while it would be impossible to harmonize the statutes and rules and practices of courts that affect this matter, by reason of the association extending to all the different states, still it was along the line of standardization, and the thought upon the matter and the consideration of it might be useful in bringing about, or in assisting to bring about, something that would be common to all. Of course, the laws that affect the subjects treated in the paper differ widely in the different parts of the country.

The next paper was that on "Train Orders and Train Signals on Interurban Roads," by C. A. Coons, superintendent of transportation, International Railway Co., Buffalo, N. Y. This paper will be found at page 665.

The Chair: We will pass to the next paper—"Freight and Express on Electric Railways," by Mr. J. B. McClary, manager of the railway department of the Birmingham Railway, Light & Power Co., Birmingham, Alabama.

[For Mr. McClary's paper, see page 667.]

Mr. W. O. Gotshall: It appears to me that this is one of the most important subjects in connection with what are undoubtedly the coming electric railways, that is, the railway connecting the centers of population adjoining and about large cities. For about a year past I have been trying to get some information on this matter and the essential trend of what I have been doing has been to ascertain the income from this service, and the amount of money it is costing to do a given amount of business. I do not find that there is any statement in this paper showing anything from which you could derive much information concerning the point of income or the cost of doing business. I have found in going over the matter and corresponding with railroads in different parts of the country, as to the express and freight business, that they are receiving all the way from \$500 to \$900 per mile of single track, that is, the gross receipts for the freight and express business they are doing. I have not been able to get satisfactory information which would indicate the cost of doing that business. It is certainly unfortunate that our time is limited. It would require three or four hours to discuss this paper properly.

Mr. C. O. Mailloux: I have often noticed that it is only upon reading papers, after they become cold in the transactions of an association that one gets ideas and suggestions which might lead to important questions and discussion. It seems to me, therefore, that in the case of this association many of the subjects which form the basis of papers or reports at one annual meeting, might well serve as the basis of topical discussions at a subsequent meeting. In this way the members would have time during the year to read the papers and collate their

ideas, and come prepared at the next meeting to discuss and finish any consideration of a subject, which might not have been accomplished at the meeting at which the papers were read. There are many of these subjects which are still live questions, even after the lapse of a year. "Express and Freight on Electric Railways" will not only be a live topic next year, but a better topic than today, and will continue to be so for many years; hence there will be no harm in bringing that subject up again at a subsequent meeting. The same thing may be said concerning the paper on "The Right of Way," which will be as lively a question next year as it is this year; so the same thing may be said of almost all the papers. In looking over the list it seems to me that all of the subjects will be just as interesting next year as they are today, and I think it would be well for the committee who will prepare the program for the next meeting to bear in mind that fact and recommend as subjects for topical discussion many of the points which do not receive a comprehensive and satisfactory discussion today.

Mr. John I. Rogers, Milwaukee: I might say on this question, Mr. Chairman, that as Mr. Mailloux has just stated, this question of freight and express is likely to become much more important with electric railways as time passes along. It is being tried by quite a number of the roads in a small, and by some in a tentative way. In many of the states of the union we are not permitted to carry freight, and therefore some who attend the convention have not given attention to it, except in a general way. In Wisconsin, where our company has large interests, it is impracticable to carry even small parcels, unless the parcel is in charge of the passenger, and we have no right to make an extra charge for it anywhere in Wisconsin. In Wisconsin, if we attempted to carry package freight, we would have to condemn every foot of every street in any city or highway on which the company operated cars, which would make it absolutely impracticable; and that is a condition which meets many of those operating street railways. I believe it is generally admitted throughout the East that the right does exist for electric railways to carry freight. I am not prepared, for this reason, to discuss this question. I am watching the matter with much interest and am awaiting the time when a demand shall be made in all the cities of the union that the electric railways shall be permitted to perform the great service to the community, particularly in the rural districts, of carrying express and freight matter, so that this service can be performed with dispatch and economy for the people.

Mr. G. Tracy Rogers, Binghamton, N. Y.: Some years ago we started an express business in a small way on our interurban road, about ten miles in length, in a small town of 1,500 persons at the other end. We used a trailer first, and then we used a larger one, and then we bought a freight car. We had no terminal and left the freight car standing in the middle of the street on one of our city streets. Some of the city officials objected to the car being left on the street, and resolutions were introduced in the council to have the car taken off the street; but the merchants in the city came forward and protested and wished the car to remain anywhere we wanted to leave it as the service was a great accommodation to them and the people on the line. The result has been that in our small way we have made a little money on the enterprise and today we are buying real estate as near as we can in the heart of the city in each of the towns we reach with the freight and express service. Our plan is to farm the business out to an express man. He pays so much of the expense, and then we have a percentage, and I will state that the business has been fairly profitable.

Mr. Gotshall: If Mr. Rogers has no objection I would ask him what the duty of the car is—the car mileage, or how many trips a day it makes, or what is the basis on which the business is computed.

Mr. Rogers: The car makes two trips, the distance being about nine miles. One of the principal reasons why we inaugurated the service and continue to put money into it is that it helps to develop outlying sections of our district, opens up

new fields for passenger service. New towns are starting up in our vicinity and we wish to encourage them. We have the competition of two steam roads to meet.

Mr. Gotshall: I would again express the hope that this subject be continued at the next meeting and given some consideration. In investigating the express and freight business on electric railways, I find that electric railways carry parcels at about one-half the price charged by steam railroads. Reports which some roads make are very interesting, and it will be a very important subject, for the reason that the introduction of these frequent units, carrying parcels at relatively low cost compared with existing conditions, will work radical changes in and about the centers located near the large cities. I think the subject should be continued and given more attention than it has received in the paper and the short discussions.

Mr. C. Loomis Allen, Utica, N. Y.: In December last we organized an express department on the Utica & Mohawk Valley Railroad. We did not undertake to handle anything in the way of heavy material or such matter as freight. We operate three express cars, which are operated about twelve hours a day. We do not take any material for shipment unless that material be delivered at the terminal point of shipment. By that I mean we have at each village or municipality where we give service, teams for the delivery of the express matter. In each of the cities we maintain teams for the purpose of collecting express matter, on the same system as that adopted by the old line of express companies. The expense, which, of course, must be very large, due to the maintenance of the drivers and agents in each of the municipalities, has been in the neighborhood of about 70 per cent of the gross receipts.

Mr. W. K. Morley, Grand Rapids: We have about forty-five miles of track, and operate three freight cars. We make a round trip with these freight cars every day. The management thinks that the freight business is susceptible of development, and proposes to invest considerably more money for freight equipment next year. We handle almost any kind of freight, except the lower classes of freight, which we do not handle and do not want. We have an agent at all our terminals, and also at the sub-stations, which latter costs us nothing additional, as we should be obliged to have some one at the sub-station anyhow to help out. We figure that the freight business pays us and we are going to develop it. We get the same rates as the steam roads. We do not devote ourselves entirely to the high class of express business, but handle anything except low class freight. We cannot handle and do not want to handle carload business.

The Chair: As to the suggestion made by the gentleman from the Portchester road, Mr. Gotshall, unless there is some direction from the convention, the chair would say that the matter will be brought to the attention of the executive committee when selecting the subjects for next year's papers, with the statements that were made in the convention. It would seem in the light of the experience which we are having, the International Railway Co., of Buffalo, operating several interurban lines, one of them being 35 miles long,—a high-speed road, operated under steam railroad rules, with freight trains drawn by electric locomotives, handling mail, express, fruit, small crops, and all kinds of baggage freight—it would seem in the light of our experience to be a subject that might occupy the attention of the convention again with great profit. Some of the statements contained in the paper which has been presented are very pat, and especially one thought where the manager has shown his profits and added "that it is 'velvet,' there is no doubt, if you would engage in the business and not let expenses eat it up." Where I have seen this business best done, the expenses are eating it up. It is all right enough to say you will go into the freight and express business, but when you establish a freight station and go there to get freight, then you must have a station master, some one to unlock the car and let the stuff out to the farmer who calls for a bale of wire or something of that sort, and when he comes with stuff to ship you must have some one there to receive it and take care of it. That means you are going into the equipment of a full-fledged freight operating

department, and that is a branch of steam railroad operation that is carried on to the highest degree. Many railway managers have met this railway condition like a lot of boys. That is not a reflection on any one at all. The street railway man says, "Everybody concedes that in the steam railroad business the freight is the cream of the business, the big roads make their money out of the freight and carry passengers in many cases at a loss, therefore we can make money out of freight." The big roads have long hands, we have short hands. If you are going to handle freight to any extent you must make an arrangement with steam railroads for cars. We cannot equip our roads with standard freight cars to haul freight fifteen, twenty, thirty or forty miles. We must make an arrangement with the steam railroad companies not only to furnish freight car equipment, but to take freight from us and haul it to the center for which it is destined. That means you go to a steam railroad manager, prejudiced against you very often, and ask them to take the stuff from you. The answer is invariably that they will be glad to do it, because the electric railroad will be able to originate freight for the steam roads. It is within the knowledge of some present that there exists a beautiful gentlemen's agreement between steam railroad people to discourage this kind of business as there ever was which regulated the distribution of the proceeds of the mail coach robberies. When you meet if you are received with courtesy and politeness, entertained by the hour, and taken out to lunch; but you do not get anything, except what you eat. They do not propose we shall get into that business if they can stop it. I know of my own knowledge where a steam railroad, a trunk line, extending from New York to Chicago, operating large freight steamers on the Great Lakes, one of the greatest trunk lines in this country, had an arrangement with an electric railroad whereunder the trunk line furnished the freight cars to the electric road, and received freight originating on the line of the electric railway in the cars of the trunk line, and in turn delivered cars to the electric railway. The steam railroad, when it transported these freight cars to the point of contact with another trunk line which was to take it and carry it to points not on the line of the trunk line, owning the cars which received the freight, was met with a refusal to receive the car, and that refusal was firm and would not be receded from. One of the roads refusing these cars is a trunk line in the New England States, and the parties who have the matter in hand got around the question by making an arrangement with another line which was a competitor of the first named, and in that way beat the devil around the bush.

I agree with the gentleman representing the Portchester road that it is the subject of the greatest importance; and its fair consideration, with the idea of arriving at some practical determination might save those about to institute electric express and freight routes a great deal of money.

If there is no further discussion on this paper we will proceed to the next paper entitled "The Right of Way," by Mr. H. H. Vreeland, president of the Interurban Street Railway Co. of New York.

Mr. Vreeland read the paper (which will be found on page 664), and said: In the preparation of a paper of this character, not having to do with statistics or illustrations, it has always been my purpose in preparing anything of this character to get it concise, to endeavor to have it bristle with points which could be taken up for discussion. The experience and judgment of the writer of a paper of this class are generally indicated in the paper itself. They are his views; he can only enlarge upon them, not add to them much, and it is the discussion which follows, giving the views of gentlemen from various parts of the country on this question, which is of the chief value to the members of this association.

The necessity of approaching questions of this character from the right point of view is very important. Last winter there was a great agitation in New York City, that you all know, on the question of transportation. The existing facilities in the city were clogged and hampered in every way by abnormal conditions of obstruction—the aerial lines by reason of reconstruction and the surface lines by reason of subway construction, and all that went with that; and it was taken up, as a burning

question, that proper facilities were not offered to the public. There were two ways to approach that state of affairs. One way was to say that the company was giving all the service it could give and doing the best it could do, and that is all that could be done, which would at once raise a controversy as to whether the company was really doing it or not. There was another way to approach the matter, and that was that the conditions that existed at that time, which surrounded the operation of the cars in the city, were conditions which were apparent to the eye of everybody, but in the rush of business had been lost sight of. It was no new point, nothing novel, absolutely none; every one knew it who saw it every day, and yet when I came out with this statement before a public meeting, that was called on this burning question, that the trouble was not that there was not sufficient service, but that the public was deprived of the use of that service by reason of the obstructions that existed on the tracks and streets, for which the railroad company could not be held responsible, and could do nothing, the matter was viewed in an entirely different way. We elaborated on that point after making a careful study of the general traffic conditions of the city, and went on to show that until there was a recognition on the part of public authorities that the movement of thousands of citizens should be considered of greater importance than the delivery of a ton of coal or a barrel of flour, the railways were helpless to improve the condition of affairs, the matter was taken up as an almost entirely new proposition. Any number of letters were written to me at that time by persons who rode in the cars of our company on Broadway and who would say that a man with a truck of coal had held the car up for five or ten minutes, and they would all close with saying that the position which the company had taken in the matter was right. The man with the truck load of coal had been running on the tracks for the last twenty years—but the public had become so used to the condition of affairs that it did not exercise enough thought to understand that the true cause of the delay in local transportation was not any fault of the operating company but of the conditions of traffic which existed on the streets of the city and had existed all the while. The agitation resulted in strong public sentiment. The regulation of city vehicular traffic was taken up by the police authorities and by other civic bodies, in the interest of the movement of car traffic, and treated it from the standpoint, not of the company, but of the public; that the public was in the cars and that no one lost his right to free movement, etc., by reason of being in a car, and while the car itself might not have the same rights as an individual who was obstructing it in the street, yet the passengers in the cars lost none of their right to free and easy passage through the city streets; that it was a question of the convenience of the few standing aside for the convenience of the many. This agitation resulted in quite a revolution which has had a lasting and improving effect all the time on the question of our transportation, viewed from this standpoint of the right of way.

On the same line as I indicated in my paper last year, and on the same general lines as taken in his opening address by the presiding officer a few days ago, it seems to me on this question of right of way and other important questions connected with our work, that they are not taken hold of in a sufficiently strong manner; that our side of the question is not put in proper shape before the public in many instances. We are very prone to consider we know it all, and the other fellow does not know anything; that the newspaper man does not know anything when he criticizes us; that the citizen who writes a letter of complaint or criticism to the company does not know anything; but we know it all. We make ourselves believe that we are carrying on our particular business better than any one else could do it; and we resent suggestions and criticisms, when we really should study every criticism which is made to see whether we are right or not and get some good out of the criticism to produce a better result. It is the one thing, in my opinion, which has created much of the antagonism that exists in the public mind and is expressed in the public press regarding matters connected with the operation of all our systems of transportation, some of the new systems as well as some of the old, the point that we think we know it all. I find when you

approach any question from that standpoint, that you can create not only a good deal of disturbance in the minds of others, but a good deal of disturbance in connection with the management of the property you have to do with.

I will take up another point which occurred to me as a strong point, and that is the moving of the United States mail. When you consider the rights of the many as against the rights of the few, the United States mail wagon affords one of the strongest examples. A mail wagon leaves the General Post Office in New York to go to the Grand Central Depot. It has mails destined for the Pacific Coast, Honolulu, Japan, etc.—nothing local in its character whatever, yet I as a citizen of New York and you as a citizen of New York, or any other city, if you happen to be in New York, must stand aside and let that mail wagon go by. The mail wagon and its contents are of no interest to us; add nothing to the comfort or convenience of our lives; there is no mail destined for our office or our houses; we have no interest in it whatever. Yet the consideration of the interests of the world as a whole in the movement of its mail matter is such that the consideration of the rights of the millions against the few makes it necessary that you all must go a little to one side and give the mail wagon the freedom of the streets.

We do not ask in our business for the freedom of the street in the operation of our cars, except for the operation of the cars in the interests of the general public and the quick handling of the people who are entrusted in our care. Of course, it is absolutely unnecessary, in view of the many addresses we have had on the subject of what a boon street railways have been to the United States, to go over that old ground again and say why all this should be done, except to leave the statement in this shape—that we should consider this question in a broad way, and see if we cannot get the general authorities, not only of one state, but of all the states, educated up to that point where they will consider this question from the standpoint of the public itself. Our regulations are just as crude with reference to municipal propositions connected with railway properties, lighting properties, etc., as are many of our rules and regulations with reference to the operation of a property. The conditions have changed so quickly in street railway operation that they have not been met at all by any change in municipal regulations; and when this question was receiving so much consideration in New York City last winter and the matter discussed very thoroughly in the newspapers, the newspaper men were surprised to find that the movement of electric cars with the millions upon millions of passengers transported every year were governed by regulations and laws made away back in the 60s and 70s, and it was necessary to collate these and present them to the city authorities before it was seen how absurd it was to attempt to regulate it by rules which had been framed for conditions which existed thirty or forty years ago. It was like an experience I had not long ago where, in looking over some questions connected with an accident, in taking up the rules and regulations of a certain company, I found that the rules and regulations were dated in July, 1872, when the property was a horse-car property with less than 100 employees, and operated about 20 cars, and that same property by consolidation had grown into a property employing more than 1,200 men, with a corresponding increase in the service and all the operations of the company increased in proportion, and yet the road was operated under rules and regulations dated in 1872, telling how the men should care for the horses, etc., and nothing being said with reference to electric motors.

I am free to say that although there are certain limitations, restrictions and conditions imposed on the operation of street railways abroad, I would be willing to accept these restrictions and limitations and bear whatever loss might ensue, to gain the advantage of having proper regulation of all kinds of street traffic, and have such regulations thoroughly and intelligently enforced, as is the case abroad. The systematic manner in which regulations governing street traffic of all kinds was one of the things which appealed to me very much.

On the question as applied to this Association, I think that the importance of a thing of this kind may be minimized in the minds of men who have to do with the operation of lines in the smaller cities and towns; but the importance of matters of this character is emphasized when you consider that a com-

pilation was made last winter of the laws and regulations governing the movement of all street traffic of the United States by the authorities of the city of New York to determine what was reasonable regulation. Some gentleman in this room may consider that this matter is of no interest to him, because of the condition which prevails in his city, where his lines are located; but you must consider these two points: First, that whatever your regulations are, when this question comes up in other sections of the country, your regulations become a part of the consideration of what is being done in other places, large or small, and the next consideration is that some of you bright young men may be operating the lines in the city of New York within the next few years and will have to face this condition yourself. The same thing is true of the franchise proposition, and franchise regulations and limitations and restrictions, which could just as well be included in this general proposition, in my mind. On this point of franchise limitations and conditions you gentlemen of the Association who have to do with the operation of properties cannot in fairness to the country as a whole consider these things as entirely of your locality. Today inquiry is being made abroad as to what we are doing in this country; and the limitations and restrictions that you may have in a weak moment accepted in securing something for your property may be a keynote and turning point on which hundreds of enterprises abroad may be strained, and ultimately some in our own country, and without going into a discussion of the details of this matter, from the standpoint of franchise limitations, restrictions and conditions, from the standpoint of vehicular traffic and regulations, and from the standpoint of rules and regulations which govern employees of these properties throughout the country, we cannot consider any one of these points as individual, but they must be considered collectively and as a part of the whole number of the railroad properties of the United States, if not of the world.

The chairman in his address referred to the matter of rules and regulations of the steam railroads, which I was very glad to have brought out in connection with the work of this Association. I had occasion back in the early 80's to examine a number of engineers and conductors for appointment on a property that required a heavy summer service and among the number were some men from the West. In examining them on our train orders and regulations, the most important and essential in the operation of a railroad, there was not one man who understood our orders. They were men who had run trains for fifteen or twenty years in the West. As the chairman pointed out, today an engineer, under the rules and regulations for the movement of trains, by telegraphic orders, who may have been running a train in California last week can tomorrow step on an engine in Maine and his rules are just the same, and the engine is run under the same orders. The thing is important to us, for the reason that in New York City we are every day hiring men as motormen and they come from all parts of the United States. We have a school of examination and instruction in which these matters are gone over thoroughly, and it is the most surprising thing to find what a diversity there is in regulations in cities and states that border on each other with reference to questions concerning which there should be no difference whatever, any more than the question of running a locomotive.

The main points for consideration that I wanted to bring out are those I have covered, and I wish to again emphasize the proposition that there is nothing injurious, I do not care how small a property you are operating in the United States, that can be done with your property, but what will have its effect on all the properties of the United States.

Mr. J. G. White, New York: There is, perhaps, no need to elaborate on the point of view offered by Mr. Vreeland, who has brought this subject to our attention. It seems to me that it is self-evident that to secure attention at the hands of municipal authorities the subject must be presented as conducive to the comfort and welfare of the citizens, and not as increasing the earnings of the street railway companies. If a car is delayed for fifteen minutes by a coal truck unloading, it is of comparatively little use to say that the wages of the motorman and conductor for that fifteen minutes amounted to 11½ cents, or

whatever it may be, and that much of the street railway company's earnings are wasted. But if we point out that 75 or perhaps 100 or 120 passengers, if they should be on Mr. Vreeland's car, had been delayed for that fifteen minutes, then it begins to be of interest to the traveling public, and they will assist in bringing about some reasonable regulations.

The general impression in this country is that electric railwaying has advanced far beyond anything known on the other side of the Atlantic. Mr. Vreeland implied that this is not exactly correct, without going into details. In this matter of regulating vehicular traffic and imposing municipal regulations which tend to minimize the delays to the traveling public, European cities are far ahead of those in this country. Frequently one sees on Broadway, in New York, perhaps a 5-ton truck, loaded with coal or fire proofing material for a new building, which is backed around with its rear wheels toward the pavement and which prevents the passage of street cars, and there is a string of cars accumulated running down three or four blocks before the wagon will move or its load is discharged. In most of the municipalities abroad wagons are not allowed to back to the curb in that way, and if any particularly heavy material is to be unloaded, it has to be done within certain hours, say between 8 and 10 o'clock in the evening, and at no other time during the twenty-four hours is it permitted, but if the material to be unloaded is not of a nature to cause much noise and keep people awake, it may be done during the entire night. Coal, for example, may not be loaded unless the wagon is drawn along the curb and the coal taken away in sacks or baskets. The crying need for some regulations in this country applies more particularly to cities like New York, where the traffic is dense and the best facilities possible to provide will scarcely take care of it, and to cities like Boston and Chicago, where the traffic is condensed into restricted business areas, and particularly in Boston, where the streets are narrow, and consequently where special regulations should be formulated in justice to the city and to the people in the city and should be rigidly enforced.

It seems to me this Association might perhaps partly collate the rules and regulations on this subject in foreign cities and gather the information in convenient form so that it could be used by the members of the Association to bring about police and municipal regulations in their respective cities; and such an action by the Association would be very advantageous in this respect.

The Chair: It seems to me that the questions brought up by Mr. Vreeland in his paper and in his remarks concerning it, are very important, and that in the investigation of these questions along the lines of an honest and earnest attempt to get something better lies as much money saved for our corporations as in any other branch of the business. The great trouble today with us is this—we who use alternating current in the operation of cars know what "out of step" means. Has it ever occurred to us that we are a little out of step with the public and the authorities? It seems to me that we are. The field is wide open for useful tillage. In what public school in the United States is a word ever said to a boy or a girl about the rule and law of the road? The city schools are filled with hundreds of thousands of children who are not instructed in the simplest rules as to how to cross a street, how to go along the street, or how to drive a horse or a dog attached to a vehicle, or anything of the kind. What little instructions children receive in this particular they get from thoughtful parents, but many of the parents in large cities are in utter ignorance of the common rules and laws governing the conduct of individuals passing along the public way. There are few, if any, ordinances in force giving anything like proper regulation to the passage over the public ways or streets. It is as simple as the nose on a man's face—the portion of the street or highway from curb to curb should be reserved for the passage of vehicles; pedestrians should be limited to the sidewalks, and should be compelled to cross the streets at the street crossing, and not to make a perler floor of a city street, using the street as if they were in their own homes, as is done in Buffalo and other large cities. Women, without looking up, step into the street in every part of Buffalo where we have asphalt pavements, meandering along the street with the cars passing by them in

quick succession, the women acting as if they were treading the mazes of the dance. How the motormen can escape hitting them is a wonder to me. Yesterday those who took the ride by the courtesy of the Schenectady Railway Co. and looked out of the window saw several cases where women, and in one case a large fleshy woman, with a young infant in her arms, risked their lives by crossing the track, with perfect recklessness, in front of the swiftly moving car. In Nuremberg, Germany, it is a criminal offence to attempt to board or alight from a moving car. Why should there not be a law like that in every state in this country? There is a law in New York that makes an attempt to commit suicide a criminal offence, and it is just as much an attempt to commit suicide to jump off a moving car, in many instances, as to draw a razor across the throat and is followed with as bad a result in many cases. It is a perfectly simple and easy matter to get at, for the reason that our interests and the interests of the public are identical, as pointed out by Mr. Vreeland. No sane person wants to get hurt, or to be killed, and therefore the method of controlling transportation problems should be carefully examined by the public authorities and public men, and the people should be convinced that we are not acting arbitrarily, so that the street car shall not have any obstacle and shall be free to run through the streets at 30 miles an hour without let or hindrance, but that we are endeavoring to work for the people, for the benefit of every one in town, and that is all we want to do.

It suggested itself to me a short time ago that possibly I might accomplish some good by sending a letter to School Superintendent Emerson, of the city of Buffalo, asking him if he would not think it a wise thing to set aside several periods each week, two or three, consisting of a few minutes each, in which the teachers might in a very simple way instruct the children as to the rule of the road, and what they ought to do. If that plan were adopted, it seems to me that after a while—you cannot do things in a minute, cannot arrive at results in a minute, every good result obtained has been through long agitation and hard work—we would have a lot of people walking on the streets that know something about the rules of the road, and their individual rights and the rights of others.

There have been some unusual decisions of the courts recently. In New York, the law has been laid down by courts that at street intersections the rights of any vehicle, and the vehicle known as a street car, are equal; that is to say, a milk peddler, driving a wagon of milk or a man bringing in garden truck from the country, has as much right to our tracks at the intersection of streets as our car, with 150 busy men going to business. I do not believe that such a decision would be maintained in a court of last resort.

It does seem that this is a field wide open for us to go into, and if we do not do anything but slush around we ought to get a whole lot of benefit out of it.

Mr. Beggs: I think we can do more than slush around, Mr. Chairman. I reduced the obstructions to our lines in Milwaukee to a very great extent by a personal appeal to the users of large numbers of teams in obtaining their co-operation; as, for instance, the brewing interests, with hundreds of large 3 and 4-horse teams, occupying and obstructing our lines, by a personal request made to them to reduce this annoyance as much as possible, and also of large manufacturers who many times with their heavily laden wagons would delay a car for several blocks rather than turn out of the tracks, and by that kind of co-operation much can be done, because that is educational. What the teamsters of one class of business will do, the others drop into after a while and follow along. It seems to me if we could enlist the co-operation, for instance, of the express companies which have a large number of teams, with drivers who are usually very indifferent as to the accommodation of any one else, and the ice distributors, large coal dealers, and people of that kind, we would accomplish more in our respective cities than in any other way. In some of the cities where the roads continue to provide a steel tramway for vehicular traffic, which is done by municipal requirement, in those cities that have a flat girder rail where you virtually supply a steel road upon which to run vehicles, it is difficult to keep them out of the track, as it is the easiest place in which they can run. This is one of the disadvantages that come

in with the grooved rail; one of the greatest advantages which we have where we have finally converted our city officials to realize the benefit of a high T rail with granite headers on each side, a groove formed in it. It does not make a convenient place for driving, and our obstructions from vehicles in the city of Milwaukee has been reduced 50 per cent in five years. In our state we are fortunate enough to have from the Supreme Court in the last two or three years a very sensible decision, which has accorded to street cars, at street intersections at least and in most parts of the city, rights superior to a vehicle, upon the reasoning that a street car is restricted to the rails upon which it runs and cannot turn out or in, and that therefore other vehicles must give way to it; and at street intersections the law of steam railroads applies. "Stop, look and listen." It is also held that where a team continues for several blocks, or any considerable distance, in a track, and is struck by a street car, the driver is guilty of contributory negligence and cannot recover damages from the street car company—that it is his duty to keep watch, knowing he is in the line of street car track, to keep careful watch and keep out of the way. There was a case where a man had not looked back for 300 feet, and the case was thrown out of court.

Mr. John Grant, St. Louis: I may state an experience we had in St. Louis. We found in 1901 that the authorities of the city did not know the law. We went to the police department and tried to have the delays caused to cars eliminated to some extent, and were informed that there was a law which allowed a wagon to hold a car for five minutes. We thought that was peculiar and had our attorneys look the matter up and found the law was that when a car came up the wagon must move out of the track immediately. Some of our friends started a crusade against wagons on the track, with the result that drivers on the track delaying cars are arrested and fined. We had some trouble from wagons and pursued the method Mr. Beggs mentioned, going to a large number of the livery wagon and express companies and breweries and making appeals to them. One very large concern which employs in the neighborhood of 50 wagons made it a rule that any of their drivers whose wagon was hit by a street car paid the damages to the wagon and lost his position. In that way much can be accomplished, but it may be that the great number of changes being made around the country in the different roads, some of the men do not know the laws of their city in relation to cars. Some of our city authorities did not know the law, and as soon as we pointed it out they helped us to do away with a great many of the delays. In the last two years fifty per cent of the delays on our line have been eliminated. It means hard work all the time—you have to keep after the drivers, and the authorities also have to keep them up to the mark. If laws to keep wagons off the tracks could be passed in different cities generally, the law being a reasonable one, it would be a good thing.

The Chair: We will take up the next subject, "Comparative Merits of Single and Double Truck Cars for City Service." Mr. Beggs has not prepared a paper, but as he is present he will probably give us his views on the subject.

Mr. Beggs: This subject has been so thoroughly threshed out in the last seven years that there does not seem to be much left to say upon it, as it appears that most men charged with the operation of large systems have been forced, almost, to the use of double truck cars, even for heavy city service. The principal points of advantage to result from the use of double truck cars, in the first place, a much higher speed, of which the public receives the benefit. As soon as the public realizes that it does not seriously affect the street railway company to have its cars obstructed, but that it is the people on the car who are discommoded, the public will awaken to the fact that it is for them to get a better condition of affairs, so that in running double truck cars the first point is the smooth and comfortable riding of the passenger, as compared with the single truck car, with the great oscillation sometimes experienced running over a track, which is indifferently maintained. The track may be really worse as bad, but to the riding public it would not be evident in a double truck car. The next thing is that the large double truck car, equipped with four motors, one on each axle, which is our practice and has been for six

or seven years, enables the car to be accelerated much quicker; in other words, in many of our cities, the blocks are only 300 or 400 feet long, some shorter than that. If we follow out the rules as laid out in the usual book of rules, you would not get a street car up to speed between crossings. By the time you left one crossing and used the regulation method of feeding a car, it would not be up to speed by the time it got to the next crosswalk, the consequence being the general public is delayed, and you are not giving them rapid transit. The car is limited as to the number of trips it can make over a line during the day and consequently the cost of operation is unnecessarily increased. The quicker acceleration means higher average speed; in other words, I believe that it is applicable in most cities, even where there is pretty dense traffic—I am not referring to Broadway, New York, the conditions there are unusual—but on our city lines, where traffic is sometimes quite dense, we maintain an average schedule speed of nine miles an hour; with the large seating cars you are enabled, because of the greater seating capacity, to maintain long headway on the lines and still take care of the traveling public. Longer headway means less car miles and less car hours and less trainmen, and that your trainmen are performing more service for the company, and thereby reducing the cost per car hour or car mile for trainmen alone. The consumption of power is possibly increased, yet not more than would be necessary, in all probability, to put the same number of single truck cars, with two motor equipment, in operation. Then the cost of track repair and maintenance is less, as we discovered after an experience of seven years with double truck cars, which run smoother, than it is with single truck cars.

These are the principal points which seven years of use and the adoption of heavy truck cars as standard, has brought out, and which in our experience have been more than satisfactory. We several years ago established as a standard a large double truck car, fitted with cross seats, seating 44 passengers. They have a capacity, when passengers stand, of over 100. These are the reasons for our maintaining that it is much more advantageous, both to the general public and the operating company, to maintain and operate large double truck cars equipped with a motor on each axle, and with a motor of sufficient capacity to warrant you in quickly accelerating the car and getting it up to speed within about 200 feet, so that you are able to make the average speed of the car with the usual number of stops, of about nine miles an hour.

Mr. Gotshall: It occurs to me a great deal of good could be accomplished by this Association as a national body, if there were appointed a number of standing committees in this Association, as I believe now exists in the New York State Association. My idea is that there should be a Committee on Legislation, another Committee on Standards and Operation, and other similar committees. It appears to me that if the important matters of the Association were taken up by special committees in this manner much good could be accomplished along the lines that have been indicated by Mr. Vreeland and the other speakers. A representative committee of this Association, embodying the views of our members, could present these matters to legislators throughout the country and seek to have laws enacted which will remedy some of the troubles complained of. I would suggest that the executive committee of the Association take up the matter of the appointment of the Committee on Legislation, and it seems to me the matter could be extended by having sub-committees subsidiary to the main committee, in each state.

The Chair: It is quite evident to the Chair from very extended investigation made among the members of the Association and the supplymen, carefully conducted by him since he has been here that the time is ripe for the making of new arrangements in the affairs of the Association; and it is no reflection upon any of us at all. There seems to be a general acquiescence in the thought and its expression, that we have outgrown the clothes that were cut for a much smaller association and an association under different conditions.

It is my opinion that a motion to refer to the executive committee the consideration of the subjects which have been suggested would be the proper way to have these matters formulated and presented to the members.

Mr. Gotschall's suggestion was thus referred.

Vice-President Ad. Wright in the chair.

The Chair: The next business in order is the report of the committee on rules for the government of employees, of which Mr. L. G. Connette, of Syracuse, is chairman.

For Report of Committee on Rules, see page 703.

Want of space prevents our publishing the discussion of the report of the Committee on Rules. An abstract of this will appear in an early issue of the "Street Railway Review." The report of the committee was adopted by the convention.

The Chair: The special committee appointed at the session yesterday to consider the matter of furnishing reports to the press is ready to report.

The secretary read the following report:

"Your special committee, after duly considering the question of the revision of papers and discussions prior to publication, reports as follows:

"We recognize the importance and desirability of encouraging and securing a comprehensive and even confidential discussion of topics presented before the Association.

"We also recognize the importance and utility of the press and the desirability of not unduly restricting its privileges.

"We are of the opinion that the realization of these two objects necessitates intelligent censorship of the proceedings. We recommend for adoption the following rules:

"First. Upon the request of any delegate, any remarks or data submitted by him shall be considered privileged communications and withheld from publication in both the press and the annual report.

"Second. At the first session of each meeting of the Association the chairman shall appoint from the delegates in attendance a censorship committee of three members. All reports of proceedings shall be submitted to this committee and approved by at least one member thereof before being made accessible to the press.

"So far as possible all persons participating in the discussion shall be given an opportunity by the committee to revise and correct their remarks before publication. The committee also recommends that, to promote the best interests of the Association, the technical press be respectfully requested to refrain from the daily publication of the proceedings.

"C. O. Mailloux,

"John L. Beggs,

"J. G. White."

The report of the committee was adopted.

Mr. Beggs offered a resolution for the appointment of a committee of three members to confer with the so-called "steel rail pool," to obtain, if possible, a discontinuance of or material reduction in the differential charged for high tee girder and grooved rails used in street railway construction.

Mr. W. K. Morley offered the following resolution:

"Whereas, owing to the change of conditions and especially to the growth of the suburban and interurban railway interests, and the fact that the mule has been relegated to the plow, and that electricity is the motive power more generally used in street, suburban and interurban railway service, therefore be it

RESOLVED, That the name of this Association be and is hereby changed from "American Street Railway Association" to the "American Electric Railway Association."

On motion the resolution was referred to the executive committee.

The Chair: The Chair announces the appointment of the following committee on compensation for carrying the mails: Messrs. Grant, of St. Louis, chairman; Beggs, of Milwaukee; Rogers, of Binghamton.

Officers for next year, as reported by the Committee on Nominations, were unanimously elected, as follows:

President, W. Caryl Ely, president International Railway Co., Buffalo, N. Y.

First Vice-President, Elwin C. Foster, president New Orleans Railways Co., New Orleans, La.

Second Vice-President, John Grant, general superintendent St. Louis Transit Co., St. Louis, Mo.

Third Vice-President, James F. Shaw, president Boston & Worcester Street Railway Co., Boston, Mass.

Secretary and Treasurer, T. C. Pennington, treasurer Chicago City Railway Co., Chicago, Ill.

Executive Committee: President, Vice-Presidents, and Jere C. Hutchins, president Detroit United Railway, Detroit, Mich.; A. B. Colvin, president Hudson Valley Railway Co., Glens Falls, N. Y.; G. Tracy Rogers, president Binghamton Railway Co., Binghamton, N. Y.; W. A. Smith, general manager, Omaha & Council Bluffs Railway Co., Omaha, Neb.; S. L. Nelson, vice-president and general manager Fort Wayne & Southwestern Traction Co., Fort Wayne, Ind.

The only invitation received by the committee for a place of meeting next year was from Chattanooga, Tenn., and the committee recommended that the matter be referred to the Incoming Executive Committee.

On motion the question of a place for the next meeting was referred to the executive committee.

Mr. W. Worth Bean: We are 21 years old as an Association, and we have met for 22 consecutive years. I have been to all the conventions, and I have seen the time when the Nominating Committee has had considerable trouble in selecting the place of meeting, owing to the fact that numerous invitations were extended to the Association. We have grown to such magnitude and such proportions that the American Street Railway Association today has no invitation to visit a city for its next meeting, where ample hotel accommodations can be afforded us. I hope the time will come when we shall not expect such invitations. I hope the incoming executive committee will take decided action to the effect that we do not desire to have it understood that we expect these generous invitations from our friends in the business, and to be entertained by them at enormous expense, in the future. I went to the meeting in Boston in 1882; there were 25 delegates. Today we have at this convention 300 delegates, and our membership is 206 companies. I trust the executive committee will consider the selection of a place where this Association can meet, and where we individually can pay our bills, and pay our car fares, and not expect courtesies to be extended so that burdens are put on local companies; but let us go to any proper place, any city in the United States that the executive committee sees fit to select, transact our business as business people, and not junket and waste so much time. Let us also give the attention to the supplymen that is proper and in a measure repay them for going to the enormous expense to show us the interesting exhibits which are part and parcel of our meetings; and if we do not want to examine and look into the supplymen's exhibits, we should inform the gentlemen we do not want them around us. I want them. They have helped to increase our business and helped us in other ways, and it is a matter of courtesy to them that we should give them attention.

I am informed they feel that at this convention we have had so many other things to do that we have failed to visit them and give them the attention they deserve, after offering the exhibit they have for our special benefit. I do not know that it is germane to the matters before the house, but I felt it was my duty to speak on these points. I hope the executive committee will take this matter up seriously, and let us do our business in the manner it should be done. We have just elected a very able board of officers and executive committee, and the next meeting of the Association should see the most radical changes in our methods of doing business.

Mr. W. E. Harrington, Camden, N. J.: I wish to supplement Mr. Bean's statement by some observations I have made since I have been here, that struck me forcibly. I think we can draw lessons from the new Association composed of the master mechanics, which has just started in. They have decided to hold their meeting two days in advance of the meeting of this Association, and to hold three sessions each day to accomplish their work. I have been here since Tuesday morning, and have not been able to accomplish anything like what I wished to do in the matter of seeing certain exhibits and talking with certain people as to certain details in connection with our business. I think the pleasure trips have been of such a character that we have lost too much valuable time. I know from talks I have had with general managers of different companies that they will not come again to our meetings unless we make some very great

changes in the way of handling our business. I think the practice of spending so much time in sight-seeing and things of that kind should be done away with and we should devote ourselves strictly to the business for which the delegates attend the convention.

President Ely: I desire to return to you my sincere thanks for the very great honor which you have conferred upon me in electing me President of the Association. I accept the place with a full realization of the responsibility. I deem it a position of great responsibility. I will endeavor, with the help of the other officers and the executive committee, the supplymen, and all who are concerned in the welfare of the Association and the business represented by it, to devote such an amount of whatever of ability and energy I may have, together with a sufficient amount of time, in an earnest endeavor to bring about good results during the next year.

While returning thanks, I wish to say that in the Census Bureau report upon our industry, it is stated that there are 987 companies in the United States engaged in the street railway business, and of that number we have 206. Of course, that is a large membership, but it would seem as though we ought to have more than 20 or 25 per cent of the companies represented in this organization, when it must be conceded by all that the benefits of the Association are so great; and it would seem that we might make a much larger addition to our membership during the coming year if we would all be mindful of it and when we meet our neighbors who are not members of the Association suggest to them the benefits and advantages of membership. I know that the executive committee, the vice-presidents, and the secretary of the Association will make a very determined effort along those lines during the coming year.

I wish to make a further statement. When I returned to the country on Saturday last, reaching my home on Sunday, and Saratoga on Monday, I was not in synchronism with the present status of affairs touching our business, nor as to what had been going on during the last three months, because I had been engaged in an endeavor to have a good time and not think about any business at all; and I am quite satisfied that I succeeded in a very eminent degree. Therefore, my first thought in coming here was as to what should be presented to you as an opening address, and so I asked some of my friends of the technical press for kind suggestions, and I desire to return to those gentlemen who very kindly assisted me in preparing the address presented to you, not only my thanks, but a public acknowledgment of their assistance. Gentlemen, I thank you sincerely for the honor conferred upon me, and I pledge my best efforts, together with those who are working with me, towards the advancement of the affairs of this Association.

The meeting then adjourned to re-assemble at the banquet at 9 o'clock in the evening.

AN ADJUSTABLE CAR STRAP.

An adjustable passenger strap exhibited by Charles F. Luther, of Pawtucket, R. I., combines features that brought it prominently into notice during the convention. The adjustable feature will appeal to most car patrons. It is an easy matter to lengthen the strap to accommodate passengers of small stature by pulling down one side, the strap being provided with a special attachment, or buckle, for the purpose. A taller person grasps the short end and is thereby able to support himself with comfort. The strap is made of webbing, so it can be removed and cleaned at any time, and it is placed on the strap rod or removed from it without having to lift or disturb the rod in any way.

EUGENE MUNSELL & CO.

Eugene Munsell & Co. and the Mica Insulator Co., of New York and Chicago, were represented by Charles E. Coleman, manager of the Chicago house. Their exhibit, which consisted of "Macamite" ring segments and "Empire" cloth and their other lines of installation was located at the left of the main cross aisle in the booth with the National Carbon Co. Samples of these materials were freely distributed among the visiting delegates, and at all the writing desks of the hotels very attractive blotters were very much in evidence.

NEW CAR-BUILDING PLANT.

The Briggs Carriage Manufacturing Co., of Amesbury, Mass., has separated its car building department from its carriage business and is about to establish a car building plant at High Point, N. C. The machinery for this plant has been packed and will be shipped south this month. A company, known as the Southern Car Co., has been organized with a capital of \$75,000, for the purpose of conducting the car industry in the southern city named.

W. S. McDonald personally conducted the Detroit Trolley & Manufacturing Co's. exhibit and reports that this was a very successful meeting, so far as his company is concerned. The base, which has been on the market only a little over a year, is a ball bearing device. It has come into prominence in a remarkably short time.

The Dearborn Drug & Chemical Works issued a variety of souvenirs this year, as usual, but the one which it considers its official souvenir was an engineers' spirit level, pocket size, enclosed in a round case about the size of a cigar. For the ladies bottles of perfumery made in the company's works were given.

The Allis-Chalmers Co. was represented at the convention by Edward J. Meisenheimer, advertiser; J. B. Allan, manager English sales; J. Vail, New York representative, and James Lyon, of Chicago. Mr. Lyon was accompanied by Mrs. Lyon.

The many friends of A. H. Sisson, general manager of the Jewett Car Co., were pleased to see him in attendance.

Representatives of the Barbour-Stockwell Co., of Cambridgeport, Mass., who were at the convention yesterday were H. R. Luther, president; F. S. Stockwell, general manager; F. H. Ellis, engineer, and William W. Field.

The Crenghead Engineering Co., of Cincinnati, presented all callers an ivory pocket rule with metric and standard measurements.

HOW TO HIDE YOUR SINS.

A helpful suggestion may be found in the following euphonious contribution from the pen of a representative of the Detroit Graphite Manufacturing Co.; it's not half bad-a-bad:

King "Bad-a-Bad"—a wicked king;
His sins were piled so high,
A ghastly monument they formed
That well-nigh reached the sky.

A queen there was—so fair and pure,
From the lands across the sea;
And she, old "Bad-a-Bad" would wed—
If she would fain agree.

"Indeed, my lord," these words she said;
"I surely must decline;
Till all those towering sins, forsooth,
With virtuous splendor shine."

King "Bad-a-Bad," in deep despair,
Tried every patent mix;
Alas! tho' these were water-proof,
For sins, well, they were nix.

At last, however, he won his bride—
Became a glorious saint;
For "Bad-a-Bad" touched up his sins
With Superior Graphite Paint.

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Application made for entry as second class matter.

5TH YEAR
No 4

Saturday, Sept. 6, 1903.

SERIAL No. VOL. XIII
No 8 D

SAVE THE DAILIES.

The page numbers of the "Daily Street Railway Review" are consecutive with the page numbers of the monthly "Street Railway Review." Therefore save all your copies of the "Daily." No. 8 of Vol. XIII of the "Street Railway Review" ended with page 550, No. 9 will commence with page 711. The intervening 160 pages are comprised in the Saratoga "Dailies" which bear the serial numbers Vol. XIII, Nos. 8 A, B, C and D.

The publishers of the "Daily Review" feel that they have every reason to congratulate themselves upon the success of this enterprise. The following table shows the growth of the "Daily Street Railway Review" in a very striking manner:

| City. | Year. | Issues | Pages. | |
|-------------------|-------|--------|----------|--------|
| | | | Reading. | Total. |
| Chicago | 1899 | 5 | 102 | 242 |
| Kansas City | 1900 | 4 | 88 | 188 |
| New York | 1901 | 4 | 125 | 252 |
| Detroit | 1902 | 4 | 132 | 300 |
| Saratoga | 1903 | 4 | 164 | 368 |

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The "Daily Review" will be there in 1904

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A. R. M. & E. A.

The promises held out at the first meeting for an enthusiastic and successful launching of the American Railway Mechanical and Electrical Association have been more than fulfilled, and the society starts upon its first complete year under auspices that promise a bright and useful future. Since the opening of the Saratoga convention, over thirty new members have been added to the roll, making a total membership of over 110. As results have demonstrated the office of secretary has been in good hands and in recognition of this fact Mr. Walter Mower, of Detroit, was re-elected secretary and treasurer, and at the last session President Farmer in a few well chosen words proposed a vote of thanks to Secretary Mower for the excellent manner in which he had handled the business of the Association entrusted to his care.

ELECTRIC RAILWAY SUPPLYMEN'S ASSOCIATION.

A meeting of the street railway supplymen exhibiting at the convention was called at 1 o'clock p. m., Friday, Sept. 4, 1903. In the meeting room of the Street Railway Accountants' Association. The meeting was called to order by Mr. O. W. Johnson, general manager of the Johnson Wrecking Frog Co., who explained that the object was to form an organization of the manufacturers and dealers in street railway equipment and supplies, who attend the annual conventions of the American Street Railway Association and its allied associations. Mr. D. M. Brady, president of the Brady Brass Co., explained the organization, and the methods of the supplymen's association, which conducts entertainments and arranges for exhibits in connection with the conventions of the American Railway Master Mechanics' Association and the Master Car Builders' Association.

After some discussion as to the best method of proceeding and an explanation as to what had been done in past years in attempts to form an association along the lines suggested, Mr. W. J. Cooke, vice-president and general manager of the McGuire Manufacturing Co., was by motion chosen temporary chairman; Mr. Cornell S. Hawley, of the Consolidated Car Heating Co., was then chosen temporary secretary.

Mr. Johnson stated that he had secured the signatures of 80 per cent of the exhibitors at the Saratoga convention, all of whom firmly believed that such an organization as had been outlined was a necessity if exhibits were to be held at future conventions. These signatures were arranged alphabetically in a book which was turned over to the secretary of the meeting.

Mr. J. G. White, of J. G. White & Co., moved that an organization of Electric Railway Supplymen be formed and that a committee consisting of W. J. Cooke, vice-president and general manager of the McGuire Manufacturing Co., Chicago, Chairman; D. M. Brady, president of the Brady Brass Co., Jersey City, N. J.; Scott Blewitt, of the American Car & Foundry Co., St. Louis; Fred S. Kenfield, president of the "Street Railway Review," Chicago, and James H. McGraw, president of the Street Railway Journal, New York, be constituted an Executive Committee, to which they shall add four other representative supplymen; that the full committee of nine as thus appointed confer with the executive committee of the American Street Railway Association and other committees representing those who may have interest in this question, and that the Executive Committee have full power to establish a permanent organization, to decide upon the name of the association, and to act upon all business affecting the interest of the association.

The motion being duly seconded and put was carried unanimously.

Mr. White suggested that the name of the association be the Electric Railway Supplymen's Association.

The organization as outlined contemplated the appointment each year of a number of sub-committees on finance, on entertainments, on exhibits, etc., which sub-committees would have charge of details connected with the meeting of the association.

The meeting then adjourned.

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A meeting of the four members of the executive committee who had been present at the meeting when they were appointed, was at once held. After a brief discussion of plans for future action the executive committee adjourned to meet in New York city at the call of the chairman, at which time the other four members will be added to the committee and the plans of the association be fully outlined.

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Among those present at the meeting were:

W. J. Cooke, vice-president McGuire Manufacturing Co., Chicago.

D. M. Brady, president Brady Brass Co., New York.

O. W. Johnson, general manager The Johnson Wrecking Frog Co., Cleveland, O.

Cornell S. Hawley, general agent Consolidated Car Heating Co., New York.

S. T. Dodd, Stanley Electric Manufacturing Co., Pittsfield, Mass.

F. N. Root, manager Root Track Scraper Co., Kalamazoo, Mich.

O. P. Johnson, secretary and treasurer Star Brass Works, Kalamazoo, Mich.

J. G. White, president J. G. White & Co., New York.

Bertram Berry, Heywood Bros & Wakefield Co., New York.

F. S. Kennel, president "Street Railway Review."

L. S. Schenck, The Sterling Varnish Co., Pittsburg, Pa.

Jas. H. McGraw, president Street Railway Journal.

Philip C. Snow, Globe Ticket Co., Philadelphia.

Daniel Royse, editor "Street Railway Review," Chicago.

R. W. Conant, Cambridge, Mass.

Dr. Chauncey B. Forward, president Eclipse Car Fender Co., Cleveland.

John C. Dolph, Standard Varnish Works, New York.

Wm. E. Reid, United States Steel Co., Everett, Mass.

W. C. Pope, vice president Globe Ticket Co., Philadelphia.

Elmer P. Morris, president Elmer P. Morris Co., New York.

De Witt Clinton Griffiths, Globe Ticket Co., Philadelphia.

E. G. Chamberlin, Standard Pole & Tie Co., New York.

W. E. Daria, Magneto Electric Co., Amsterdam, N. Y.

C. B. Fairchild, "Street Railway Review," New York.

THE NEED FOR THE NEW ASSOCIATION.

The readers of the "Daily Street Railway Review" are familiar with the efforts made in recent years to effect an organization of the suppliers who exhibit at the street railway conventions. In 1900 at Kansas City, we gave considerable space to this subject. In 1901, at New York, steps were taken towards such an organization, and again in 1902, at Detroit, the matter was under consideration.

These attempts came to naught largely because they did not have the sympathy of the Executive Committees of the American Street Railway Associations which served in those years. It needed a convention held otherwise than as the guest of a street railway company to emphasize the need of an organization of suppliers. So long as the chairman of exhibits was a street railway man, and the exhibit hall was furnished by the local street railway, matters were handled in a manner that was reasonably satisfactory to all concerned, though it was recognized that there were good reasons for concerted action by exhibitors which would relieve the street railway official acting as chairman of exhibits of these additional duties.

This year for the first time in its history the A. S. R. A. was not the guest of a street railway company, as exhibitors have found to their sorrow.

There has been general complaint of the exorbitant charges with which the exhibitors were met on every hand—for hotel accommodations, for booths, for decorating, for trucking, for signs, for power. In one instance the charge for trucking was reported as fully four times city prices for the same service. About the only thing regarding which the suppliers have no cause of complaint is the weather for the week.

The American Street Railway Association has been at fault in accepting plans for entertainments and excursions which took the majority of delegates away from the exhibit grounds during practically all the time the conventions were not in session. This fact was fully recognized by Mr. Ely and by Mr. Bean and Mr. Harrington, whose emphatic remarks on this subject appear on pages 690 and 691 of this issue.

Read them again!

"DEPRECIATION."

The Accountants' Association was extremely fortunate in having presented before it two able articles on "Depreciation"—a most important and a hitherto unconsidered subject. The third address of President Deane comprised an able discussion of the subject which was also treated in an admirably frank manner by Mr. Stinson of the United States Census Office.

J. P. Provost, cashier of the R. D. Nuttall Co., was on hand to help load, after the company's address.

A. S. R. A. OFFICERS.

The Association is to be congratulated upon the officers chosen to serve for the ensuing year. Mr. Ely's election as president is a recognition of his ability as the executive officer of large traction and electrical interests and a timely acknowledgement of the able and graceful manner in which he presided at the 1903 convention. The reelection of Secretary Penington is an additional certificate of faithful work well performed.

SECRETARY BROCKWAY.

The Accountants' Association has again elected Mr. Brockway to the office of secretary and treasurer. We congratulate Mr. Brockway, and we also congratulate the Association.

A WORD OF ACKNOWLEDGMENT.

We desire to take this opportunity of expressing our thanks to the J. B. Lyon Co., of Albany, which has been printing the "Daily Street Railway Review" during the Saratoga Convention. Although most of the work has been done at night, and under exceptionally trying conditions, the "Daily Reviews," well printed and well bound, have been placed on the early morning train regularly every morning and have reached Saratoga before the opening of the various conventions. To accomplish this result has taken very careful management in every department of the printing office, but not a slip has occurred throughout the entire week. This speaks well for the management and organization of this printing house and it is owing to its reputation in this very line that the establishment has secured the state printing of the State of New York.

In addition to this wholly inadequate expression of our appreciation of the service rendered us by the company, we would also put on record our obligations to the heads of the four departments—the composing room, the pressroom, the bindery, and the shipping office—whose hearty co-operation and untiring efforts, have enabled us to make this year's "Daily" the most nearly perfect one we have ever published.

The "Daily Review" would not have been possible without Mr. T. E. Crossman and Mr. A. B. Weaver, official stenographers of the Associations, and their efficient assistants.

THE BANQUET.

The 22d annual banquet of the American Street Railway Association was held last evening at the Grand Union Hotel. After the banquet the newly-elected officers were installed, followed by the post-prandial exercises. Hon. Addison B. Colvin was toastmaster and the toasts announced and their sponsors were as follows: "How the Wheels Go Round," Hon. Adelbert P. Knapp; "The Legal Side," Hon. Job E. Hedges; "The Empire State," Hon. George E. Green; "The Relation of Labor to Capital," Rev. John R. Mackay, D. D.; "The Perfection of Success," Herbert H. Vreeland; "The Happiness (?) of Public Service," Hon. Edgar T. Brackett; "The Best Fare—The Feminine Fair," Hon. W. Caryl Ely.

We feel deeply indebted to our esteemed eastern contemporary for the brilliant illumination provided for the "Street Railway Review" booth each night of the convention.

It is extremely gratifying to the "Review" that its suggestion made just a year ago in relation to the changing of the name of the American Street Railway Association to the American Electrical Railway Association is in a fair way of being carried out, as a resolution providing for this change of name was introduced at the session yesterday and is now in the hands of the Executive Committee.

The American Street Railway Association this year broke the record for the dispatch with which it disposed of the business before it. During the three days of the meeting the sessions devoted to the consideration of technical papers aggregated about five hours.

AUTOGRAPHIC TEST CAR.

About E. H. Hensley, consulting electro-rail engineer, of New York, was present at the convention and made the most of the opportunity to explain to the electric railway fraternity the work of his autographic test car. This car, as it passes over the track takes a record from the bands of Weston's instruments of the flow of current on the rail as well as the resistance of every point on both tracks without touching the hands of the instruments or interfering with their sensibility.

This record travels at the rate of 1 in. of record to 100 ft. of track and the autographic machine will also mark on the record the location of any point where resistance is above that for which the machine is set, the pen on the record simultaneously sports point on the track at the bad bond. The car is fitted up for making line electrolytic and equipment tests, and also with apparatus for complete station tests. Since January 1st Mr. Hensley has tested and reported on several important railway properties.

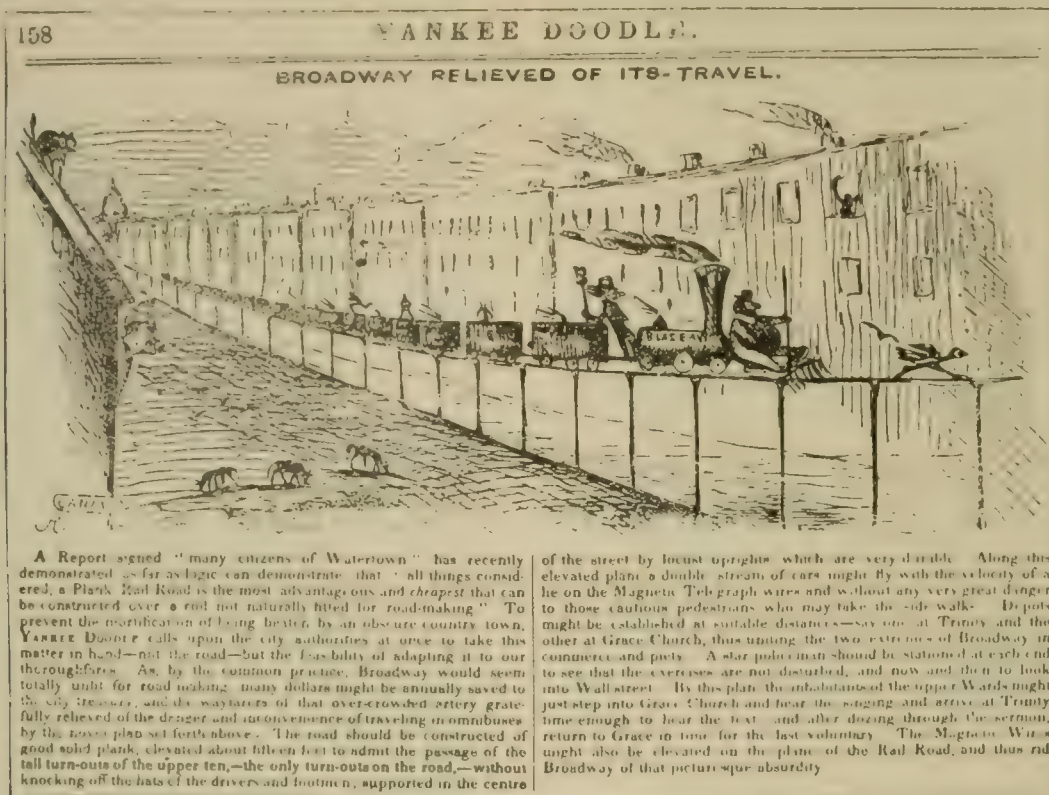
George W. Provost, manager of the General Railway Supply Co. of Pittsburg, was among those present.

Among those who registered during the week is Arthur S. Fairbridge, the St. Louis street railway supplyman.

J. H. Stedman, of Rochester, N. Y., was an interested visitor at the convention.

J. A. Hanna, of Cleveland, was present in the double capacity of western selling agent of the John Stephenson Co. and the Peckham Manufacturing Co.

John Jay Morse, treasurer and assistant secretary of the St. Louis Car Wheel Co., was among the late arrivals.



A Report signed "many citizens of Watertown" has recently demonstrated as far as logic can demonstrate, that "all things considered, a Plank Road is the most advantageous and cheapest that can be constructed over a road not naturally fitted for road-making." To prevent the mortification of being beaten by an obscure country town, YANKEE DOODLE calls upon the city authorities at once to take this matter in hand—not the road—but the feasibility of adapting it to our thoroughfares. As, by the common practice, Broadway would seem totally unfit for road making, many dollars might be annually saved to the city treasury, and the wayfarers of that over-crowded artery gratefully relieved of the danger and inconvenience of traveling in omnibuses by the *new* plan set forth above. The road should be constructed of good solid plank, elevated about fifteen feet to admit the passage of the tall turn-outs of the upper ten,—the only turn-outs on the road,—without knocking off the hats of the drivers and footmen, supported in the centre

of the street by locust uprights which are very durable. Along this elevated plane a double stream of cars might fly with the velocity of a lie on the Magnetic Telegraph wires and without any very great danger to those cautious pedestrians who may take the side walks. Depots might be established at suitable distances—say one at Trinity and the other at Grace Church, thus uniting the two extremes of Broadway in commerce and piety. A star policeman should be stationed at each end to see that the exercises are not disturbed, and now and then to look into Wall street. By this plan the inhabitants of the upper Wards might just step into Grace Church and hear the singing and arrive at Trinity time enough to hear the text, and after dicing through the sermon, return to Grace in time for the last voluntary. The Magnetic Wires ought also be elevated on the plane of the Rail Road, and thus rid Broadway of that picturesque absurdity.

WAS FUNNY IN 1846.

The funny man of Yankee Doodle, a comic paper published in New York City in the 40's, thought he struck a very humorous lead when he sketched the choice cartoon reproduced in fac simile here, which appeared in that journal in 1846. Being a fenny man he doubtless has been roasting these many years in expiation of the roasts he perpetrated when on earth; but in the light of subsequent events, his satiric predictions have now become an interesting literary curiosity.

The Old Colony Street Railway Co., has purchased Lakeside Park, in Freetown, near New Bedford, Mass. The Massachusetts Railroad Commissioners approved of the purchase, the Old Colony paying \$27,575, for which 260 shares of stock will be issued at 105. This park was built by the James F. Shaw syndicate when the street railway between New Bedford and Brockton was opened and is considered one of the best properties of this kind in New England.

The western agent of the Ball & Wood Co., J. H. Parshall, of Chicago, was among the attendants at the convention.

The Positive Railway Sander Co., of Lancaster, Pa., showed a sample of a track sander that came in for considerable attention throughout the convention. Charles V. Rote, vice-president, pointed out the various features of the device.

The Root Track Scraper Co's. exhibit arrived and was set up yesterday and F. N. Root, the manager of the company, had one of the busiest days he has known. He states that he sold more than 25 scrapers yesterday, and did not sell more than three to any one road, it being what he calls a nice sample order business.

William B. McVicker, the popular second vice-president and eastern manager of the Dearborn Drug & Chemical Works, was kept busy dispensing souvenirs and good fellowship, as usual.

SEVENTH REGULAR ANNUAL MEETING

STREET RAILWAY ACCOUNTANTS' ASSOCIATION

Saratoga, N. Y.—Sept. 2—4, 1903.

FRIDAY, SEPT. 4, 1903.

President Davies called the meeting to order at 10:20 a. m. and called for the report of the Executive Committee, as the first order of business, which report was presented by Secretary Brockway, on motion duly accepted and its recommendations adopted.

Mr. Frank R. Henry of St. Louis then read his paper on "The Advantages and Disadvantages of the 'Bag System' as compared with the 'Receiver System' of handling conductors' remittances."

[For Mr. Henry's paper, see page 637 of the "Daily Street Railway Review," September 4, 1903.]

Mr. Ham said that the paper expressed his views and that he agreed absolutely with everything stated therein. In Washington, however, probably 90 per cent of the business was ticket business and he (the speaker) felt satisfied that under those conditions the receiver system was impracticable. They made it a practice to deal personally with conductors in the adjustment of discrepancies and he was becoming more and more impressed with the defects in the methods of making returns in bags. The better that you could treat the men, the more courtesy you could show them, the better it was for the company, and from that standpoint alone he should prefer the receiver system to the bag system where the former could be employed.

Mr. Smith reported some valuable details as well as the general results obtained by his company (Chicago Union Traction Co.) in the use of the receiver system and stated that the expense of that system amounted with them to \$1.93 per thousand dollars collected.

Mr. Mitchell stated that in Pittsburg they had both systems, and he might say also a third system which was somewhat like the bag system. They had gone through a consolidation some 18 months ago and had not yet been able to make up their mind as to which system they wanted to adopt exclusively, largely owing to the fact that there were conflicting opinions among the several officers.

Mr. Fullerton said his company at Detroit had the tickets and transfers turned in each trip and the cash once a day. They had the same trouble with contentions over shortages and averages that others complained of, and for that reason, among others, he was very much interested in this question and its consideration at this meeting, to see if something could not be invented to do away with that feature. One other difficulty they experienced was the delay caused conductors in turning in their receipts at times when a great many of them pulled off at about the same time.

Mr. Henry said that at their largest barn, where they ran some 240 cars, they never experienced serious trouble from that source, the men not being delayed as a rule more than a minute or a minute and a half. During exceptional rushes, and such conditions as they expected to arise at the World's Fair time, doubtless there would be more congestion, and then it would be a question of putting on more receivers and throwing more work on them.

Mr. Lester of the Worcester Consolidated said they had adopted the receiver system. They had had the bag system in vogue on some of the suburban roads before the consolidation, but it was very unsatisfactory, as sometimes bags were turned in as they should be and sometimes not and there was always a dispute between the receiver and the conductor.

Mr. Henry explained that instead of having the receiver indicate the amount of money and adult tickets on the trip sheet, as described in his paper, they had since changed the procedure by cutting out that detail, and all the receiver did now was to take

the amount reported to him, which he could check if he saw fit, put his initials on the trip sheet, treating that as a teller would a deposit sheet.

Mr. Duffy stated that from his experience both with the bag system and the receiver system, there was nothing whatever to be said in favor of the former where the latter was practicable.

Mr. Bartlett said that in Boston they were using the bag system, more from force of circumstances, he supposed, than anything else, but he agreed with those who had already spoken in the view that the receiver system, where it could be used with reasonable economy, was the system to use.

Mr. Mitchell reported that in their experience the bag system was costing them about \$2.00 for a thousand dollars collected, and the receiver system about \$3.17 a thousand.

Mr. Boyle stated his company used the fare box system on four lines and the receiver system on the others; he hardly knew whether theirs would be called a receiver or a bag system, as it was a combination of both.

Mr. Mackay stated that they were using the bag system, principally he thought on the ground of greater economy, but they had overcome some of the difficulties that had been mentioned by preceding speakers, as for instances, in the check provided against the purloining of receipts.

Vice-President Ely of the A. S. R. A. visited the Accountants' meeting at this point, and was invited by the chair to address the members.

Mr. Ely was greeted with applause and spoke briefly. He said that he came before the Accountants with fear and trembling, as he always did, because he never knew what the result was going to be until after he had gotten through. Though he had left the meeting of the A. S. R. A. in the midst of a very important discussion, and had but a moment to spare, he felt that he could not refrain from accepting their kind invitation to appear before them. He looked upon the Accountants' Association as one of the most valuable results of the existence of the A. S. R. A. and the work which the former had accomplished spoke for itself and was an achievement of which they might well feel proud. However, Rome was not built in a day, and perfection could not be attained without continuous labor. The only thing to do was to put their shoulders to the propositions still before them and just keep on pushing. He complimented the accountants upon being a body of thoughtful, very intelligent, clean, bright and business-like men. He hoped to meet twice as many of them next year, and that success would crown their efforts in every branch of their work.

Messrs. Hogarth, Henry, Smith, Christ, Pease, Simpson and others contributed further to the discussion of the bag versus the receiver system of handling remittances, whereupon this subject was closed and the chair called upon Mr. C. N. Duffy to present the subject next announced on the program, a "Comparison of the Municipal Tramways Association of Great Britain Proposed Standard Classification and Form of Report with the American Standard."

Mr. Duffy presented this subject very interestingly in what he termed an "informal talk," beginning with the correspondence with Mr. Dalrymple of the Glasgow Corporation Tramways Company preliminary to the investigation that had been made, showing among other things that full credit had been given to the work accomplished by the S. R. A. A. of America. He (the speaker) had advocated very warmly the adoption by the British Association of the American classification with a view to securing its use the world over, and was met with the argument that the difference in conditions presented obstacles to that consummation, especially in respect to those companies abroad which

were municipally owned and operated. Mr. Duffy then proceeded to a comparison of the details of the respective classifications and terms, which owing to the limited time at his disposal was necessarily somewhat hurried and incomplete, and on motion it was voted that anything additional which Mr. Duffy would have time to write upon the subject should be included in the printed proceedings.

On motion of Mr. Ross, the President was directed to appoint a committee of one to rearrange the selection of blanks as recommended by the Executive Committee, and Mr. White of Hartford was appointed as such committee.

Mr. Smith for the Committee on Amendment of the By Laws reported adversely to making any change at this time.

The Committee on Nominations presented the following report, which was adopted unanimously:

President, F. E. Smith, of Chicago.

First Vice-President, F. R. Henry, of St. Louis.

Second Vice-President, C. O. Simpson, of Birmingham, Ala.;

Third Vice-President, J. J. Magilton, Schenectady.

Secretary-Treasurer, W. B. Brockway, Yonkers.

Executive Committee, H. J. Davies, of Cleveland; S. C. Rogers, of Youngstown, Ohio; S. G. Boyle, of Louisville, Ky.; H. M. Pease, of Buffalo.

President Davies said that in retiring from the chair he wished to express his thanks to the members for their attendance, for their patience with their presiding officer, to the members of the Executive Committee for their assistance and especially to Secretary Brockway for courtesies innumerable, which had made the work of the President almost a pastime. He congratulated the Association upon the selection made for its officers for the coming year.

President-elect Smith was then called to the chair, and pleaded the lateness of the hour as an excuse for limiting his remarks to an expression of his high appreciation of the honor conferred.

Secretary Brockway announced that the place of the next meeting of the A. S. R. A. had been left, as it was last year, to the Executive Committee, in consequence of which it would not be known until that committee had taken action where the place of meeting would be.

Mr. White moved that the Executive Committee be given authority to arrange for the printing of the standard report of the commissioners of the several states in the regular form for distribution to members of the Association, which motion, as amended in some of its details in the course of a brief discussion, was carried.

It was moved by Mr. Mackay that the portrait of the outgoing President be inserted in the Proceedings, and that the thanks of the Association be extended to him for the very able manner in which he had discharged the duties of the office.

Carried.

The Secretary was directed to draft a set of resolutions, expressing the appreciation of the Association for the courtesies and privileges extended at this meeting.

Mr. Henry, of St. Louis, reminded the Association of the approaching World's Fair in his city and invited the members to call upon him during their visit there, when he would do all in his power to see that they were properly taken care of.

On motion of Mr. Mitchell the convention then adjourned sine die.

CROUSE-HINDS CO.

The Crouse-Hinds Electric Co. exhibit included guy anchors, sockets for series wiring and a new arc headlight, which was exhibited for the first time. The exhibit was housed in a pagoda erected in the courtyard designed by the Crouse-Hinds company and lighted by 1,500 lamps set in the "Norbit" sockets. A. F. Hills, Nathan Shute and H. B. Crouse were in attendance.

Edward P. Sharp, manager of the street railway department of the Lumen Co., was in charge of that company's exhibit of Lumen bronze bearing and trolley wheels.

THE ACCOUNTANTS' PRESIDENT.

In selecting Mr. F. E. Smith as president, the Accountants' Association has made no mistake. He has been closely identified with the work of the Association from the first, is a thoroughly practical man and, therefore, familiar with and capable of devising ways and means for increasing the practical benefit of the Association to the members. We predict a successful and prosperous year for the Accountants.



F. E. SMITH.

Mr. Smith holds the office of auditor for the receivers for the Chicago Union Traction Co. and auditor for the Chicago Consolidated Traction Co. Prior to his going to Chicago four years ago he was general auditor for the Massachusetts Electric Companies of Boston to which position he was appointed after the merger of the Lynn & Boston system on which he had held the office of auditor for five years. Previous to his work in Massachusetts he had held the position of auditor for the Zanesville & Ohio River Railway Co.

The Baldwin & Rowland Switch Co. exhibited the B. & R. switch for electric railways, "a marvel in simplicity". This switch opens by magnetism and sets by gravity and has very few parts.

The Baltimore Railway Specialty Co., represented by J. E. Norwood, showed the "Norwood" improved center and side bearings, which are in service on nearly 100 large electric and steam roads. The combination bearing, style K, is made to fit all bolsters. In it all the bearings are suspended. The use of these bearings is said to prevent lateral strain between car and truck.

The George W. Knowlton Rubber Co., of Boston, was represented by D. B. Wakelee, who cheerfully expounded the virtues of the Knowlton packings and gaskets, at the same time distributing rubber cigar holders as souvenirs.

The Diamond State Steel Co., of Wilmington, Del., had a small exhibit, showing diamond tie plates and spikes. All the products of this company are made from open hearth steel or iron.

The Traction Equipment Co., of Brooklyn, N. Y., was represented by George B. Cornell, George Best and C. V. Rapelje. The company distributed useful vest pocket note books for souvenirs.

ELECTRIC WELDED JOINTS.

By William Pestell, Superintendent Motive Power and Chief Engineer, Worcester Consolidated Street Railway Co.

Probably no one thing contributes more to the expense of operating an electric railway than bad joints in the track. First comes the wear and tear on cars, trucks, motors and equipment from the constant pounding over the joints; the loss of voltage due to the breaking of bonds with its inevitable consequence, baked out motors, reduced schedule speeds, increased coal consumption and chances for electrolysis; then the expense of taking up paving, renewing splice bars, bolts, etc., in an almost hopeless attempt to make the rail fit for further service. It is usually found that by the time a general overhauling of the track is decided upon the rail ends are so badly pounded out that the simple raising of the joints and renewing of splice bars and bolts does not extend the life of the rail to a commercially practical extent. This is particularly so in the case of girder rail in



WM. PESTELL.

paved streets. T-rail is usually more accessible and less costly to repair, consequently it does not get into as bad condition before repairs are made and can by the use of some of the patented joints be put in such condition that many years are added to its useful life.

In 1892 the Johnson Co. organized a department for electric welding of track working under the patents of Prof. Elihu Thompson, of Lynn, Mass. In 1893 and 1894 the Johnson Co. welded about 50 miles of track in the cities of Boston, Cleveland, Brooklyn, Johnstown, Detroit and St. Louis. The track welded had been laid for some time and was in bad condition so that the first work attempted was repair work rather than construction.

It was early found that the voltage was not maintained at all points on the line at the necessary 500 volts the apparatus was designed for and a booster was introduced to compensate for the line losses and make up the deficiency. Storage batteries were also used with the first apparatus to help maintain the voltage and prevent an excessive demand on the station for current. It was soon found that sufficient current could be obtained from the line without the use of batteries and they were abandoned.

The first welds were made by welding a short vertical bar directly over the joint as shown by Fig. 1. This weld was made under pressure, but the pressure was not continued after the weld was completed and the metal became porous in cooling, leaving a mechanically weak joint. A great deal of the tendency to porosity in the metal was undoubtedly due to the burning of the rail and bars at the small points of contact then used. To overcome the tendency to burn and the porosity in the metal, a form of weld, Fig. 2, was devised, two distinct welds being made at each joint, practically butt welding the rail ends together. As in the previous case, the welding was done under pressure but the pressure was immediately released when the weld was completed, the welding company not yet realizing the importance of continuing the application of pressure until the weld had practically set. As in the case of the first weld, the second weld was porous and weak mechanically, and in addition,

the heat being applied directly at the head of the rail, bulged the latter so that it became necessary to plane it down to a working surface after welding.

A great number of breaks occurred in both these types of welds and in each case the track opened up from one-fourth inch to one half inch. The breaks occurred soon after welding, usually during the first twenty-four hours. The welding company was led to believe from the nature of the breaks and from the opening in the track after breaks occurred that they were due to strains in the rail from contraction after welding.

The company then devised a machine to compress a length of track before and during welding, the idea being to put enough compression into the track while welding to prevent any tendency to contraction strains after welding. While this reduced the breaks to some extent, breakage was still excessive and the porosity of the metal at the fracture led the welding company to believe that a change had taken place in the metal from the passage of the electric current through it and commercial welding was discontinued until some method of overcoming the defects could be devised in the company's shops. Experiments were carried on continually both from a chemical and mechanical standpoint from 1895 to 1897, and it was proved conclusively that the heating of the metal by electricity had no more injurious effect than heating by any other source. At the latter part of the experiments it was discovered that by making the weld under pressure and increasing the pressure as the weld was completed, continuing the pressure until weld had practically cooled, the metal was left in a dense condition, free from porosity and of high tensile strength. It was also found that any part of the weld that had not been subject to this condition was of a porous nature and weak mechanically. This led to the making of projections or bosses on the bars which were as in Figs. 3, 4, 5 and 6, the bars being placed one on each side of the rail and welded in their places directly to the web of the rail, the center weld being made through a loose piece of metal dropped on the bar rather than a boss on the bar.

The welding plant consisted of five cars—the sand car, welding car, rotary converter car, booster and motor car and motor and emery wheel car for finishing. The cars are run on the track by their own motors, and can be sent from place to place over the different roads wherever there are connecting lines. The connections of the first welding outfit were as in Fig. 7.

Recent improvements have reduced the number of cars from five to four and instead of regulating on the D. C. side of the rotary transformer by a motor generator, the regulating is done on the A. C. side by means of variations in the connections of a regulating transformer. The latter machine is shown diagrammatically in Fig. 8. This type of machine has reduced the amount of current taken from the trolley from a maximum of 500 amperes to a maximum of 300 amperes under adverse conditions. At the present time all welds are made by means of two steel bars, the usual size of which are 1 in. x 3½ in., and from 18 in. to 48 in. long, 18 in. being the shortest bar found practical to weld even where the holes are not drilled in the rail, the greater lengths depending on the distance of drilled or punched holes from the end of rail. It is not safe to weld on bars where holes are nearer than 3 in. from end of the bar. The same size bar is used on both 6-in. and 9-in. rail, the strength of the bar being ample to support the joint directly at the weld without the bar mechanically fitting the rail.

The first mile of track welded under the system using long plates was welded in the fall of 1897 on the Johnstown Passenger Ry., Johnstown, Pa. The rail was 6-in. girder, 78 lb. to the yard, 78-225 Johnson Co. section. Breaks to date, 3; street macadamized, no paving. Next welding, Nassau Electric Ry., Brooklyn, N. Y., Fifth Ave., from Atlantic Ave. to 39th St., Marcy Ave., from Fulton St. to Flatbush and So. H. St., a total of nine miles. This Brooklyn rail was 9-in. girder laid in paved streets; at the end of the first year there had been eight breaks.

In March, 1901, seven different roads in and about Worcester, Mass., were consolidated under the name of the Worcester Consolidated Street Railway Co., with headquarters at Worcester, and Mr. R. T. Laffin as general manager.

Upon investigation it was found that a number of miles of 6-in. and 9-in. girder rail while not worn out was so badly down at the joints required that some method had to be devised to

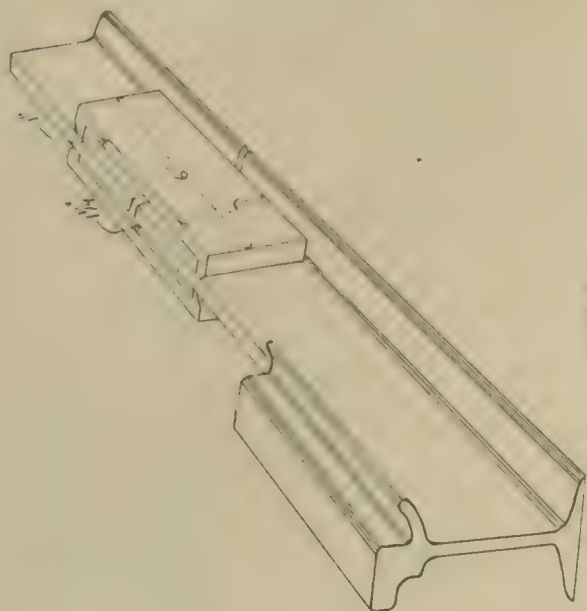


FIG. 2.

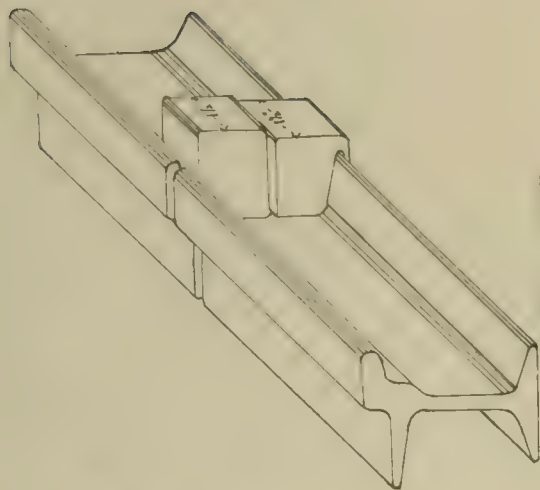


FIG. 1 — BACK.

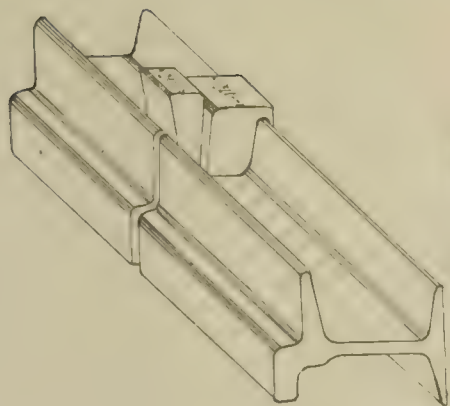


FIG. 1 — FRONT.



FIG. 3 — BAR FOR WELDING.



FIG. 5 — SECTION END WELD.

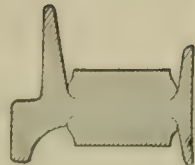


FIG. 6 — SECTION CENTER WELD.

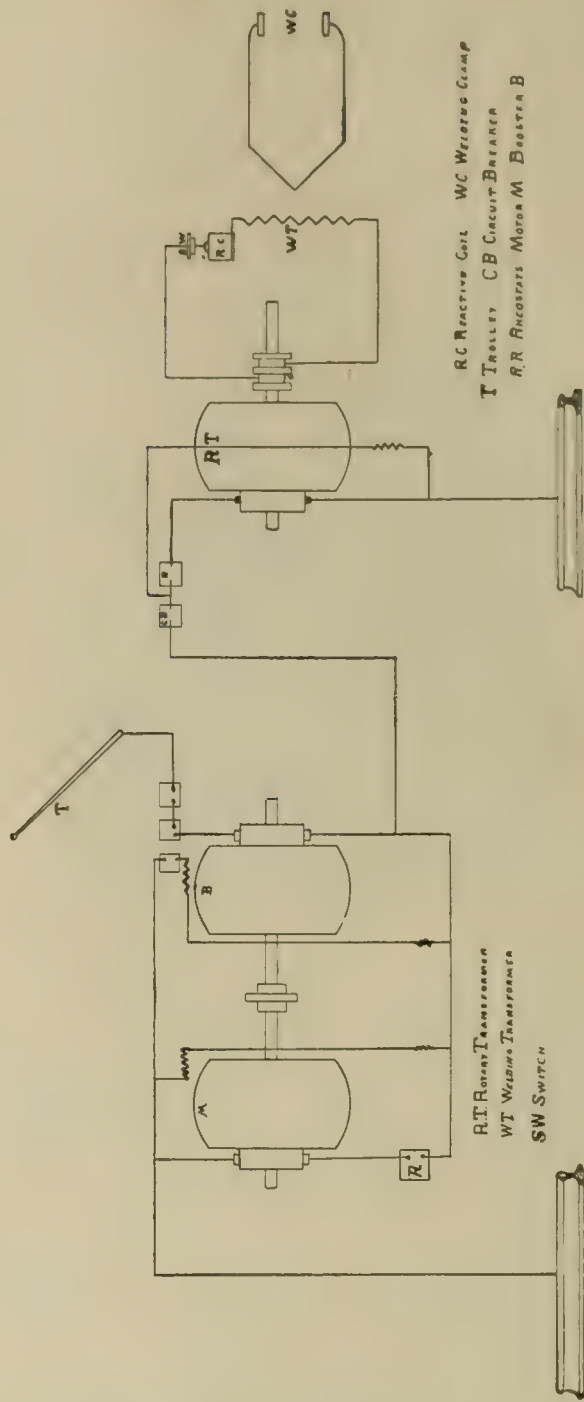


FIG. 7 — CONNECTIONS FOR FIRST WELDING OUTFIT.

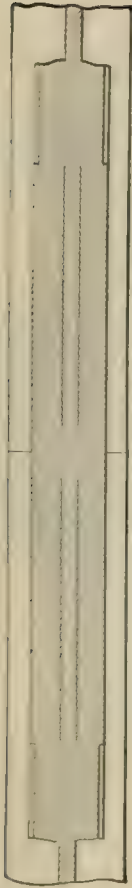


FIG. 4—HORIZONTAL CROSS SECTION THROUGH BARS AND RAIL WEB.

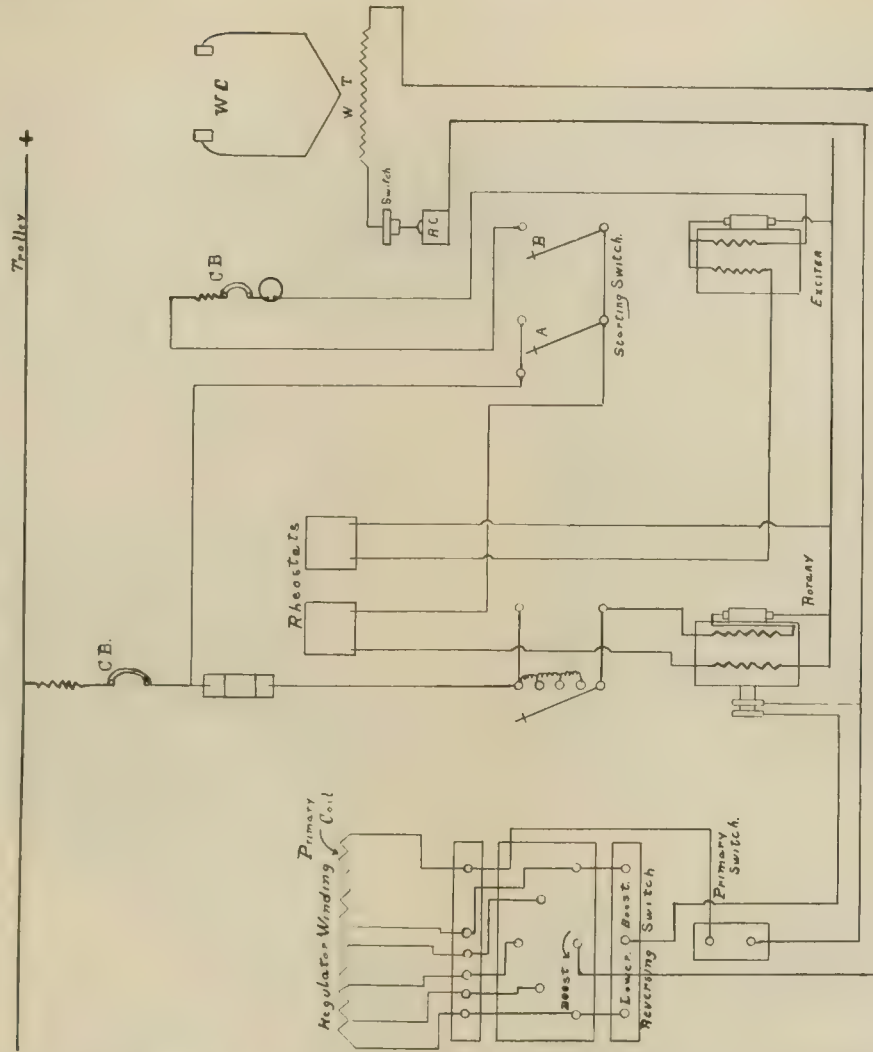


FIG. 8—REGULATING TRANSFORMER.

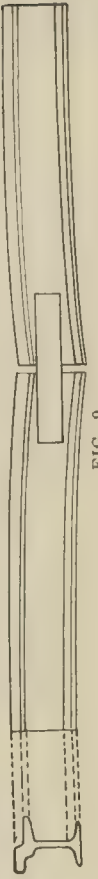


FIG. 9.

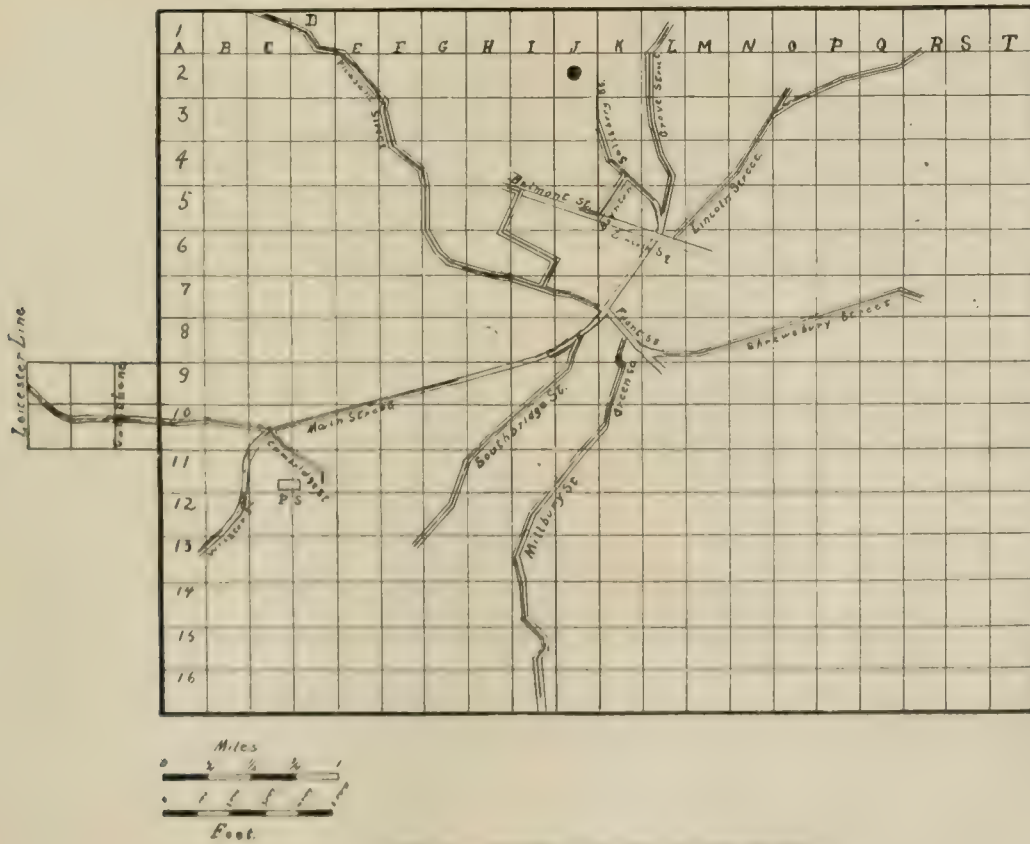


FIG. 10—WELDED TRACK IN WORCESTER.



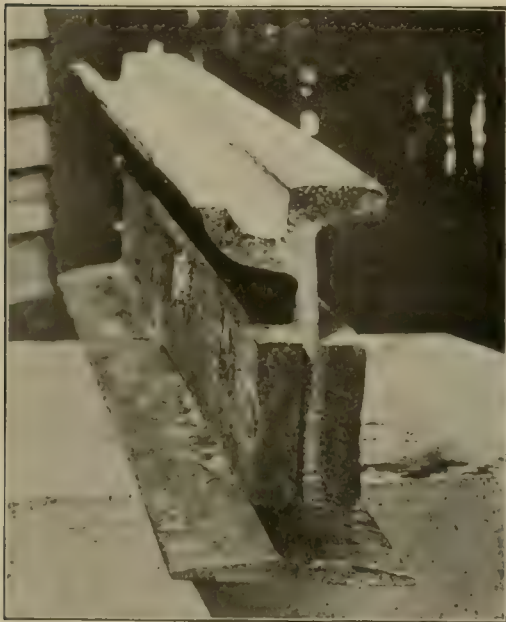
BONDING AROUND SPECIAL WORK — COPPER CABLE CARRIED FROM WELDED RAIL AROUND SWITCH PIECE.



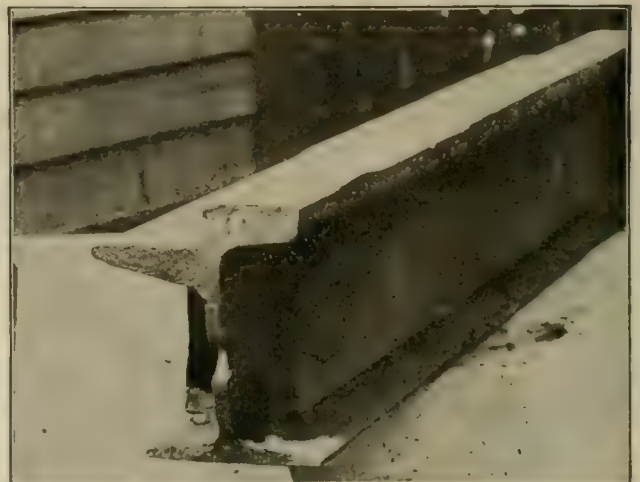
ELECTRICALLY BRAZED COPPER CONNECTION.



JOINT AS APPLIED TO C.N. RAIL.



BROKEN JOINT — WORCESTER.

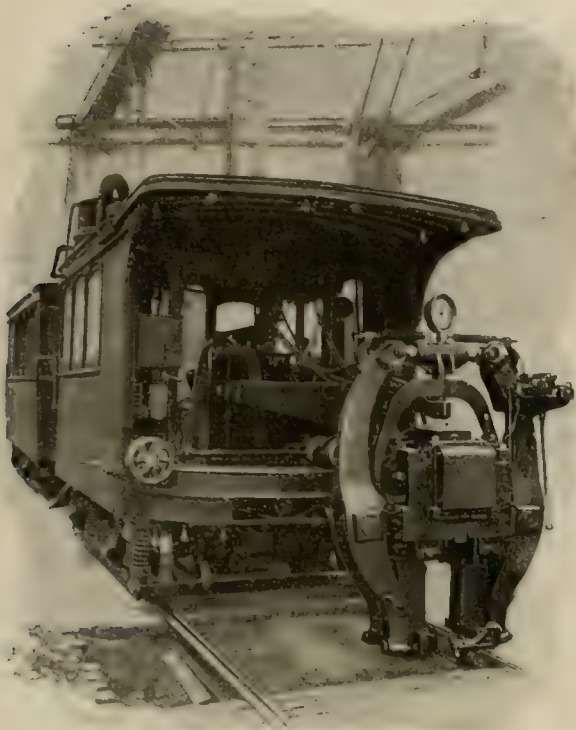


BROKEN JOINT — WORCESTER.

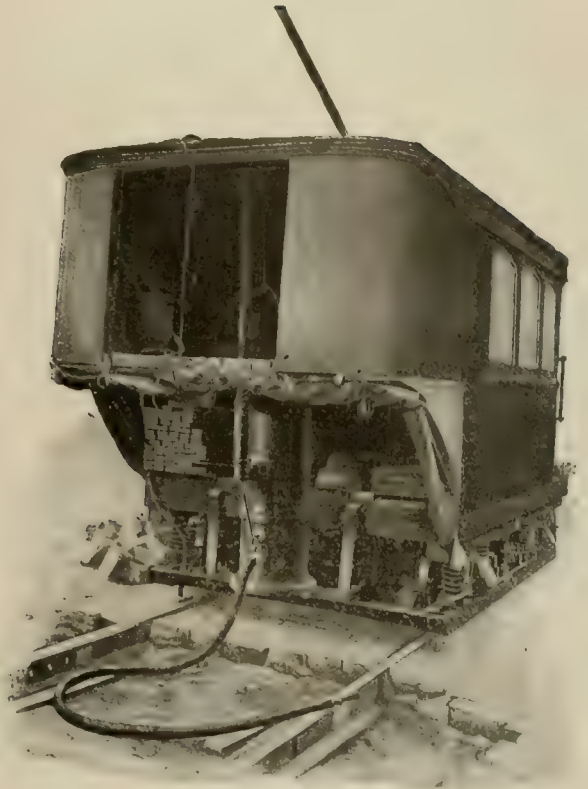
raise the joints or renewal of rails would be necessary. After careful investigation it was decided to electrically weld the joints on all 6-in. and 9-in. girder rail that had sufficient wear left to pay for the work. Arrangements were made with the Lorain Steel Co. (successor to the Johnson Co.) to bring its apparatus to Worcester, and work was started the latter part of April, 1902, the first year being devoted to the laying of new track.

The method of procedure was to take up paving, remove splice bars and raise and shim joints a sufficient distance ahead of the welder so that no delay would be incurred, paving being taken up

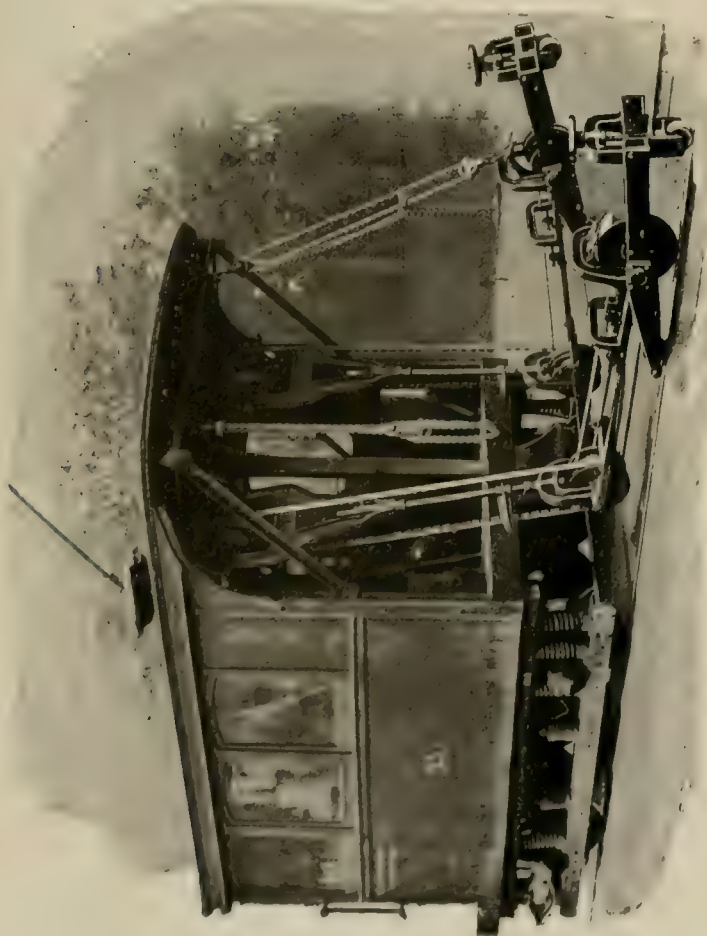
one day (where it was necessary to weld at night) and replaced the next day. We at first started to renew ties and line up track ahead of the welder, but the rail being surface bent (see Fig. 9) it was impossible to raise joints without raising the center of the rail in about the same proportion, consequently the rail could not be properly lined and no allowance could be made for the



WELDER.



SAND BLAST.



GRINDER.



PATCHED JOINT, EAST MERRIMAC ST., LOWELL, MASS.

rolling action of the cars after welding. In subsequent work, on advice of the Lorain Steel Co. no lining up of track was attempted before welding, the joints being simply raised and slammed both between and underneath the rails. It is important to see that the joints are raised a sufficient height as the rolling action of the cars on the rail tends to straighten out the surface if the raising of joints is not properly attended to. Wherever it was necessary to renew ties the work was done immediately after welding, the track being lined up at the same time. We have found that solid joints stand up better than suspended ones and would recommend a three-tie joint for all welded work. It is possible where ties are not more than 20 in. apart under joints that a suspended joint would be all right. The Lorain Steel Co. recommends that no lining up of track or renewing of ties be attempted until after the first season's run over the welded track, claiming that the roadbed should not be disturbed until the rail had been rolled back to a proper surface. The company estimates that a 6-in. rail will be rolled to a proper surface in about one year, while a 9-in. will take from one to two years according to the traffic over it.

Mr. T. W. Wilson, of the International Traction Co., Buffalo, N. Y., says, in answer to the question, "What shall we do with expansion?" "We forget it the same as we do the joint after it is welded."

In this connection we would quote from Dr. Louis Bell, "Power Distribution for Electric Railways:" "That a continuous rail is entirely feasible now admits of no dispute. Expansion does not and cannot take place longitudinally when the rails are firmly embedded in the paving even under the extremes of temperatures encountered."

Dawson, in his "The 'Engineering' and Electric Traction Pocketbook," says: "It is easy to ascertain the strain on rails due to variations of temperature. Assuming a coefficient of expansion for steel of 0.000005, and multiplying this by 75, which is a liberal figure for the number of degrees of maximum deviation from the temperature at which the welding is done, we get 0.000487, which is that part of its length which a rail would expand when exposed to a rise of 75 degrees, or contract when exposed to a fall of 75 degrees in temperature. A steel bar would expand 0.00003 of its length, due to a load of 1,000 lb. per sq. in. Dividing the estimated expansion by this figure, we get for the stress 16,200 lb. per sq. in.

"As 40,000 lb. per sq. in. is a safe value for the elastic limit of steel, it can readily be seen that the elastic limit will never be reached. This means that these expansions and contractions may go on indefinitely, and so long as the joints remain unbroken, no harm will be done to the rail, for stresses within the elastic limit work no harm. Assuming 80,000 lb. per sq. in. as the ultimate strength of steel, there is still, as far as the strength of the rails themselves is concerned, a factor of safety of five.

"Wherever joints have broken, in no case have they pulled apart more than 2 in. This would seem to show that the pull which broke the joint was not a cumulative effort extending all along the line, but merely the result of a local strain extending but a short distance on either side of the joint."

Fig. 10 is a map showing the welded track in the city of Worcester, giving some idea of the location as well as the continuous lengths of track welded. The rail welded was principally 9-in. girder, there being about 15 miles P. S. section 201, two miles P. S. 222, four miles Wharton 2-90 and about one-half mile 6-in. and miscellaneous. The P. S. section 201 had been in use about nine years, the 222 had been in use from one to four years and the Wharton No. 90 about ten years.

The breaks to date have been 24 on P. S. 201, 17 on P. S. 222, 12 on Wharton No. 2-90 and 1 on 6-in., a total of 54 out of 7,383 or about .7 of one per cent. While this seems a small proportion, the record of Rochester, N. Y., of 10 breaks out of 7,609 welded joints is remarkable considering the fact that 5,308 were welded in 1901, and have done service through two winters. The majority of the breaks occurred during the winter months and especially during sudden changes of temperature.

In addition to the welding of track, we run 1,000,000-c. m. cable through all special work and to connect to overhead negative feeders using the Lorain Steel Co's, electrically brazed connec-

tion for the purpose. The improvements we have made in our tracks, including new rails and bonding, electrically welded joints and supplementary cables, have reduced our track loss about seventy-five per cent. The cost of removing paving, welding joints, replacing paving and cleaning up the street is variously estimated by the roads who have done the most welding at from \$2,000 to \$2,500 per mile on a basis of 30 ft. rail lengths. The above costs will not include renewal of ties.

It is certainly obvious from the results obtained on electrically welded old track that this method is equal to any other known method for extending the useful life of the rail, decreasing the repair bills for track and equipment and lessening the electrical losses.

From the experience of Buffalo and Rochester, New York, and Columbus, Ohio, where new track has been welded, it would appear that in cities where permanent grades have been established and the liability of changes in track location are apparently remote, the electric welding of new tracks seems advisable. The expense of original construction should certainly be much less than it would be several years later when the joints commence to go down, and it is a question whether it would not be cheaper than a good splice bar joint bonded to the same capacity. From tests made by the General Electric Co. and the writer on electrically welded joints, the conductivity equals from 130 to 140 per cent on 6-in. girder rail and from 110 to 120 per cent on 9-in. girder, compared with equal lengths of solid rail.

Appended are tables showing the mileage of welded track in service, cuts showing sections of welded joints, broken joints taken out at Worcester, and a patched joint on East Merrimac St., Lowell, Mass. The latter is especially interesting, as it shows the method used to repair a broken joint by the welding process, a short piece of bar being first welded across the break, butting up to the original bar, a chuck being then welded to both bars at the junction, practically extending the original bar beyond the break. The method used when breakage occurs after the welding outfit has left the job is to cut out about a 10-ft. section, putting in a new piece of rail by means of splice bars and bolts and bonding in the usual manner.

Table Showing Mileage of Electrically Welded Track in this Country

| Place. | Today. Year. | Miles. |
|---------------------|-----------------|--------|
| Johnstown, Pa. | 1897 | 1. |
| Brooklyn, N. Y. | 1898 | 9. |
| Buffalo, N. Y. | 1899 | 39. |
| Buffalo, N. Y. | 1900 | 60.5 |
| Lockport, N. Y. | 1900 | 1. |
| Buffalo, N. Y. | 1901 | 6. |
| Rochester, N. Y. | 1901 | 18. |
| Rochester, N. Y. | 1902 | 8.5 |
| Columbus, Ohio | 1902 | 18. |
| Worcester, Mass. | 1902 | 22. |
| Lawrence, Mass. | 1902 | 4.2 |
| Lowell, Mass. | 1902 | 6.8 |
| Lowell, Mass. | 1903 | 14. |
| Total miles welded, | | 208. |

[For data on the amount of electrically welded track in Buffalo, and the number of broken joints see the article by Mr. T. W. Wilson, in the "Street Railway Review," Feb. 20, 1903, page 131.—Ed.]



Charles F. Luther, of Pawtucket, R. I., was present in the interests of the adjustable passenger strap which he makes, and reported that substantial returns are in sight as a result of his efforts.



One of the most congenial supply men at the convention was "Pinky" Spear, one of the Dearborn Drug & Chemical Works' most entertaining representatives.



George Weston, vice-president of the Chicago Engineering & Constructing Co. (formerly Weston Brothers), with Mrs. Weston, enjoyed the convention immensely.

REPORT OF COMMITTEE ON RULES FOR THE GOVERNMENT OF EMPLOYEES.

The committee respectfully submits the following as a standard code of rules for the government of conductors and motormen of street railways (except interurban lines), but would call the special attention of the members of the association to Rules 61-62, to determine as to the advisability of their adoption as a standard for general use.

The committee reports these rules as fundamental in their character, and therefore can be used by roads both large and small. If the local conditions of any company are such as to require additions to any of the rules, they can be added by using the same rule number and affixing letters of the alphabet; for instance, if it is desired to add to Rule 36, the addition would be embraced as rule 36-a.

ALL EMPLOYEES WHOSE DUTIES ARE PRESCRIBED BY THESE RULES WILL BE FURNISHED WITH A COPY, FOR WHICH THEY WILL SIGN RECEIPT, AND WILL BE REQUIRED TO HAVE THE SAME IN THEIR POSSESSION AT ALL TIMES WHILE ON DUTY.

GENERAL RULES.

1. Knowledge of Rules.—Conductors and motormen are required to be familiar with the rules, and with every special order issued. The bulletin board must be examined daily for special orders. Employment by the company binds the employe to comply with the rules and regulations, and ignorance thereof will not be accepted as an excuse for negligence or omission of duty. If in doubt as to the exact meaning of any rule or special order, application must be made to the proper authority for information and instruction.

2. Report for Duty.—Regular conductors and motormen must report for duty ten minutes before leaving time for their first trip, or, if for any good reason unable to so report, must give notice at least ten minutes before such leaving time.

Extra men must report at such time as ordered, or must give notice at least ten minutes before such time. They must not absent themselves after answering roll call without permission.

3. Personal Appearance.—Conductors and motormen must report for duty clothed in full regulation uniform, and must be clean and neat in appearance.

4. Politeness.—Conductors and motormen must treat all passengers with politeness; avoid difficulty and exercise patience, forbearance and self-control under all conditions. They must not make threatening gestures, or use loud, uncivil, indecent or profane language, even under the greatest provocation.

5. Habits and Personal Conduct.—The following acts are prohibited:

- (a) Drinking intoxicating liquors of any kind while on duty.
- (b) Entering any place where the same is sold as a beverage while in uniform or while on duty, except in a case of necessity.
- (c) Constant frequenting of drinking places.
- (d) Carrying any intoxicating drink about the person while on duty.
- (e) Carrying intoxicating drinks on the company's premises at any time.
- (f) Indulging to excess in intoxicating liquors at any time.
- (g) Gambling in any form, including the laying of bets (and playing raffles) while upon the premises of the company.
- (h) Smoking tobacco while on duty.
- (i) Smoking tobacco while off duty in any part of the company's building, except in the conductors' or motormen's room.

6. Talking to Motorman.—Motormen while operating cars are permitted to answer questions of superior officers and to give proper instructions to students only. All other conversation with motormen while car is in motion is forbidden.

7. Run on Time.—Cars must never be run ahead of schedule time, but must pass time points and leave terminals promptly on time, unless unavoidably delayed.

8. Railroad Crossings.—Cars must be brought to a full stop, at a safe distance, approaching steam railroad crossings at grade, and motormen must not proceed until conductor has gone ahead to the center of crossing, looking both ways, and given the "Come ahead" signal. Before starting, the motorman will look back to see that no passengers are getting on or off; and in no case

proceed, even after conductor's signal, until he has also examined the crossing and satisfied himself that steam cars are not approaching.

When there is more than one track the conductor must remain in advance of the car until the last track is reached.

Where crossing is protected by derail, interlocking plant or flagman (employed by the company) this rule does not apply, special instructions being issued to govern.

9. Starting Cars After Blockage.—In the event of a blockade of cars from any cause, all cars in such blockade must not be started at one time, but only singly and at such intervals as will not burden the feeder line.

10. Reporting Defects.—Conductors and motormen will report to foreman or inspector any defect in car, track or wire which needs immediate attention.

11. Hearing by Superintendent.—A hearing will be given by the superintendent to every employe who desires to complain. Reports or suggestions for the betterment of the service will always receive consideration.

RULES FOR CONDUCTORS.

12. Be on Rear Platform.—Remain on rear platform when not collecting fares, keeping a lookout for persons desiring to board car.

Keep careful watch of passengers to observe requests to stop car.

When stops are made at principal streets, places of amusement, churches, or at any point where a considerable number of passengers enter or leave the car, conductors must be on rear platform until such point is passed.

13. Announcements.—Announce distinctly the names of streets, public places and transfer points when approaching the same.

14. Removing Trolley.—Do not remove trolley from wire at end of run, or elsewhere at night, until passengers have alighted from car.

15. Route Signs.—See that route signs are properly displayed on each half trip.

16. Carrying Packages.—Passengers must not be allowed to carry bulky or dangerous packages aboard cars.

Do not in any way take possession of, or assume responsibility for, any package which a passenger may bring upon the car, excepting such articles as are to be turned into the Lost Article Department.

17. Watching the Trolley.—Keep your hand upon the trolley rope when passing over switches, crossings, or going around curves. Should the trolley leave the wire, the conductor must at once pull down the trolley and signal the motorman to stop. After the car has stopped replace the trolley on the wire, look around and through the car and see if any persons are boarding or leaving same; ring two bells for the motorman to start. See that passengers keep their hands off the trolley rope.

18. Keeping Gates Closed.—Front and rear gates on closed cars on the side between the tracks must always be kept closed and securely fastened (when running on the road). On open cars the guard chains and guard rails must be kept fastened on the side between the tracks. When gates or chains or their fastenings are broken or out of order, prompt report must be made to foreman, inspector or starter.

19. Housing Cars.—When car is run in the house, either day or night, always shut off lights, remove trolley from the wire and turn to position.

This applies to roads having overhead trolley, ready for leaving, and turn up longitudinal seats of closed cars.

20. Moving Forward.—On closed cars, when standing passengers crowd the rear door, request them to "please step forward in car."

21. Seating Passengers.—Standing passengers should be directed to vacant seats, and an effort made to provide them with seats where possible.

22. Assisting Passengers.—Elderly and feeble persons, and women and children, should be given assistance getting on and off car, when possible.

23. Dogs in Cars.—No dogs should be allowed on a car except such small dogs as can be carried in the laps of passengers.

Rules for Motormen.

24. **Stopping for Passengers.**—Keep a careful lookout on both sides of the street and bring the car to a full stop for every person who signals, except that when a car has considerable head way, is overcrowded, and another car follows within the same block or 200 feet, passengers should be requested to take the following car.

Cars will stop on signal only at farther corners, at car stations, transfer points and at points as provided in special orders.

Do not stop cars so as to block cross streets or crosswalks.

25. **Churches and Hospitals.**—When passing a church during the hours of service, and, at all times when passing a hospital, do not use the current and do not ring the gong, unless necessary.

26. **Reversing Car.**—Never use the reversing lever to stop car except to avoid a collision or injuring a person or animal, or when the brake rigging is disabled.

Do not reverse the power when the brake is set, but release the brake and reverse the power simultaneously, and, when the reverse lever is thrown in position, apply the current one point at a time, otherwise the fuse will melt or the breaker will release. Sand should be used when making an emergency stop.

27. **Passing Cars.**—Never run against the switch point of crossover when meeting a car, but slacken speed sufficiently to allow the car moving in the opposite direction to pass before striking switch point.

This rule refers particularly to all crossovers having switch points facing opposite to the direction in which the car is moving.

28. **Leaving Car.**—Never leave platform of car without taking controller handle, throwing off the overhead switch and applying brake. Be careful to see that the hands point to the "off" mark before taking off controller handle.

29. **Economical Use of Current.**—In order to effect an economical use of the electric current, it is necessary that the continuous movements of starting and increasing speed should be made gradually.

In starting a car, let it run until the maximum speed of each notch has been obtained before moving handle to the next notch.

Do not apply brakes when the current is on.

Do not apply current when brakes are applied.

Do not allow the current to remain on when car is going down grade, or when passing over section breakers. Endeavor to run car with the least amount of current, allowing the car to drift without the use of the current when it can be done without falling behind time.

A great amount of power can be saved by using judgment and discretion in approaching stopping places and switches by shutting off the power so as to allow the car to drift to the stopping place or switch without a too vigorous use of the brake.

30. **Throwing Overhead Switch.**—An overhead switch must never be thrown until power is turned entirely off, except in case controller cylinder fails to turn when power is on. It must be thrown by hand only.

31. **Power off Line.**—When the power leaves the line, the controller must be shut off, and the overhead switch thrown, the light switch turned on, and the car started only when the lamps burn brightly.

32. **Release Brakes Before Stop.**—When brakes are set to make a stop they should always be released, or nearly so, just before the car comes to a standstill.

33. **Water on Track.**—When there is water on the track run the car very slowly, drifting without use of power whenever possible, otherwise there is danger of burning out the motors.

34. **Sanded Rails.**—Never run on freshly sanded rails with brakes full on, except to prevent an accident, as the wheels are liable to be flattened when this is done. On cars provided with sand boxes, in case of slippery rail, always sand the track for a short distance before applying the brakes.

35. **"Spinning" of Wheels.**—Care must be taken, particularly during snow storms, to avoid "spinning" of the wheels with no forward or back movement of the car.

36. **Do Not Slide Wheels.**—On a slippery rail do not allow wheels to slide; as soon as wheels commence to slide the brake must be released and reset.

37. **Do Not Oil Car.**—Do not oil or grease any part of a car.

Signals and Their Application.

The following code of bell signals will be used in the operation of cars:

38. **Bell Signals.**—From conductor to motorman, to be given on motorman's signal bell:

1 Bell — "Stop at next crossing or station."

2 Bells — "Go ahead."

3 Bells — "Stop immediately."

4 Bells — Given when car is standing — "Back car slowly."

From motorman to conductor, to be given on conductor's signal bell:

1 Bell — "Come ahead."

2 Bells — "Watch the trolley and danger signal to the conductor."

3 Bells — "Set rear brake."

4 Bells — Signal to conductor that motorman desires to back the car.

5 Bells — Warning — "Pull trolley down to roof." This applies to roads having overhead trolley.

Whenever a car in service is stopped, the motorman will, as soon as he is ready to go forward, give two taps of the gong; after which, if the conductor is ready to proceed, he will give the regular "Go ahead" signal — two bells.

The motorman will answer the signal to stop from conductor by one loud tap of gong and two loud taps of gong after receiving the signal to go ahead. If unable to proceed immediately upon receipt of signal, motorman will wait for another "Go ahead" signal before starting the car.

When the car is standing and motorman desires to back, for any reason, he will give the conductor four bells, but must not move the car until the conductor has answered with four bells to signify "All is clear behind."

39. **Danger Signals.**—Red lights or flags indicate danger, and when they are placed alongside the track cars must be run slowly and with caution. When placed on the track, cars must come to a full stop until such signal is removed.

40. **Signals Before Passing Obstructions Near Track.**—Before passing any vehicle or obstruction close to the track, where passengers or conductor are liable to be injured while standing on the step of an open car, motorman must give two taps of signal bell as warning, reduce speed, and assure himself that all is clear before proceeding.

41. **Starting.**—Motorman must never move car (whether stopped on signal or for any other reason) without signal from conductor, and then only when assured that no one is getting on or off front platform.

Conductor must never give signal to start when passengers are getting on or off.

Conductor must never give signal to back a car unless he is on rear platform and knows track is clear behind the car.

Precautionary Rules — Accidents.

42. **Safety.**—The safety of passengers is the first consideration. All employees are required to exercise constant care to prevent injury to persons or property, and in all cases of doubt take the safe side.

43. **Persons Between Cars.**—Cars moving in opposite directions must not pass at points where persons are standing between the tracks, but must be operated so as not to occupy both tracks at such points simultaneously.

44. **Patrols.**—When any police or fire department vehicle is observed approaching (from any direction) cars must be stopped until such vehicle has passed.

45. **Ambulances.**—Ambulances must be allowed the right of way, and when approaching or passing, cars must be kept under control to avoid collision.

46. **Warning to Passengers.**—Conductors and motormen must (in a polite way) endeavor to keep people from jumping on and off the cars while in motion.

If such people attempt to get on or off the car while it is in motion, notify them politely to wait until the car stops. If passengers are leaving car while another car is approaching from the opposite direction, notify them politely to look out for car on other track.

47. **Standing on Steps.**—Do not permit any one to stand on the

steps or buffers, and never, under any circumstances, permit a woman or child to ride on the steps. They should be fully inside of the car before the signal is given to start.

48. Leaving Car.—When necessary for conductor to leave his car he must notify the motorman to protect passengers and car. Should passengers board car during absence of conductor, motorman will notify conductor of the number and location of such passengers upon his return.

Cars in commission must not be left unprotected; either conductor or motorman always remaining in charge.

49. Exercise Care.—Motormen are cautioned to exercise great care when a vehicle is passing alongside of track ahead of car. Ring the gong vigorously to attract the attention of the person driving as a warning not to pull in ahead of car, and run cautiously until the vehicle is passed in safety.

50. Passing Cars.—When passing standing cars gong must be rung and car brought to slow speed.

51. Render Assistance.—In case of accident, however slight, to persons or property in connection with or near any car, the motorman and conductor in charge of the same will render all assistance necessary and practicable. In no case will they leave injured persons without first having seen that they are cared for.

52. Medical Attendance.—Motormen or conductors are directed not to employ medical attendance to injured persons, except for the first visit, in cases of personal injury; nor will they visit such persons at any other time afterward, unless specially instructed so to do by an officer of the company.

53. Fatal Accidents.—In the event of a fatal accident, it will not be necessary to blockade the line awaiting the arrival of the coroner or any other official. If any accident occurs where it is impossible to carry the body to a place of shelter and security, motorman and conductor will put the body on the car and convey it to some suitable place.

54. Reports to be Full and Complete.—A full and complete report of every accident, no matter how trivial, and whether occurring on or near the car, must be made by the conductor. Accidents sometimes considered as not worth reporting are often the most serious, troublesome and expensive.

The conductor will obtain the name and residence in full of all witnesses on or near the car.

The motorman will assist the conductor in securing the names of witnesses whenever practicable, and he will be held responsible for any neglect to render assistance.

In all cases full facts must be obtained and stated in the reports as follows:

The date, exact time, exact place, run and car number, and the direction in which the car was moving, the nature of the accident or collision, and the cause of its occurrence.

The full name and address of the party injured or whose vehicle was in collision (giving the name of both the driver and the owner of the vehicle).

Ascertain the extent of injuries or damage, if any, before leaving the spot.

In case there has been an accident on the car, and the conductors change ahead, the conductor taking car on which the accident happened must secure the names of witnesses as above.

In case a person is struck by a car after passing around the rear of a standing car, the numbers of both cars must be obtained, and both crews shall report accident.

If an accident is caused by any defect or damaged condition of car, conductor must report the same and its cause.

Accidents to employees will be reported the same as accidents to passengers.

Any trouble or disturbance of a boisterous or quarrelsome character which occurs on a car, or the ejection of a person from a car, will be reported as an accident.

55. Telephone Information.—In case of accident involving personal injury or serious damage to property, conductor will telephone at once to headquarters, giving notice and particulars of accident.

In case of a blockade, where assistance is required to get cars moving, conductor of car first in block must perform this duty. Expense of telephone message will be refunded upon application at office.

56. Report Accidents to Inspectors.—Conductors and motormen will make a verbal report to the first inspector or official of

the company they meet of any accident, blockade or mishap of any kind.

57. Give Information to Proper Persons.—No employee shall, under any circumstances, give any information whatever concerning any accident, delay, blockade or mishap of any kind to any person except to a properly authorized representative of the company.

58. Responsibility for Damages.—Employees will be held answerable for any damages caused by their neglect or carelessness or by disobedience of rules.

59. Disabled Cars.—The motorman or conductor of any disabled car, withdrawn from the track, must remain with the car until relieved by proper authority or until car reaches depot.

Ejections.

60. Ejections.—No passenger shall be forcibly ejected from a car for any cause whatsoever without order of an inspector, starter or official of the company, unless the conduct of the passenger is dangerous or grossly offensive. In such case the ejection must be made by the conductor with the assistance of the motorman after the car has been brought to a stop, using "only such force as is sufficient to expel the offending passenger with a reasonable regard for his personal safety."

61. Refusing to Pay Fare.—Transfers.—When a passenger refuses to pay fare or presents a defective transfer, or ticket, upon which, in the judgment of the conductor, the passenger is not entitled to ride, the conductor must secure the names of as many witnesses to the fact as is possible, whereupon the car must be stopped and the passenger requested to leave. If the passenger fails to comply with such request, the facts of the case must be brought to the attention of the first inspector, starter or official of the company, who is met, and the conductor must act according to instructions received from such inspector, starter or official. In all cases the passenger must be given the benefit of any doubt.

When a passenger who refuses to pay fare, requests to be allowed to leave the car, the car must be stopped and the person permitted to alight.

62. Intoxication.—No passenger will be ejected from a car for mere intoxication, unless said passenger becomes dangerous or offensive; such passenger must be then ejected with great care and must be guided until free from probable injury.

63. Stealing Rides.—Any person caught stealing a ride on a car must never be pushed therefrom while it is in motion.

64. Spitting on Floor.—No passenger will be ejected from a car for spitting on the floor. If a passenger violates the rule of law prohibiting spitting, the conductor will call the attention of the passenger to the law prohibiting such conduct, and endeavor to persuade passenger to desist.

65. Get Witnesses.—In case of ejection, always get names of witnesses, and make report showing all the circumstances, the same as in case of accident.

66. Where to Eject.—Any person ejected from a car must be put off at a regular stopping place.

No passenger will be put off at a point where likely to be exposed to danger.

Particular attention must be paid to this rule during bad and inclement weather, late at night, or when a passenger is intoxicated.

Fares and Transfers.

67. Collection of Fares.—Fares must be collected promptly after passenger has boarded car. When more than one passenger or party boards car at a time the fares must be rung up on the register in the presence of the party who paid it before any more fares are collected. Conductor must ring each fare from the place where he collects it. Thus, a fare paid inside of car must be rung up from the inside, or from the platform if collected thereon.

68. Change.—When necessary to give change, conductors must first register fare, and immediately thereafter give change.

69. Register Rings.—Conductors must be careful to see that register rings each fare and that dial shows it.

70. Register Out of Order.—In case the register gets out of order the conductor must stop using it, make report of fares on back of trip report or on blanks supplied for that purpose, and



Fig. 1 — Position of Conductor when about to give "Proceed" Signal, Flagging Train to Stop, with Lantern. See Rule 16a.

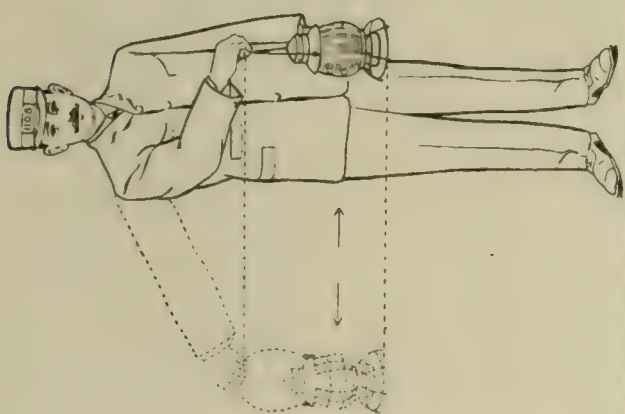


Fig. 2 — Proper Method of giving "Stop" Signal with Lantern. See Rule 16b.



Fig. 3 — Position of Conductor when about to give "Proceed" Signal, with Lantern. See Rule 16b.

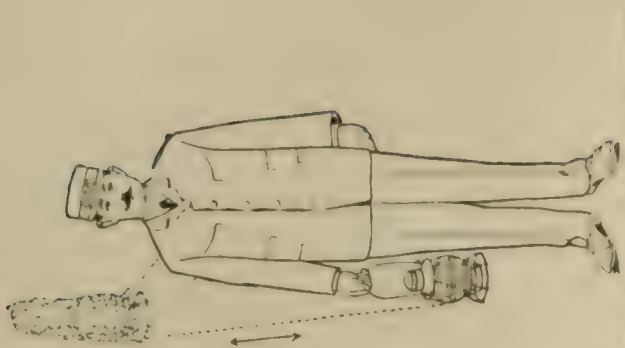


Fig. 4 — Proper Method of giving "Proceed" Signal with Lantern. See Rule 16b.



Fig. 5 — Position of Conductor when about to give "Back Up" Signal, by night, with Lantern. See Rule 16c.

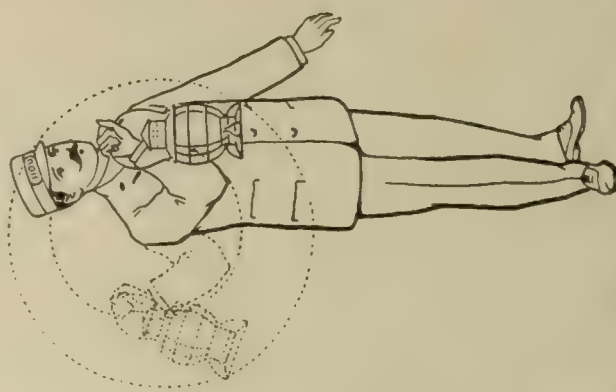


Fig. 6 — Proper Manner of giving "Back Up" Signal, by night, with Lantern. See Rule 16c.



Fig. 7 — Position of Conductor when about to give "Train Proceed" Signal, by night, with Lantern. See Rule 16d.

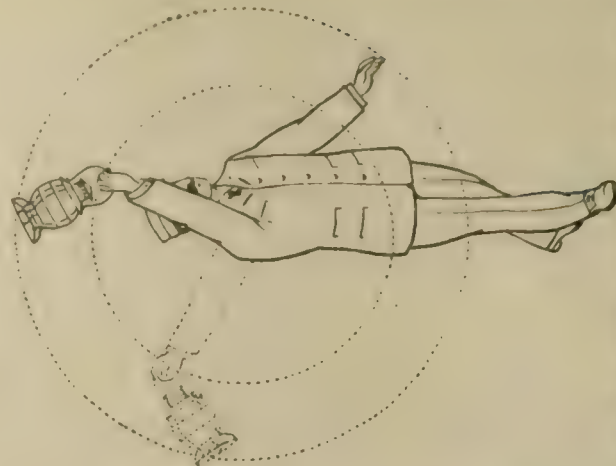


Fig. 8 — Proper Manner of giving "Train Proceed" Signal, by night, with Lantern. See Rule 16d.

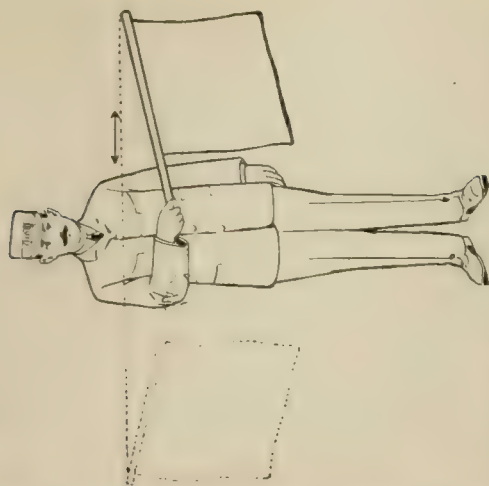


Fig. 12.—Proper Method of giving "Stop" Signal, by day. See Rule 19.



Fig. 11.—Position of Conductor when about to give "Danger" Signal. Flagger Train to Stop, by day. See Rule 19.

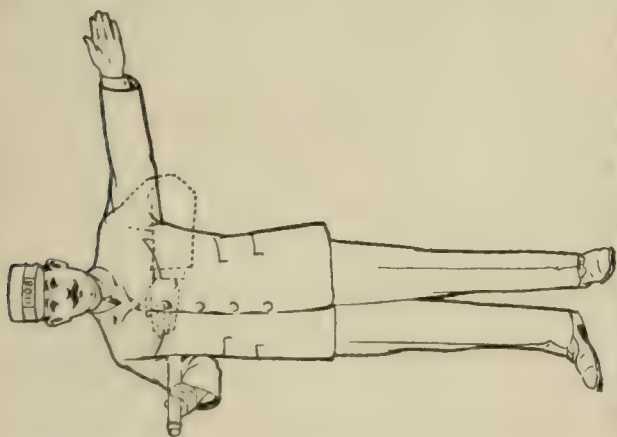


Fig. 10.—Proper Method of giving "Come Ahead" Signal, by day. See Rule 19.



Fig. 9.—Position of Conductor when about to give "Come Ahead" Signal, by day. See Rule 19.

report the fact to the first inspector or starter met on the road, and subsequently report to superintendent.

71. Transfers in Blockades.—In case any line is blocked, it is the desire of the company to carry passengers to their destination on other lines. Under such circumstances conductors of parallel or intersecting lines will accept transfer tickets accordingly and will issue a transfer on a transfer if necessary. They will also accept transfer passengers without tickets on orders from any inspector or authorized representative of the company, making report of same on back of trip report.

72. Transfer Point Meetings.—Motormen and conductors will be held equally responsible for leaving a transfer point so quickly as to prevent the transfer of passengers from an approaching car on a connecting line.

Interurban Rules.

In addition to the rules hereinbefore given, the following rules will be observed by crews of interurban cars:

Definitions.

Train.—A car, or more than one car, coupled together, displaying signals.

Regular Train.—A train represented on the time table. It may consist of sections.

Section.—One of two or more trains running on the same schedule displaying signals or for which signals are displayed.

Extra train.—A train not represented on the time table. It may be designated as:

Extra for any extra train, except work extra.

Work Extra.—For work train extra.

Superior Train.—A train having precedence over other trains; a train may be made superior to another train by RIGHT, CLASS or DIRECTION.

Right is conferred by train order; CLASS and DIRECTION by time table.

Right is superior to CLASS or DIRECTION. DIRECTION is superior as between trains of the same class.

Note.—Superiority by direction is limited to single track.

Train of Superior Right.—A train given precedence by train order.

Train of Superior Class.—A train given precedence by time table.

Train of Superior Direction.—A train given precedence in the direction specified in the time table as between trains of the same class.

Note.—Superiority by direction is limited to single track.

Time Table.—The authority for the movement of regular trains subject to the rules. It contains the classified schedules of trains with special instructions relating thereto.

Schedule.—That part of a time table which prescribes the class, direction, number and movement of a regular train.

Main Track.—A principal track upon which trains are operated by time table, train orders, or by block signals.

Single Track.—A main track upon which trains are operated in both directions.

Double Track.—Two main tracks, upon one of which the current of traffic is in a specified direction, and upon the other in the opposite direction.

Current of Traffic.—The direction in which trains will move on a main track, under the rules.

Station.—A place designated on the time table by name, at which a train may stop for traffic; or to enter or leave the main track; or from which fixed signals are operated.

Siding.—A track auxiliary to the main track for meeting or passing trains, limited to the distance between two adjoining stations from which train orders may be received.

Fixed Signal.—A signal of fixed location indicating a condition affecting the movement of a train.

Note to definition of Fixed Signal: The definition of a "Fixed Signal" covers such signals as slow boards, stop boards, yard limits, switch, train order, block, interlocking, semaphore, disk, ball, or other means for indicating stop, caution or proceed.

Yard.—A system of tracks within defined limits provided for the making up of trains, storing of cars, and other purposes, over which movements not authorized by time table, or train order, may be made, subject to prescribed signals and regulations.

Fact.—A person assigned to a train when the motorman or conductor, or both, are not fully acquainted with the physical characteristics, or running rules of the road, or portion of the road, over which the train is to be moved.

Rules.

1-1. Employees whose duties may require them to give signals, must provide themselves with the proper appliances, keep them in good order and ready for immediate use.

1-2. Motormen will be held responsible for the care and proper operation of the signal lamps and signals as well as the headlight on the front of the car.

Conductors will be held responsible for the care of the tail lights and signals on the rear of the car.

Motormen will see that their cars are provided with the following equipment, viz.:

- 2 Regular Run Numbers.
- 2 "Car Following" signs.
- 2 "X" signs.
- 1 Combination or Classification Lamps with oil.
- 1 Headlight.
- 1 Red Lantern.
- 1 Red Flag.

Conductors will see that their cars are provided with the following equipment, viz.:

- 1 Red Flag to be carried on rear platform.
- 1 Red Lantern in such a manner as to be available for immediate use.

1-3. Signs of the prescribed color must be used by day, and lamps of the prescribed color by night.

1-4. Night signals are to be displayed from sunset to sunrise. When weather or other conditions obscure day signals, night signals must be used in addition.

Visible Signals.

1-5. Color Signals.

Color. Indication.

- (a) Red. Stop.
- (b) White. Proceed, and for other uses prescribed by the Rules.

1-6. Hand, Flag, and Lamp Signals.

Manner of Using. Indication.

- (a) Swung across the track. Stop. (See Figs. 1 and 2.)
- (b) Raised and lowered vertically. Proceed. (See Figs. 3 and 4.)
- (c) Swung vertically in a circle across the track, when the train is standing. Back. (See Figs. 5 and 6.)
- (d) Swung vertically in a circle at arm's length across the track when the train is running. Train has parted. (See Figs. 7 and 8.)

A flag, or the hand, moved in any of the directions above will indicate the same signal as given by a lamp, except the "Come ahead" signal, when used flagging railroad crossings, which shall be as provided for in Rule I 9. (See Figs. 9, 10, 11 and 12.)

1-7.—Any object waved violently by any one on or near the track is a signal to stop.

Audible Signals.

1-8. Whistle Signals.

Note.—The signals prescribed are illustrated by "o" for short sounds; "—" for longer sounds. The sound of the whistle should be distinct, with intensity and duration proportionate to the distance signal is to be conveyed.

| Sound. | Indication. |
|-------------|---|
| (a) ——— | Train has parted. To be repeated until answered, as provided for in Rule I-6 (b). |
| (b) ——— | Flagman return from west or south. |
| (c) ——— | Flagman return from east or north. |
| (d) o o | To call the attention of trains of the same or inferior class to signals displayed for a following section. |
| (e) — o o | Approaching public crossings at grade. |
| (f) o o | An answer to any signal (except train parted). |
| (g) o o o o | Motorman's call for signals from switchtenders, watchmen, trainmen and others. |
| (h) ——— | Approaching stations, junctions and railroad crossings at grade. |

A succession of short sounds of the whistle is an alarm for persons or cattle on the track, and calls the attention of trainmen to danger ahead.

1-9. In addition to the instructions contained in Rule 9, which apply while cars are operating over city lines, conductors when flagging railroad crossings will use red lantern at night and red flag by day; both in manner prescribed in Rule I-6. The red flag to be carried, rolled up, under right arm, and used only as a signal that crossing is not clear and train may not proceed.

1-10. The headlight will be displayed to the front of every train by night.

1-11. All regular trains will display on outside of front and rear dash in place provided a red sign with designating run number signals thereon by day, and, in addition, a red signal light by night.

1-12. Each section of a train, except the last, will display on outside of front and rear dash in places provided, in addition to its red dash signs and its red signal lights, a green sign with the words CAR FOLLOWING thereon by day, and a green signal light at night.

1-13. Extra trains will display on outside of front and rear dash in place provided a white sign with black "X" thereon by day, and, in addition, a white signal light at night.

An extra train at night will display on outside of rear dash in place provided, in addition to its other signals, a red signal light.

Use of Signals.

1-14. A signal imperfectly displayed or the absence of a signal at a place where a signal is usually shown, must be regarded as a stop signal, and the fact reported to the dispatcher.

1-15. The gong must be rung on approaching every public road crossing and until it is passed; and the whistle must be sounded 1,000 feet from the crossing.

1-16. The unnecessary use of either the whistle or the bell is prohibited. They will be used only as prescribed by rule or law, or to prevent accident.

1-17. Watchmen stationed at public road and street crossings must use red signals only when necessary to stop trains.

1-18. Express trains, work trains and extras must keep out of the way of a regular, and clear its time at least five minutes.

1-19. A train failing to clear the main track by the time required by rule, must be protected as prescribed by Rule No. I-23.

1-20. Unless some form of block signals is used, cars must keep at least one mile apart, when running at speed.

1-21. Work extras will be assigned working limits. Within these limits such trains must move with the current of traffic.

1-22. Trains must approach the end of double track, and junctions, prepared to stop.

1-23. When a train stops or is delayed, under circumstances in which it may be overtaken by another train the conductor must go back immediately with stop signals a sufficient distance to insure full protection. When recalled he may return to his car.

The front of a train must be protected in the same way when necessary.

1-24. Switches must be left in proper position after having been used. Conductors are responsible for the position of the switches used by them, except where switch tenders are stationed.

1-25. Both conductors and motormen are responsible for the safety of their trains and, under conditions not provided for by the rules, must take every precaution for their protection.

1-26. In all cases of doubt and uncertainty the safe course must be taken to guard against accident.

1-27. When a train crosses over to, or obstructs the other track, unless otherwise provided, it must first be protected as prescribed by Rule I-23 in both directions on that track.

1-28. Trains must use caution in passing a train receiving or discharging passengers, and must not pass between it and the platform at which the passengers are being received or discharged.

E. G. CONNETTE.

T. E. MITTEN.

W. E. HARRINGTON.

ROBT. McCULLOCH.

Committee.

TAYLOR TRUCK CO.

The Taylor Truck Co. made a good exhibit, which embraced seven styles of trucks made by it. The many merits of these trucks were carefully detailed to inquiring visitors by John Taylor, F. M. Nicholl, G. A. Tupper and T. Thorne.



STANDARD AUTOMATIC LUBRICATOR.

The Standard Automatic Lubricator Co., of Philadelphia, exhibited its device in which oil is fed from a reservoir to the top and sides of the journal and bearings. No change is necessary in the journal boxes and no dust guard is required, as the lubricator is dustproof. It was stated that by actual test a mileage of 88,000 miles had been obtained at a cost of 15 cents for a double truck car, based on oil at 10 cents a gallon. The company is represented by John P. Durkin and J. B. Kirkbride.



A WORLD'S FAIR SOUVENIR.

In addition to its comprehensive exhibit the Security Register Co., of St. Louis, provided a souvenir of unusual attractiveness, it being an album treating of the World's Fair at St. Louis in 1904, and containing many beautiful engravings and short pen sketches of the coming Exposition. The idea was that of Giles S. Allison, the well-known New York supply man, whose name is synonymous with "Security" registers. The exhibit was further cared for by H. E. Donecker and D. J. Fitch.



COIN COUNTING MACHINE.

The National Coin Counting Machine Co.'s exhibit attracted an unusual amount of attention. It showed one of its automatic machines for counting and wrapping specie. Each coin is advanced separately, registered and assembled in a row with the others, ready to be transferred to the wrapping device before the next coin is handled. Twenty coins of the second bundle may be counted while the first bundle is being wrapped. The machine counts at the rate of three coins a second, or 180 a minute. It is accurate, also.



NEW AUTOMATIC SWITCH.

The Keefer Car Switch Co., of Albany, showed an automatic switch which it has recently placed upon the market and which looks to be a meritorious device. It is operated from the car without stopping the vehicle, thus dispensing with switchmen and saving time. It consists essentially of a bed plate and a shifting block pivoted thereon, the shifting block being adapted to engage with a cross-bar running in a groove. A lever carrying a shoe at the lower end is attached to the car. When this lever is in its normal position the shoe is not in contact with the shifting block, but on pressing down the plunger which projects through the car platform the shoe is brought in contact with the shifting block, which in turn engages with the cross-bar in the groove thus throwing the switch. The car platform is not affected by wrenching or otherwise by the operation of switching. The switch lies entirely on the surface, requires no weights or delicate adjustments, no connection with drain or sewer and may be attached to any switch point in use.

J. W. Keefer, president of the company, personally superintended the exhibit.



William B. McVicker, the popular second vice-president and eastern manager of the Pearson Drug & Chemical Works, was kept busy dispensing conveniences and good fellowship, as usual.



Richard L. Weltham, representing the National Lead Co., arrived at the convention Thursday.



The Armspear Manufacturing Co., of New York, had no exhibit this year, but the company's interests were ably conserved by C. K. Freeman of the New York office and L. A. Buckley, manager of the Chicago branch.

LATE REGISTRATIONS.

A. S. R. A. DELEGATES.

Albany, N. Y.—J. W. MacIntosh, United Traction Co.
Buffalo, N. Y.—F. M. Wilson and Edward McDonnie, International Railway Co.
Cleveland, O.—Horace E. Andrews, W. G. McDole, F. R. Phillips, Cleveland Electric Ry. Co.
Detroit, Mich.—Walter Mower, Rapid Railway System.
Glens Falls, N. Y.—F. H. Harrington, M. P. McKernon, S. E. Cochrane, D. E. Van Wint, C. M. Dicker, Hudson Valley Ry. Co.
Hazleton, Pa.—A. Markle, Lehigh Traction Co.
New Orleans, La.—H. A. Ferrandau, New Orleans Railways Co.
New York—Henry Sanderson, Interurban St. Ry. Co.
Oneida, N. Y.—E. Leland Hunt, Oneida Ry. Co.
Schenectady, N. Y.—James F. Hamilton, R. E. Harris, C. B. Davis, Schenectady Ry. Co.
Utica, N. Y.—A. W. Weswall, Utica & Mohawk Valley Ry. Co.
Washington, D. C.—E. B. Blizzard, George H. Harries, Washington Ry. & Elec. Co.

MISCELLANEOUS.

Barnes, G. Edgar, Asst. Secy. A. S. R. A., Chicago.
Bowers, G. H., Peckham Mfg. Co., New York.
Buckley, F. A., Armspear Mfg. Co., Chicago, Ill.
Clark, Geo. C., Adam Cook Sons, New York.
Cushing, Chas. B., Jno. A. Roebling & Sons Co., Trenton, N. J.
Davis, Thos., Westinghouse Elec. & Mfg. Co., East Pittsburg, Pa.
Farnham, W. B., Ohmer Fare Register Co., Dayton, O.
Freeman, C. K., Armspear Mfg. Co., New York.
Goddard, Stephen H., Electrical Review, New York.
Gaunt, H. H., A. W. Harris Oil Co., of Providence, R. I., Springfield, Mass.
Gilbert, Geo. F., H. W. Johns Manville Co., New York.
Hyde, L. W., Ingersoll Construction Co., Pittsburg, Pa.
Lewis, H. E., Mayer & Englund Co., Philadelphia, Pa.
Hammitt, Edward, Mayer & Englund Co., Philadelphia, Pa.
Laidlaw, A. H., Traction Equipment Co., New York.
Mead, George A., Ohio Brass Co., Mansfield, O.
Murphy, W. M., Electric Cable Joint & Appliance Co., New York.
Oakman, Henry B., Gould Storage Battery Co., New York.
Pennington, Walter V., Register Clerk, A. S. Ry. Assn., Chicago, Ill.
Priest, E. D., General Elec. Co., Schenectady, N. Y.
Russell, S. Jr., Crocker Wheeler Co., Philadelphia, Pa.
Riley, J. J., Peckham Mfg. Co., Kingston, N. Y.
Schilling, P. J., Troy Malleable Iron Co., Troy, N. Y.
Sanderson, H. A., Mason Mfg. Co., Springfield, Mass.
Thomson, G. R., Westinghouse Co., Glens Falls, N. Y.
Taylor, Knox, Taylor Iron & Steel Co., High Bridge, N. J.
Underwood, C., Westinghouse Elec. & Mfg. Co., Buffalo, N. Y.
Van Ouden, Frank, Peckham Mfg. Co., Kingston, N. Y.
Willert, W. F., Elec. Motor & Equipment Co., Newark, N. J.
Wilkinson, H. W., Peckham Mfg. Co., Kingston, N. Y.

LADIES.

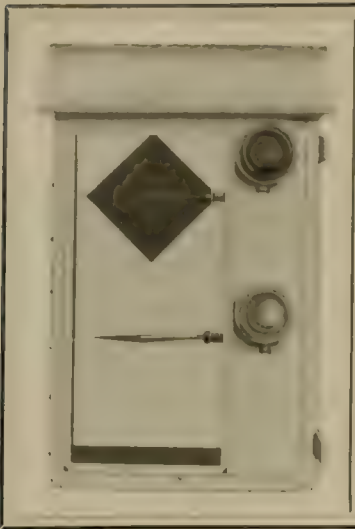
Mrs. Chas. B. Cushing, Trenton, N. J.
Elizabeth V. Daly, Springfield, Mass.
Miss Maude Pennington, Chicago, Ill.
Mrs. E. D. Priest, Schenectady, N. Y.
Mrs. W. G. McDole, Cleveland, O.
Mrs. A. Markle, Hazleton, Pa.
Miss Markle, Hazleton, Pa.
Mrs. H. A. Ferrandau, New Orleans, La.
Mrs. E. Leland Hunt, Oneida, N. Y.



The Continuous Rail Joint Co. of America, of Newark, N. J., was represented by B. M. Barr, W. A. Chapman, S. P. McGough, W. E. Clark, L. F. Braine and W. J. Bradley. The company is issues a useful memorandum book for engineers, which will be sent to those who registered at the booth, or to all who may write for one.



The Sterling Meaker Co.'s, interesting exhibit was handled by J. Albert Stone, president; H. E. Beach and E. W. Hinman.



The American Automatic Signal

GIVES ENTIRE SATISFACTION

It absolutely prevents head-on or rear-end collisions. When obeyed two cars cannot occupy any block or section of track at the same time. It will not permit the setting of a cautionary or permissive signal at rear end of block unless the danger signal at far end is set.

Incandescent lamps do not form a part of the main circuit, as they should not be the only visual indication of a signal but should follow the movement of a semaphore blade, which will move each time the signal is operated, whether the lamps burn or not.

The setting and clearing circuits are closed automatically and when the signal has been set at danger it is locked and cannot be cleared until the car has passed through the block. It will work only one way when two cars enter the block from both ends at the same time. It will operate anywhere between 250 and 600 volts.

American Automatic Switch & Signal Co., 84-86 La Salle St., Chicago

"D'RECTORS AN' RULES."

A few days afterwards I got on No. 89's car and as there were several on the platform I started to enter the car; the motorman "plugged the switch" a little too hard and the accompanying lurch threw me back against someone entering behind me who immediately clasped me violently around the arms with the result that we both went bodily backwards into the vestibule and—from the sounds—pretty nearly drove No. 89 through the rear end. We were untangled by adjacent people and my rear-guard turned out to be a stout little gentleman of about fifty who paid no attention whatever to my apologies but immediately "jumped on" No. 89 "with both feet."

"What do you mean sir by cursing, and what do you mean by giving the signal to start before the passengers are seated and what do you mean by allowing your motorman to jerk the car in that way?"

No. 89 was stooping over, gathering up punch, transfers, small change and so forth which our combined attack had squeezed out of him, and I heard a rumbling mutter come from between his legs of which the only understandable part was "I ain't runnin' th' car!"

"But you're in charge of the running of it! Rule 42 distinctly states that 'the conductor is in charge of the running of the car and will be held responsible for any abuse or misuse of same'—where is your rule-book sir?"

"'f I know!"

"What is that?"

"I don't know!"

"You don't know? And rule No. 7 orders you to carry it 'at all times when on duty'? Do you consider yourself on duty now?"

"Mark't St! Change f'r th' Avenoo east an' west!"

"Answer my question sir?"

"M-a-a-n-rk't Street!! Change f'reastanwest!!!"

"Answer—"

"Stand ter one side please an' let th' ladies out!"

"Are you going—"

"Seat right over there sir, 'gainst th' rules to stand when there's empty seats!"

"But I want to know whether—"

"'Gainst th' rules to talk to passengers sir."

Then the stout gentleman sat down—literally boiling, took off his hat and stuck his head and arm out of the window to get cooled,—a touch on the shoulder and a loud "Fare, please!" made him take his arm in, knock his hat on the floor and put his foot on it—all in one movement. There was evidently no rule to cover such a case and No. 89 looked into distant space with such a noncommittal air that the only revenge open to the

passenger was the proffer of a five dollar bill. I saw No. 89's jaw stiffen but he only said, "Smallest you got, sir?"

The old gentleman nodded a lie and No. 89 made a very careful and elaborate examination of the bill, first on one side and then on the other, then he carried it out to the motorman and said something to him and he gave it a critical examination and returned it with a shake of his head. Then No. 89 approached his victim,—Who had been squirming under these manoeuvres and the curious gaze of the other passengers—and said, in a most meek and conciliatory tone,

"Very sorry, mister, but this bill don't seem to be just right an' if you want ride an' ain't got no other change I'll ha' to get you to ride's far's th' office with me an' see 'f it's good."

"Why you're crazy! The bill's perfectly good, I just received it from the bank!"

"Yes sir. But sometimes banks makes mistakes an' if this wasn't good it'd come outer me. So if, as you say, you ain't got anythin' smaller—"

"Give me that bill!" and the passenger plunged his hand into his pocket and brought up a handful of change, selected five pennies, turned them over to No. 89 in exchange for the bill and again thrust his head and arm out of the window. A gentle touch on the shoulder brought them inside again to hear an insinuating voice say,

"Beg pardon, sir, but it's dangerous to put your head or arm outside th' winder."

The victim gasped, choked and spat and the voice went on,

"'Gainst th' reg'lations 'f th' Boarderhealth to spit 'n th' floor!"

This was the last straw! The stout gentleman arose, shouted—rather than said—

"I'll report you for this, sir!" and incontinently fled off the car.

I went out to No. 89, who was now alone in the vestibule, he grinned amiably and said,

"Guess I evened up matters all right, all right, didn't I? Ain't no small change due me, is there?"

"How about his reporting you?"

"No fear! When he comes outer that trance an' thinks how many kinds of er fool he's made 'f hisself he won't report; 'sides, I've got you fer'er witness!"

"Umph!—Who is he?"

"D'rector o' th' road. Rich ol' blokie, lives off'n his in-come an' ain't got nothin' else to do but meddle. Oughter have petticoats on 'im!—Say, you've been in this business, what good on earth is d'rectors 'n a comp'ny?"

This was a poser, so I fenced in the Yankee manner,

"Why do you ask?"

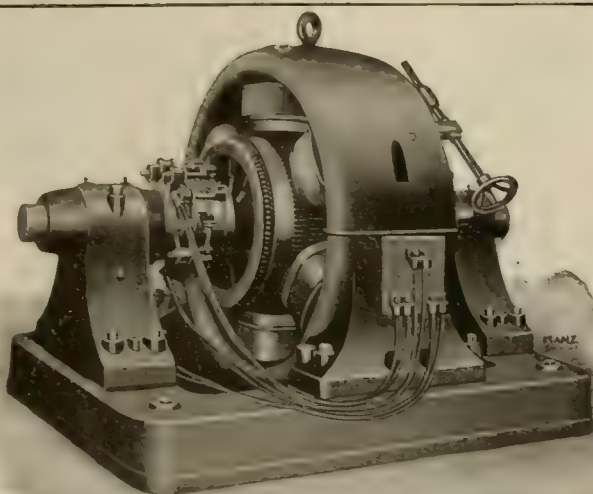
"Well, I never seen no good'n d'rectors, any place where I've been. Look't this road, got a No. 1 superintendent, knows his biz from th' bottom up, easy's 'n old shoe 'f you half-way try

POSITION WANTED.

Wanted, position as General Manager or Superintendent of Electric Lighting Plant; 16 years' experience as Manager and Superintendent. Best of references. Address X, C/o Street Railway Review, 39 Cortlandt St., N. Y. City.

POSITION WANTED.

A master mechanic of 20 years' experience—both mechanical and electrical work. Can furnish good references. Apply at Street Railway Review Booth, or address Street Railway Review, Chicago, Ill.



250 K. W. Bullock Railway Rotary

BULLOCK
ELECTRIC MFG. CO.
CINCINNATI, OHIO

We have a 400 K. W. Rotary on Exhibition at the
Saratoga Convention, Booth 96.

to do your duty, square's a die an' straight's a string with it all, never no trouble with men or passengers when he has his way an' he's made this road 'n less'n three years — made it what 'tis outer what it's earnt. Now you'd think that boarder'drectors'd let him alone, wouldn't you? Not they! Fus' thing we knows there's some dam fool rule or regulation or order up on th' bull'tin board 'by order o' th' boarder'drectors' an' then there's trouble with men or passengers or somethin'! Why don't they let him alone, he knows his biz; time enough to give him a call-down when he shows he don't! No, 't seems to me's it s'soon's a man gets to be a d'rector he wants to meddle. Now look't that ol' fool as jus' got off, there wan't no call for him 'fact that way jus' t' show his authority! Lord knows we get enough from passengers 'thout th' d'rectors puttin' em up to new tricks! Rules? Guess I know th' rules better'n he ever will an' 'f I tried t' obey 'em all I'd have more scraps than fares by th' end o' th' run!

"Say — you just orter see our new rule book — it's a peach! Th' d'rectors got a notion some time back as our ol' rule book wasn't the cheese for th' road 's 'tis now — an' I say, an' all the boys says as 'twas a good rule-book an' had all in it you wanted t' carry out. But no — th' d'rectors had t' have a new book o' rules an' 'stead o' lettin' th' old man get it up they 'pointed a committee to do it, an' th' committee — so I hears — sent off to all th' other roads 'n th' United States an' got their rule-books an' from th' looks o' things — they put 'em in a bar'l an' churned 'em up an' took the pieces 's they come out an' called it a rule-book! Why, when they was issued, Pete Johnson, a Swede, what's been conductin' for ten years — he's an A. No. 1 conductor too, — th' best on th' line — he reads it through an' he goes into th' ol' man an' says,

"Mr. Taylor, are we expected to remember, an' obey, an' enforce all these rules or take th' penalties in 'em?" (Johnson's educated, he is!) An' th' ol' man says, says he,

"That's the order from th' boarder'drectors, Johnson." An' Johnson, he says,

"Well, Mr. Taylor, I guess I'll ask for my time. I've been 'top-car' f'r a long time an' I'd hate to come down but I can't c'lect fares, 'tend to passengers an' carry out these rules," he says, "all 't th' same time! Why," he says, "there's over fifty o' these rules that I'd get discharged under th' first run I made!"

"Well, th' ol' man tried to reason with him, but he quit — said 'f he worked for a comp'ny he'd obey th' rules, 'r quit, but th' Angel Gabriel couldn't run a roun' trip 'thout smashin' nine-tenths of 'em! An' that's a fact!"

"Well, how do you and the others do?"

"Just the best we can, sir, 's near as th' rules 'll let us. Rules is all right, got to have 'em, special'y 'special rules' for new things as come up and safety rules, of course, but when it comes to rules tellin' you 'bout every move you've t' make an' how you've to breathe an' such — why it makes a man feel 's if he'd gone back to suckin' milk out 'f a bottle."

"But, you've got to have rules for the new men."

"Say — who learns the new men? Why, us older men an' th' inspectors, an' the passengers, an' th' ol' man hisself. Them's th' ones as learns th' new men their biz — why a new man might know th' rules so's he c'd say 'em both for'ards and backwards an' he wouldn't run a trip 'thout breakin' half o' 'em an' ballin' his returns so's there'd be no head or tail to it. But you let th' ol' man give him a few remarks, let th' inspectors put him onto a thing or two an' then put him learnin' onto a hard run with a good man t' instruct him an' 'f he's bright an' wants to learn he'll be ready to take an easy run with a good man with him on th' other end before he'd been able to read this 'ere rule book through, I'm tellin' you!"

ALUMINUM RAILWAY FEEDERS

AND ALL KINDS OF
ELECTRICAL CONDUCTORS

Aluminum feeders are less than one-half the weight of copper feeders and are of equal conductivity and strength.

If insulated wire or cable is required high grade insulation is guaranteed.

Prices with full information
furnished on application.....

The Pittsburgh Reduction Company
PITTSBURGH, PA.

WHICH IS SIMPLER AND CHEAPER?



THE OLD WAY

Of Replacing Handles on Register Rods

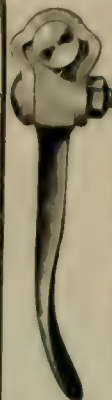
The present practice is to have an eye or hole at one end of the handle through which the rod passes. The rod and handle are held in rigid relation by means of a set screw. The fact is that the eye stretches, and the set screw becomes worn or broken from continued tightening, and of course it does it incapable of holding the handle rigid on the bar. This necessitates the providing of a new handle, and the removal of the old one. The only way to get a new one on is to loosen all the handles on the bar, and remove the rod from its bearings and connections with the register. This of course involves considerable trouble, material loss of time, and a great expense, as it takes two mechanics five hours to do the job.

THE NEW WAY

Take a Wrench and an Oberg Handle and the job is done almost instantly.

C. O. OBERG & CO.

100 Purchase St., Boston, Mass.



Hardened Steel Key. Better than Ten Set Screws.

"Lucas St? Yes'm. Four blocks up yet."

"An' another thing 'spokin' we kep' throwin' th' rules at the passengers same's I did at that ol' d'rector, where'd we be? God knows we get 'nough jawin' now when we have to call a passenger down or do so 'thin' he don't like an' say: what makes people jump on the men about th' rules? Anybody'd think to hear some o' these people talk that we made th' rules an' made 'em just out o' spite to suit the occasion -- like a lot o' little kids at play. 't makes me tired -- it does, honest!"

"Lucas St. -- Lucas St.!! -- LUCAS ST., lady!!"

"Well, I'm not deaf! That's no way to shout at a lady! You might give a person time to get up and get off! No, I can get off without any o' your help! I do think this company might get gentlemen to run its cars. I've a great mind to report" -- and by this time the car and No. 80 were out of hearing.

"Have you any rule in the new book" -- I asked, "to cover such a case as that?"

"Nex' street's where you get off, sir!" Clang!

TURNING THE TABLES.

At a recent stag party a coterie of newspaper men were exchanging some of that innumerable stock of anecdotes which is gathered during the ordinary routine of travel and work.

"Did you ever hear how the tables were turned on Seymour?" asked one of the old sporting hands. "No? I was working on the Buffalo Courier at the time and Charlie Seymour was the sporting correspondent for the Chicago Chronicle. I guess Seymour was one of the most popular members of the reportorial craft at that time and when the great fight between Fitzsimmons and Corbett was arranged to take place at Carson City, Seymour was appointed to remain in touch with the training quarters and keep the Chicago wires hot with live stuff day by day. The stuff he sent was great and people took the paper for Charlie's news alone. All went well till a week before the fight and then all communications ceased from Charlie. Frantic wiring brought no trace of his whereabouts and another man had to be engaged from Frisco at a pretty stiff price to take his place.

"What had happened was soon known, however. It appears that Charlie had fallen in with an old college chum and the two of them had taken the train to San Francisco and had indulged in an endless round of festivity which effectually and literally drowned all recollections of duties past and present. On the afternoon of the great fight, Seymour and his chum were wending their erratic way along some of the principal thoroughfares of the city when their attention was arrested by a huge bulletin board, the center of attraction of a large and excited crowd. The returns of the fight were coming in round by round. How the fight could possibly take place without Seymour's presence was the basis of an animated argument between the two jagged ones for several minutes as they stood at one of the intersec-

CURTAIN FIXTURES



The Keeler "Eccentric" Fixture has no cables, adjusting or retaining devices. Its only bearing points are pivoted eccentric rolls.

The Keeler "Pinch Handle" Fixture is superior in action to other fixtures of this type.

FEDERAL MANUFACTURING CO.
Railway Equipment Dept.
Cleveland, Ohio.

EASTERN AGENT--H. E. HEELER
26 Cortlandt St. New York.

tions of the street viewing the changing of the bulletins with growing surprise. Then all the buildings went round and round and frantically grasping each other, the bewildered pair crawled on hands and knees to the edge of the curb, Seymour exclaiming that at last he knew he had got them and got them bad. They hailed a cab and drove to the nearest Turkish bath, and later they emerged in a comparatively respectable condition and the securing of an evening paper was the first move. The fight was described in detail and an amusing paragraph told how some practical joker had turned the street-car turntables beneath Seymour and his friend while they stood reading the returns."

MR. JILSON J. COLEMAN, consulting engineer, has removed his office from 25 Nassau St. to 57 Broadway, New York City.

STREET RAILWAY REVIEW

Vol. XIII

SEPTEMBER 20, 1903

No. 9

Electric Railways of Budapest.

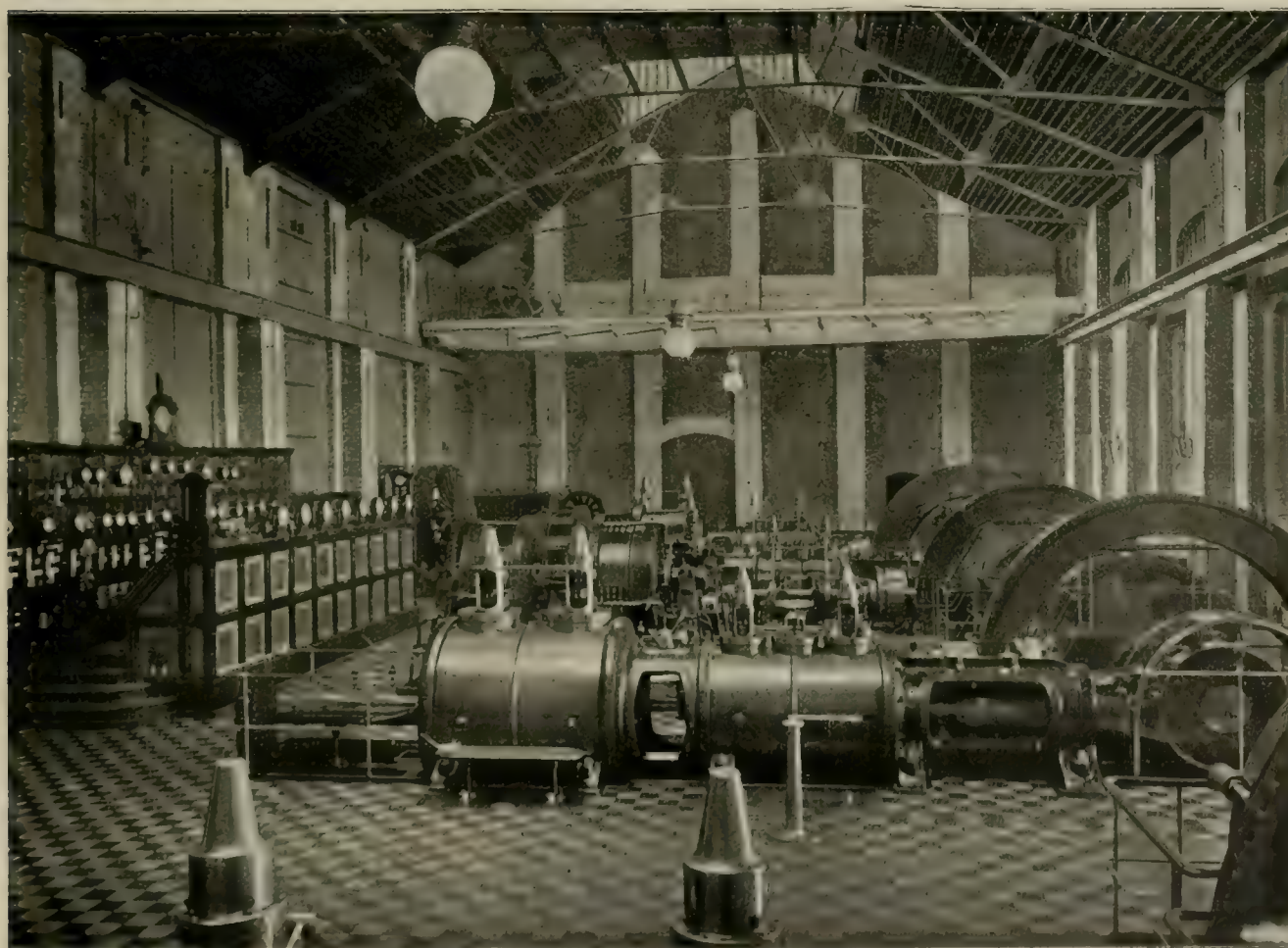
Description of the Electric Underground and Surface Railways and Power Plant Construction in That City.

BY FRANZ KÖSTER.

In no European city has the development of electric surface and underground street railways been prosecuted with greater vigor than in Budapest, the capital of Hungary, a progressive commercial city of more than a half million inhabitants, lying on both sides of the Danube, one hundred and fifty miles east of Vienna, Pest, on the east bank of the river, is the more modern city and contains

chains instead of cables; the Hauptzollamt bridge, named from an adjacent custom house; the Schwurplatz bridge, from a court house; the Franz-Joseph bridge, with sub-surface trolley, and two railway bridges; a prodigality of bridges, it would seem, judged by the standard obtaining between New York and Brooklyn.

The underground railway is for the most part under Andrassy



ENGINE ROOM OF PALFFY ST. POWER HOUSE, BUDAPEST

the greater mileage. Buda being the older in appearance, more picturesque and principally a city of residences. Here on July 30, 1896, the first electric railway in Europe built in city streets was opened to the public, and at the present time there are in operation in the city 125 miles of electric railway, 86 miles of overhead trolley, mostly in the suburbs; 40 miles of sub-surface trolley and 5 miles of underground road. The cities are connected by seven bridges, the Margaret Bridge, an immense structure with overhead trolley; the Ketten or chain bridge, 1,249 ft. long, a suspension bridge with

street and is in every way, except as to length, notable. The kiosks, or entering stations, are of great beauty and appropriateness, while in the subway itself an appeal is made to the sense of beauty as well as to utility.

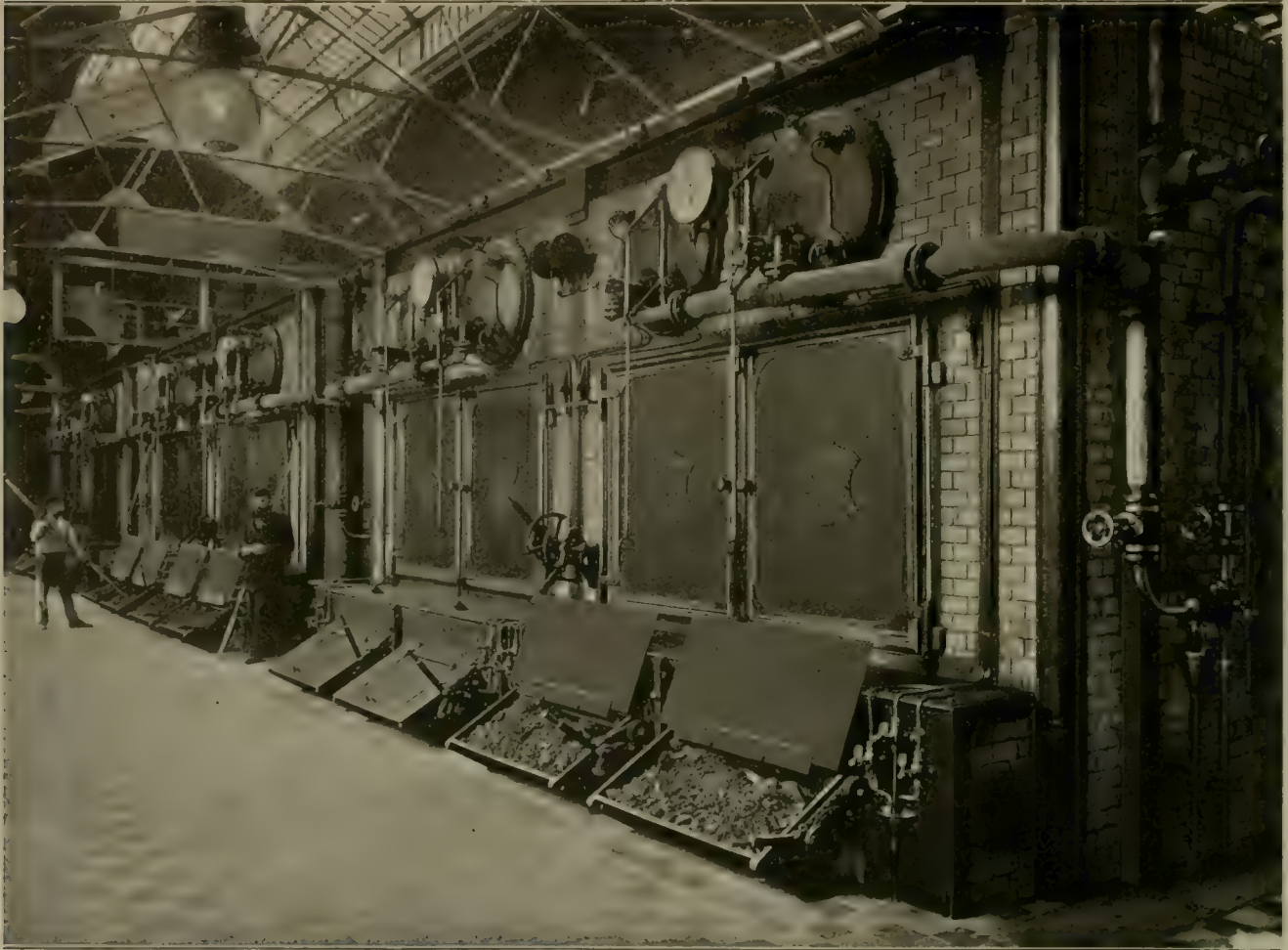
The suburban stations of the surface roads are also of well-studied design and great beauty, and as much may be said of the cars, which compare favorably with those of American construction. They are 32 ft. long, 6 ft. 9 in. wide and 10 ft. 6 in. from rail to top of roof. An interesting arrangement is that of transverse seats on one

side of the car and a longitudinal bench on the opposite side, the aisle thus being out of center. The cars are mounted on double swivel trucks with wheels of equal size. They are equipped with two 200-h. p. motors of the Siemens & Halske type.

The franchises are divided between two companies, the Budapesti Elektrosen Stadtbahn-Aktiengesellschaft and the Budapesti Strassenbahn-Gesellschaft. The first is the older company and it purchased the franchise and equipment of this Budapest road, the first electric sub-surface trolley line constructed and put in operation over a city thoroughfare, from Siemens & Halske, of Berlin, the builders. This original line is on Buross street and is about 20 miles in length.

Generally speaking, the construction of overhead trolleys was delayed by arbitrary police regulations, as such roads were consid-

ered too dangerous. The water of the Danube being unfitted for immediate boiler use. The power plant in Palfy street, which is shown herewith, develops 3,800 h. p. with six horizontal tandem engines, two of 800 h. p. each, two of 700 h. p. each and the others of 400 h. p. each. The piston rods of these engines extend through the steam chest and connect with the air pumps in the cellar below by means of a bell crank. Two dynamos of 615 kw. each and two of 500 kw. each are direct connected with the large engines. The small dynamos of 250 kw. each are also direct connected and make 115 r. p. m. In the boiler house are eight Babcock & Wilcox boilers, with 2,800 sq. ft. of heating surface each, usually working under a pressure of 150 lb. They also use purified water. This plant is fully supplied by two water softening devices with a capacity of 1,850 gallons per hour each. The water is taken out of a pit at some distance from the



BOILER ROOM, PALFAY ST POWER HOUSE, BUDAPEST.

ered too dangerous. They were permitted after experience had in some instances shown the needlessness of this over-precaution. Even now the voltage is restricted by the police to 400 for sub-surface trolleys and 350 for overhead trolleys, measured at the power house.

The second named company began the change from horse to electric power six years after the first installation of the experimental lines. Siemens & Halske installed the entire work for both companies.

The entire 125 miles of road is supplied by three power houses which are so located that the greatest distance to which power is transmitted does not exceed 10 miles. Alternating current is not used.

The first plant in Gartner street has seven horizontal compound engines, with condensers. The plant has a capacity of 2,800 h. p. and 1,500 kw., and has 13 water tube boilers with a total heating surface of 27,000 sq. ft. Both the condensation water and the feed water is drawn from pits constructed for this purpose. Before the feed water is used it is chemically purified with soda and chalk,

power house. This pit is 16½ ft. in diameter and the bottom of it is 7 ft. 3 in. below the low water mark of the Danube.

The boiler house of the third plant in Damjanich street has eight Babcock & Wilcox boilers, each having 3,260 sq. ft. of heating surface. These boilers are arranged for superheating and are in batteries of two, the engines using this steam, as well as those in the plant previously mentioned, are arrayed in such a way that the heat of the steam is not detrimental to the dynamos. This is done by placing the low pressure cylinder nearest the dynamo. This plant usually furnishes power for the underground railroad, and it contains four horizontal tandem engines, developing at 110 r. p. m. 800 h. p. each. The dynamos, which are also direct connected, are of the direct-current type, each of 615 kw. Any surplus current is used for charging a storage battery for lighting the offices, the power plants and the roads. Space has been left for the installation of more engines should it become necessary and the total output of the plants can thus be increased to 13,000 h. p.

One feature of the construction of the road noticeably different

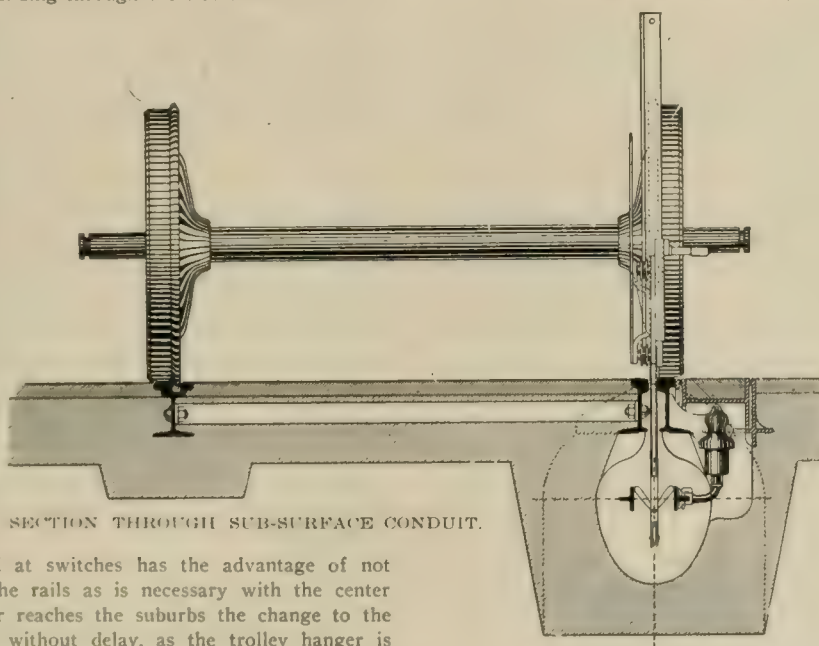
from American construction is the conduit, the slot of which forms the groove of one of the rails, the conductor rails thus being directly beneath the flange of the wheels instead of in the middle of the roadway. This accomplishes a considerable economy both as to the amount of material used and the necessary work of construction. The supporting yokes are imbedded in a concrete mass 25 in. high and 22 in. wide, in the center of which run the contact rails through a channel of oval cross-section, 15 in. deep, 8 in. wide at the top and 11 in. at the widest part. In this oval channel the contact rails of T-iron are supported on porcelain insulators which are in two parts. These are fastened to the supporting yokes and are not placed opposite each other but the insulator holding one contact rail is half way between the insulators of the opposite rail. The distance between insulators is 11 ft. One of these contact rails is negative and the other positive and they are readily accessible through covered openings, the covers of which are of cast iron in the form of basins or boxes, filled with concrete, rather than presenting a surface of cast iron to traffic.

The faces of the contact rails are $3\frac{5}{8}$ in. apart, and the current is taken from them in an interesting way. The trolley plow or hanger extending through the slot between the well below the faces of the contact rails carries on each side a shoe, which slides along the vertical face of the contact rail. These shoes are hinged to the hanger, the hinge being level with the bottom of the rails and the shoes are carried at an angle so that in a cross section the shoes have the appearance of butterfly wings touching the rails with their tips.

Each car has one trolley apparatus, though in Berlin the cars are supplied with two. The construction of the trolley trench under the wheels is economical and at switches has the advantage of not having to cross one of the rails as is necessary with the center trench plan. When a car reaches the suburbs the change to the overhead trolley is made without delay, as the trolley hanger is drawn out of the slot, the wings coming together to allow this,



STATION ENTRANCE, BUDAPEST.



SECTION THROUGH SUB-SURFACE CONDUIT.

and the overhead trolley pole is swung up.

The supply cables are laid outside the concrete and are non-covered. The trench is drained at suitable intervals. In this road no cross ties are used, the rails resting on the concrete and being kept to gage by bars of iron. The maximum gradient is 1 in 18, and the minimum curve has a 65-ft. radius. Little can be said of the overhead trolley line, as its construction is about the same as in this country. The principal difference is in the manner in which electricity is taken from the wire with the Siemens & Halske sliding contact. The trolley pole is a loop of steel pipe,

around which at the top is a channel with the opening uppermost. This channel is filled with a soft composition metal, which is replaced when it wears away, and does not cause any considerable abrasion of the trolley wire. The device is always in contact with the trolley wires, while adjacent telephone communication is not so much disturbed as where the trolley wheel is used. Further advantages of this plan are the absence of overhead frogs and other incumbrances, and the fewer number of span wires necessary, giving a less cumbersome look to the line.

The Franz Joseph Underground Railway, which takes its name from the beloved emperor, who upon riding through it and being asked if it could be named for him, granted the permission, is five miles long and has eleven stations, including the terminals. The maximum gradient is 8 per cent and the radius of the smallest curve is 130 ft. The tracks are standard gage and the tunnel is a double track one, the roof beams being supported by columns between the tracks. The side walls are of concrete masonry, 3.28 ft. wide at the bottom and 2.15 ft. wide at the top. These walls were first constructed and the bottom of the tunnel, which is of concrete, was then laid. In cross section this bottom shows four channels and three ridges, the center ridge supporting the roof columns and the other two ridges being in the middle of the tracks. These



UNDERGROUND RAILWAY, BUDAPEST

longitudinal grooves are left to be filled with more concrete when the wrought iron ties are laid, this double concreting serving to deaden noise. The roof beams are bolted to the center girders, but lie free at the ends on the masonry. The girders, supported by the center columns, 13 ft. apart, are 13 in. deep and the beams, 3.28 ft. apart, are 9, 10 and 11 in. deep. No riveting was done in the field during the progress of the work in order not to disturb the residents along the route. The tops of the roof beams are but a few inches below the surface of the asphalt street and the tunnel is waterproof, being of concrete at bottom and sides with asphalt paper and paving above. Between the roof beams the asphalt is supported by concrete arches.

The tunnel is 20 ft. wide and at curves 22½ ft. It is 9 ft. high, from track to roof, making a short descent from the street. The stations are from 10 to 25 ft. wide and from 70 to 100 ft. long and approach is had on either side. The tunnel is in a wide street and only occupies the sub-surface on one side, the other having been left open to traffic during construction. Current is taken from a 2-in.

rail overhead, by a Siemens & Halske device similar to that used for overhead surface trolley. As the roofs of the cars run quite close to the tunnel roof there is no room for a pole and each motor car is fitted with two inverted U-shaped pipes, the tops of which carry the soft metal, the points being hinged to the sides of the car. The feeder cable is covered with iron and lead and runs underground to the first station. In the tunnel it is bare. Positive and negative cables are laid so that power can be taken from either of two power houses or from both, the underground railroad being then in parallel with the sub-surface trolley street railroad.

The traffic is accommodated by single cars during the lighter hours and by trains of two cars during the rush hours. They run under two minutes headway and a car is not allowed to leave a station until the car ahead has left the next station, a block system of signals being provided.

The financial success of the lines has been much greater than was anticipated.

Autumn Work in the Park.

BY W. E. PARTRIDGE.

When the season at the amusement park closes, managers are prone to drop all thought of the park and its operations for the year. The general feeling is that the work is done and there may be at least three or four months' work before taking it up again. But after apparatus is put away, seats taken care of, buildings closed for the winter, and the usual shutting down of machinery and housing of boats, carriages and the like have been accomplished, there is much work that can profitably be done in the park during the fall in preparation for the coming season, in fact, in many electric railway parks, probably as much work can be done in the fall as at any other season of the year; much of it with less annoyance and less inconvenience to the public.

This is the most favorable time for many of the gardening operations. With care and a few not very expensive pieces of apparatus, tree planting can be carried on and the ground prepared for spring. In these days it is not necessary to limit the work to the handling of small trees with a mere brush of foliage at the top. Trunks from six to eight inches in diameter may be readily handled and shade or even groves provided ready made. Where any trouble has been experienced from insects, this is the season at which the cocoons and eggs are most readily reached, and the scraping of trunks and the clearing of trees generally from the eggs and cocoons of noxious insects can be carried on to good advantage. Although this is a work sometimes put off until spring, it frequently happens that the spring work presses so severely that it is impossible to find the time to go over the plantation or groves with sufficient care.

Nearly every state in the union has a Government Agricultural experimental station. These stations will furnish special information on request, and from them it is easy to obtain details in regard to the best means of combating the insects most injurious. It would be quite possible to give general directions for the "Bordeaux" solution and others of well-known character, but local conditions vary so greatly that such information is hardly worth the space it would occupy. Where one park is finding trouble with one species of insect, another one, not 100 miles distant, may be troubled with something altogether different. The experimental station will give just the information needed for each locality.

In almost all the states the stations issue bulletins relating to the special conditions prevailing in their territory. These bulletins and the information which they furnish are usually free or are provided at a merely nominal charge. Where intelligent co-operation can be had and good use made of information furnished, the stations usually take a great deal of pains to make their investigations valuable. Managers of parks having any considerable area of forests can afford valuable assistance to the stations and at the same time receive equally valuable information in regard to the preservation and increase of their forest land.

For almost every variety of shrub and especially for evergreens, the fall of the year is the best time for pruning. In groves, the ice storms of winter do a great deal of pruning, but frequently in a most disastrous manner. It is worth while for the sake of the life

and value of shade trees and groves to take out everything dead and secure all limbs that are likely to break away and injure the symmetry of the trees. Here a word about supporting limbs.—Never put a band around a growing tree at any point; never allow a wire guy to be wrapped around a tree no matter how many padding boards or how much soft protecting material may be put under it. The reason for this is found in the rapid growth of the tree and the choking results which follow. An eye-bolt put straight through a limb with a fair-sized washer on the side opposite the eye does no harm whatever. The guy wires may be attached to these eye-bolts with safety and branches secured permanently and safely. Where a large tree has branching limbs liable to be split from the trunk by the winds, they can be drawn together by eye-bolts and bars or links connected by turn-buckles. At the end of summer, when bare wood on the trees due to scars or pruning, is perfectly dry, painting is valuable to prevent decay. The great loss of our forest trees seems to be because of the decay of wood from which the bark has been removed.

Trees in parks are peculiarly liable to have their bark injured, exposing the wood. If a tree is given fair opportunity, the bark will usually cover such scars and the healing will be satisfactory. Many trees, however, throw out bark to cover wounds so slowly that the wood beneath decays before the injury is healed. Paint, cement, grafting wax and the like can be successfully used to protect the wood until the bark again covers it. In cutting off limbs, the stump remaining is a source of danger. Decay begins, and although the tree makes efforts to cover up the stump, the injury has been done and after decay commences there is little hope of saving the tree, although years may elapse before its final destruction. If the wood is kept sound by paint or otherwise, the bark will ultimately cover the wound, provided the limb is sawn off closely. Many of the oaks push the bark out and cover stumps projecting several inches. There are few trees, however, so vigorous in this respect.

There are some superintendents who make it a rule to plan the spring campaign in the fall and so far as possible start the work that would otherwise be put off until early spring. When the results of a season are fresh in mind, the time is especially favorable to make them useful. Much of the laying out of new grounds, and the alteration of old can at least be begun at the close of the season. The work will have the advantage of avoiding the rush just before the opening.

A gentleman who has visited most of the New England parks makes a suggestion something like this: "When people wish to see they like to sit with ease. It makes no difference whether it be a landscape or a boat race, they enjoy it better on a comfortable seat than when standing." The common fault with the amusement parks and one that causes much complaint is that there are not seats enough at the right places. Where there are water sports, everyone has to stand and a few only are able to lean against the rail. If there are seats, they are apt to be placed too far away or located so that nothing can be seen from them. If there is a fine view where

people stop to admire, bring out your seats and place them conveniently. Very few parks have enough seats and there is small danger of having too many.

One of the cheapest forms of park decoration is the rustic shelter or summer house. Rustic work is always attractive. Where rustic shelters are numerous they contribute much to the pleasure and comfort of visitors, and they are so cheap that their expense is not an item to be considered. The more rustic work and the more rustic it is, the better, excepting for seats and backs. Let the people sit comfortably and admire the artistic value of crooked branches and bark and knots from a distance. Bark and knots are not desirable in connection with one's anatomy. One of the advantages of building rustic structures in the fall is that the winter months remove the raw freshness of the carpenter work.

One of the subjects that can be taken well care of in the fall is that of the paths. Generally speaking, these are most exasperating. When they are not wrong artistically, they are vicious practically. A path, primarily, should be a comfortable way of passing from one point to another. For purposes of beauty, the path is not desirable even when made winding. It is only a little less of an eyesore than when straight. Its first requirement is a good surface comfortable to walk upon; second, it should be well drained, so that it cannot be converted into a river in case of a shower. It ought to be wide enough but not too wide and paths should never be placed where people do not wish to walk. The Maltese cross with a flower bed in the center is one of the favorite forms used by landscape gardeners. So far as our observation goes, people never willingly walk so that their steps form a Maltese cross. A flower bed in the center is always a source of annoyance. Now and then some hoodlum will rush across it. If the central place is occupied by a fountain or a statue so much the worse as the inconvenience is greater.

In placing paths the fundamental idea should be to give the people a convenient means for going from point to point. If the crowd wears out your lawns by crossing them or walking on the edges, your design is pretty sure to be faulty. Make the paths convenient and people will stay in them. The tendency of the crowd is always toward the line of easiest travel. This tendency cannot be overcome except by fences. To make a winding path across a level lawn and expect to keep the people from going in straight lines, shows a lack of thought or common sense. A flower bed in the middle of a path is an invitation for its destruction. However, in laying out a path it is not necessary to follow straight lines. Crowds crossing an open field usually produce beautifully curved paths, provided the

field be not absolutely level. Now, in laying out paths or walks, points of interest can be just as easily connected by easy simple curves as by straight lines, and if care in the design of the grounds is taken these curved lines will be followed just as readily as the straight ones. To do this, it is only necessary to place an obstruction like a tree or a bank or a pile of stones, so as to make the curve seem natural and necessary.

Where people are passing constantly between two given points, it is an absurdity to place a broad, smooth lawn between them and carry the path around the lawn. The crowd will in every case give constant trouble by crossing directly. The turf will be destroyed and there will always be a disordered look about the place. The erection of a fence or the putting up of guards and signs may do much towards keeping people away, but there will always be an exasperated feeling which is unnecessary. On the other hand, if the lawn is raised in gentle swells so that the path may be made to curve gently between them, people will instinctively recognize that it is easier to follow the curving path than to pass over the mounds, so whenever a curve is desirable, have a reason for it, and the easier line will be acceptable. When paths are laid out in this way, people keep off the grass naturally.

The Japanese in some of their gardens avoid the trampling of grass at the edge of the path by sinking the path 12 or 14 in. and letting the sod rise to make a bank, but they avoid in such cases a level top above the bank. The round edge is not easy to walk on and since the path is the best place, people naturally stick to it.

One of the signs that should not be seen in a park is "Keep Off the Grass." There is practically no use for it, except around a flower bed or where there are the so-called sunken gardens. If you have proper paths and proper seats, the people will not hurt your grass sufficiently to make it worth while to annoy them with a sign. In many parks it is found that when people are allowed to go freely everywhere, the damage to the grass becomes insignificant and unnoticeable.

The comfort and freedom which is experienced by the public when allowed perfect freedom in a park greatly overbalances the annual cost of resodding the places where the grass disappears. It is an immense relief to those whose feet are tired with long walking on hard pavements to stray upon the green sod. When no restraint is placed upon them they scatter widely and the sod is less worn than in parks where every piece of sod a foot square has the exasperating sign: "Keep Off the Grass." The wear is distributed and no spot suffers very much.

Improvements at Detroit.

The Detroit United Ry. recently erected a new car house at Gratiot and Harper Aves., Detroit, at the northern terminus of the Michigan, Harper and Gratiot Ave. lines, it being also at the point of entrance into the city of the Rapid Railway System. Adjacent to the new car house, which has been in use since August 15th, a large storage yard has been established, in which cars will be allowed to stand in the open, instead of being housed in car barns, it being reasoned that the life of the woodwork of cars is so much longer than that of the electrical equipment the additional exposure will not make any material difference; also that the danger of loss by fire will be practically eliminated, a desideratum that was forcibly emphasized when the Jefferson Ave. barn was destroyed last December; and it is further argued that electric cars can be stored outdoors as well as steam cars. Both the new car house and the storage yard, plans of which are shown herewith, possess features out of the ordinary, and each is a home product, having been evolved by the company's engineers, under the supervision of Mr. John Kerwin, superintendent of track.

The new car house, which is two stories in front, is 170 ft. long and 42 ft. wide, and it contains on the ground floor an office and an air compressor room, wash track and pit, with provision for the storage of coal, sand and salt. On the second floor over the office, is a room for conductors and motormen. The building is of brick, with 16-in. walls, the side walls resting on stone foundations 4 ft. deep. The roof is of gravel and has a pitch of about 1 in. per foot. The office, which is in the front of the building, is separated from the entrance to the wash room and pit by a dividing wall, as is also

the air compressor room at the rear of the office. Windows have been placed in this partition to furnish additional light for these rooms. All the outside windows have 4 x 7 ft. openings and stone sills. The office and air compressor room extend backward 40 ft. to a wooden rear wall, which will later be removed and this part of the building extended back to a distance of 80 ft. The office is about 20 ft. wide. The two-story part of the building is 36 ft. high, while the one-story section has a headroom of 16 ft.

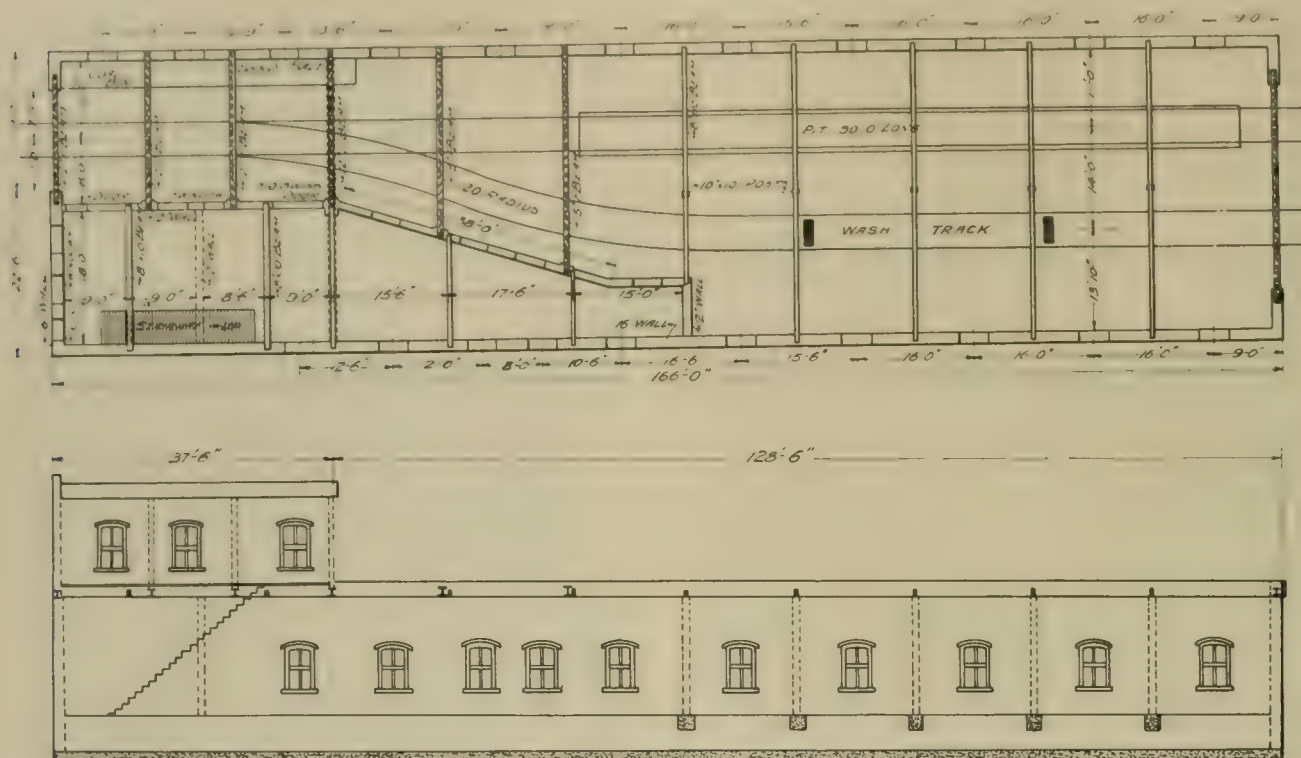
The pit is 90 ft. long. A feature of the pit construction is in the pockets which have been recessed at various points along the sides of the pit, and which serve the double purpose of forming convenient receptacles for brake shoes and other parts, which may be temporarily removed from the trucks, and also make excellent vantage points from which to reach up and work around the outside of the trucks. The pit is floored with concrete and drained in accordance with modern practice. The wash track is concreted, also. One track only enters the building, the wash track being a spur. At the rear of the house the wash and pit tracks are connected with the first of the car storage tracks in the yard, so that a car can be put into the house from the yard without going around to the front. Old rails from the Jefferson Ave. yard are used inside the new car house, and the floor is composed of common gravel from the company's gravel pit with cement laid over it and rolled to make it smooth and solid. Along side the partition between the entrance to the wash room and the office benches have been placed for the convenience of inspectors.

The pit and wash room can be closed in winter by means of

large doors extend to the roof, front and rear. Those in front are wooden swing doors which rest their whole weight upon the bottom hinges, the sockets for which are imbedded in cement. These doors are balanced so nicely that a child can swing them. The rear doors slide either way, and close on each other, so that either the pit or wash track, or both, may be closed, as desired.

The Magann storage air-brake system has been installed at this car house and both the Rapid Railway cars and those of the Michigan and Gratiot Ave. lines of the Detroit United Ry. will take air

shown in the accompanying diagram, and it will also be noticed that the Y in no way interferes with the use of the loop. When completed there will be two miles of track in this yard, of which $\frac{1}{4}$ mile has been laid. The yard has a frontage of about 300 ft. and a depth of 400 ft., and it is designed to have 28 storage tracks. The work was first ordered for 10-ft. track centers, but, the size of the cars having increased, 10½-ft. centers were deemed necessary, room enough being allowed to wheel a barrow between the cars. An obvious advantage of the loop arrangement is that it avoids the

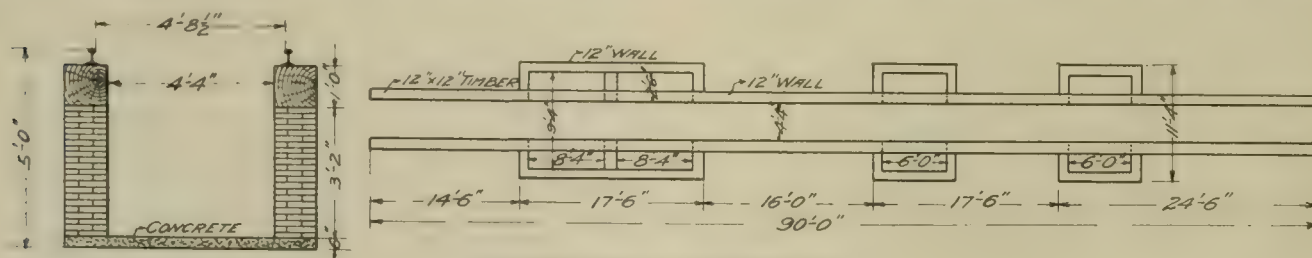


PLAN AND SIDE ELEVATION OF NEW CAR HOUSE.

from this compressor. The air compressor room has been arranged, also, to permit the installation of a transformer and switch-board at some future time for a small sub-station to help feed the city lines from the interurban high tension service, if need be.

The locker room upstairs is commodious and attractive. In it are tables at which the men may read, write or play games. There are several tiers of lockers made of southern pine, so constructed that they may be easily moved to permit cleaning. There is an opening at the bottom of each locker door and holes in the backboards to insure ventilation, and each locker has a shelf at the

wearing out of frogs and switch points. The Harper Ave. line has direct connection with the storage yard at the side, while the Michigan and Gratiot Ave. cars will use the loop and Y, and the Rapid Railway cars will use the Y. Aside from the layout of the storage tracks there is nothing unusual about them. Gravel has been used to fill in around the tracks. The company is planning to build a smaller storage yard at the corner of Gratiot and Superior Aves., where formerly stood the old Superior car house, which has just been torn down. In fact, it is doubtful if the company will ever build another car barn, although, of course, those now existing



SECTION AND PLAN OF PIT TRACK.

top. The toilet room is at the rear of the men's room. The ceiling and walls of the locker room are whitened with cold water paint.

The office and locker room are heated by the Peter Smith system, and heater coils also extend around the walls of the pit and wash room. The heater is located in a pit at one end of the air compressor room and access is had to it by means of stairs leading from the entrance to the wash room.

The arrangement of tracks in the storage yard is such that all switching and moving of cars can be done without interfering with traffic on Gratiot Ave., by means of a running loop and a Y, as

will be continued in use, being made as nearly fireproof as possible by the introduction of fire walls, which work has been going on all summer.

The Detroit United Ry. is now rebuilding about two miles of track on Woodward Ave., and on Jefferson Ave., from the junction of those two thoroughfares to the Michigan Central station. This work is of a character that calls for special mention, it being the intention to make it the best electric roadbed in the world, and if it proves to be all that is hoped for it several miles more of city track will be rebuilt in like manner next season. The portion

being replaced by a track that was laid with metal ties in 1897, the tie resting on a concrete foundation laid to a depth of six inches below the ties, which were imbedded to their full depth as required by the provisions of a city ordinance. This work was fully described in the "Review" for January, 1897. The concrete used consisted of Louisville cement, sand and crushed stone. The concrete construction seemed to be satisfactory, but serious cracks appeared, extending clear through the concrete bed. It was found

which is used to pave between and around the tracks. Asphalt was used for paving between tracks at one time, but the asphalt became broken by wagon traffic, so the company obtained permission from



CAR STORAGE YARD, DETROIT CAR SHOPS.

the city to use brick instead and that has been found to be quite satisfactory. All concrete work is allowed to set 10 days before the track is used.

The accompanying engraving will show the track construction

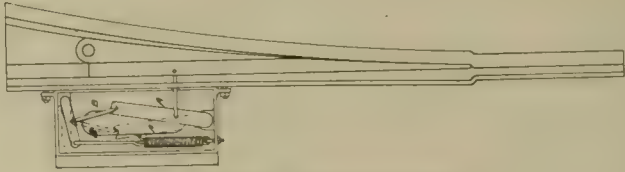
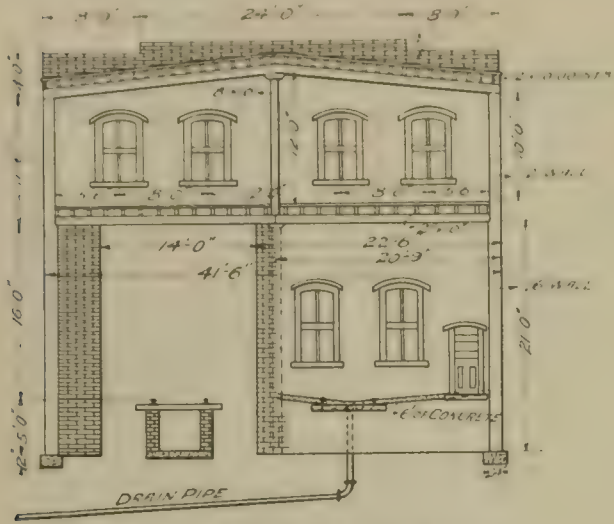


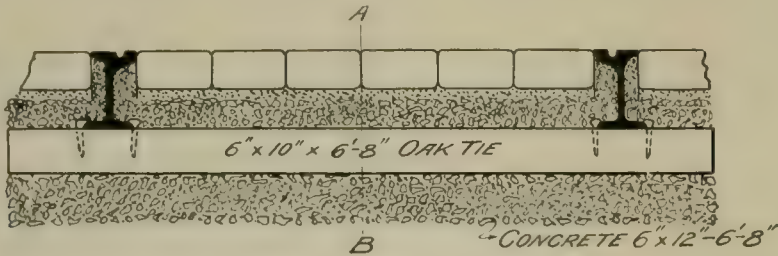
DIAGRAM OF SWITCH LOCK.

employed at the present time. The concrete mixing train, which was described and illustrated in the "Review" for August, is used in this

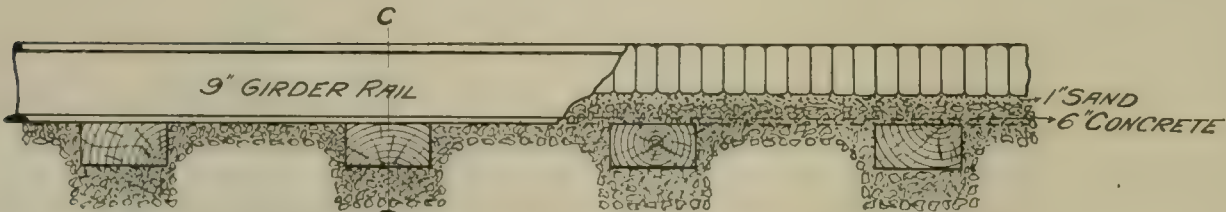


FRONT ELEVATION, NEW CAR HOUSE.

that the ends of the metal ties settled, causing the concrete to break under the rail, while the tie bent in the middle, thereby causing further disintegration of the concrete. Then it was decided that in all new work, and in repairing old work, it should be the practice to put in at least 1 ft. of concrete under the ties and to use a good quality of portland cement in place of the Louisville mixture. Concrete ties were also experimented with. Now, however, there has been a return to 6-in. white oak ties, carefully imbedded and laid but 30 in. between centers and 12 in. between centers at rail joints; it is believed that oak ties, being more resilient than metal, will



CROSS SECTION C-D



SIDE ELEVATION

LONGITUDINAL SECTION A-B

ELEVATION AND SECTIONS OF NEW TRACK WORK.

be less likely to break up the concrete. The rails used are of 9 in. girder section, in lengths from 64 to 67 ft. and weigh about 100 lb. per yard. The depth of grade used is 13 in., instead of 6 in., as formerly used, and from the pavement to the bottom of the foundation is 21 in., including a 1-in. cushion of sand under the brick

work and is eminently satisfactory, it being possible to build nearly two blocks of track per day. In fact, so successful has been this mixer a new mixer has just been built at the track department shops, which will mix 2 cu. yd. of concrete in less than 5 minutes, and will do the work of 14 men, the capacity being about double

that of the old mixer. The track department has 800 men on its pay rolls. It has a large shop, 300 x 150 ft., where are made most of the special track work as well as numerous original devices.

One of the accompanying illustrations shows a switch lock for tongue switches, which is made at the track department shops after a design furnished by Mr. Kerwin. This device prevents the derailment of a car by reason of the front truck tipping the point of the switch, opening it slightly and allowing the rear truck to take the other track. The tongue will spring back to the position shown in the sketch, until it is thrown beyond the dead, center point, when it springs in the opposite direction and is locked tight. The parts are few and simple and are held in place by studs and eyeholes, there being no screws or nuts. The parts can be taken out of the box in less than half a minute. The box is inserted in the ground at the side of the switch, the top plate being level with the surface. Several of these switch locks have been used successfully in Detroit and also in St. Louis, where Mr. Kerwin sent one to be tried sometime ago.

Mr. Kerwin has devised a handy blue-print map showing the layout of all the lines controlled by the company, both city and

and register work. In the blacksmith shop the company does all its own babbiting, there being mandrils for all bearings used. In the armature department between 30 and 40 boys are employed at taping for repair work, but it is proposed to install taping machines such as are used by the Chicago City Railway Co. for this work. Several "Detroit" machines are now used for retaping field coils.

In the truck shop a 10-ton air hoist has been installed by the Northern Engineering Works, to be used in connection with the Magann air storage system for hoisting cars or trucks. The hoist runs on an overhead I-beam track extending the entire length of the shop at the rear. Smaller hoists serve the 15 tracks that enter the truck shop from the transfer table platform. It is possible to raise a car, remove the truck and put another in place in 12 minutes. The truck shop also contains six 65-ft. pits.

The plant is divided into seven principal departments, with two minor ones, each under a foreman, and there are at this time about 390 employees.

The entire plant is 633 ft. long. It comprises two buildings built on both sides of an open area through which a transfer table is operated, serving the different shops and the 20 or more storage



DETROIT CAR AND REPAIR SHOPS.

suburban. It is not drawn to scale, but it is so arranged that in case of fire or accident it can be readily seen at a glance how the routes may be changed for the time being without seriously interfering with schedules.

About a year ago the Detroit United Ry. purchased the old Pullman repair shops located on the block bounded by St. Aubin and Monroe Aves., De Quindre and Macomb Sts., of which a general description was published in the "Daily Review" for Oct. 11, 1902. As shown by the accompanying plans these shops are exceptionally well arranged and very commodious. The shops are in charge of Mr. Sylvester Potter, master mechanic.

There is now being installed an alternating-current transformer for testing armature fields and coils. At present tests for grounds are made by the voltmeter method by means of a portable tester, and a milli-voltmeter is used to test commutator segments for short circuit. As rapidly as possible all the suburban cars are being brought into the shops to be repainted a wine color, which is to be the standard color for suburban cars in the future, instead of yellow. New signs have been adopted for the interurban cars; these are made of tin and painted wine color, with silver letters. The signs are 24 x 28 in.

The company makes and grinds points at the shops.

All the woodworking machinery is run by an electric motor made from a generator formerly used in the Antoine shops. The tool room is caged in in the machine shop and one man does all the drill

tracks at the north end of the yards. These storage tracks are capable of accommodating 40 cars, the entire capacity of the shops being 115 cars. There is about \$50,000 worth of stock on hand at all times.

An electric locomotive to be used in shunting coal for the power house has just been turned out at the shops. It has a two-motor equipment.

To Rebuild Elevated Structure.

The Metropolitan Street Railway Co., of Kansas City, has awarded the contract for rebuilding that portion of the elevated road in that city, which was wrecked by the flood last June, to the American Bridge Co., of New York. At the same time the Central Ave. bridge over the Kaw River is to be rebuilt. The steel in the new elevated structure will be much heavier than before. Each column will rest on a cement foundation and will be securely anchored. Plate girders will be used in the reconstruction.

The route of the elevated road will be about the same as before the flood. The only difference will be at Central Ave., west of Riverview in Kansas City, Kan., where instead of making a curve north of Central Ave. to Riverview station it will run straight west on Central Ave. to a point a block west of Riverview and then turn back to the old course.

Cleveland Electric Depot Co.

In the "Review" for April, 1900, (Vol. X, p. 100) was a somewhat extended description of the method of handling freight and express that had been adopted by the electric railways of Cleveland, with illustrations of scenes in front of the headquarters of the Electric Package Co. which at that time were in a storeroom, no loading platforms other than the sidewalk being used. At that

Eastern R. R., the Northern Ohio Traction & Light Co., the Lake Shore Electric Railway Co., the Eastern Ohio Traction Co., and the Cleveland & Southwestern Traction Co. By reason of the consolidation of the Cleveland City with the Cleveland Electric Ry. the latter now owns two-sevenths of the Depot company stock.

A site was secured convenient to the business district of the

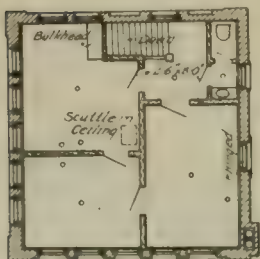


FREIGHT STATION, ELECTRIC DEPOT CO., CLEVELAND.

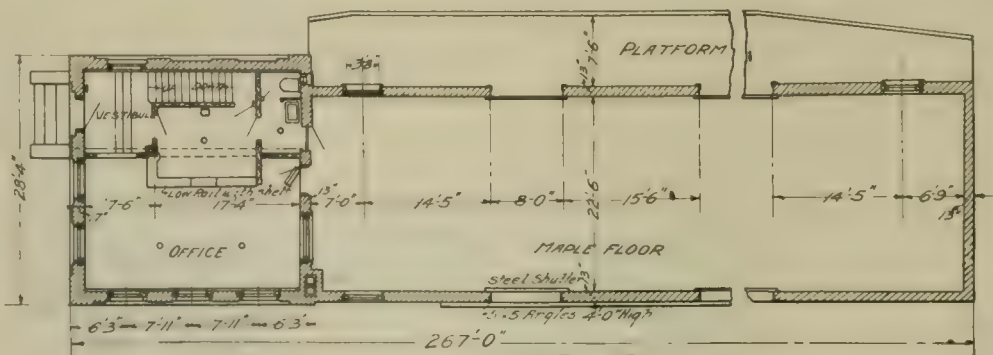
time the roads interested in the freight and express business in Cleveland were the Lorain & Cleveland, the Cleveland, Berea, Elyria & Oberlin, the Northern Ohio Traction, and the Cleveland, Painesville & Eastern.

Since 1900 this business in Cleveland has developed rapidly and some time ago it became apparent that better terminal facilities

city and the Electric Depot Co. erected a station which has been leased to the Electric Package Co. The freight station, as will be seen by reference to the accompanying plans, is 239 ft. long by 25 ft. wide, and is one story high; at the front end is a two-story structure 28 ft. square used for office purposes; the whole is of brick. The building lot extends the full width of a block, so that the station



SECOND FLOOR PLAN



STATION OF ELECTRIC DEPOT CO., CLEVELAND.

were required by the Electric Package Co., which conducts this business for the railway companies.

Some time ago the Electric Depot Co. was organized, the capital stock of this company being distributed equally among the Cleveland Electric Ry., the Cleveland City Ry., the Cleveland, Painesville &

is easy of access. On the receiving side, which has no platform, is a driveway for wagons.

At the opposite side is a 7 ft. 6 in. platform protected by a projecting roof as shown in the sectional view. The railway track is alongside this platform and additional tracks are provided for the

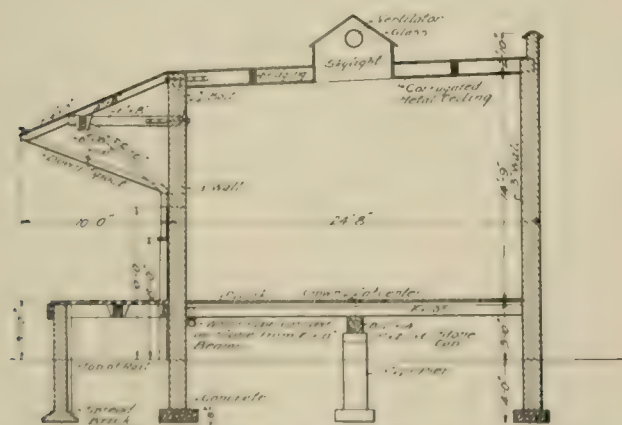
temporary use by cars that cannot be accommodated at the platform track. The floor of the station is given a slight slope from the receiving to the platform side to facilitate the transfer of heavy packages across the building. The doors, 8 ft. wide, are placed at intervals of about 23 ft., between centers, and are all of the rolling steel type. The building was designed by Searles & Hirsh, architects, Electric Bldg., Cleveland, to whom we are indebted for the drawings reproduced herewith.

It is confidently expected that the improved facilities for handling express matter will result in a marked increase in the business.



INTERIOR OF FREIGHT HOUSE.

The new depot was formally opened Saturday evening, August 29th, with a banquet at which about 80 traction and electric package managers and employees were present. B. Mahler, president of the Electric Depot Co., and general manager of the Electric Package Co., acted as toastmaster. F. T. Pomeroy, of the Cleveland & Southwestern Traction Co., spoke on "The Necessity of Electric Package Employees Co-operating with the Employees of the Traction Companies". C. A. Kenworthy, superintendent of the Electric Package Co., spoke on "The Necessity of the Traction Employees Co-operating with the Electric Package People". A. Lewenthal, attorney for the company, spoke on "The Benefits Derived by Surrounding Cities from Electric Traction". Others who spoke were F. W. Coen, secretary of the Lake Shore Electric Railway Co.; Edgar H. Hyman, auditor of the Electric Package Co., and M. W. Weiner, treasurer of that company.



CROSS SECTION OF FREIGHT HOUSE.

The officers of the Electric Depot Co. are: President, B. Mahler; vice-president, A. E. Aikins; secretary and treasurer, H. J. Davies, and of the Electric Package Co.: Manager, B. Mahler; superintendent, C. A. Kenworthy.

The methods of accounting of the Electric Package Co. were quite fully described in the discussion of Mr. Fullerton's paper on "Freight and Express Accounting" submitted by Mr. E. H. Hyman, auditor of the Electric Package Co., and published in the "Daily Street Railway Review", Sept. 3, 1903, page 627.

To Carry Freight Underground.

The Illinois Telephone & Telegraph Co., of Chicago, has perfected its plans for connecting 38 downtown freight yards and all power plants, factories and other buildings with its system of tunnels for the delivery of freight underground, and it is officially announced that contracts have been awarded for 50 motor cars of 200 tons capacity each and 1,500 freight cars to carry six tons of freight each. These are to be operated by an overhead electric trolley system in the 20 miles of tunnels which the company has built. The equipment is to be delivered and installed complete not later than July 1, 1904, and in the meantime the work of connecting the tunnels with the freight yards in the downtown section of Chicago, within a territory of two square miles, will begin.

It is planned to transfer 100,000 tons of freight daily in the tunnels, which is the amount, it is estimated, that is now handled through the downtown streets on trucks, and it is expected that the congestion in the streets will be appreciably relieved. Practically all that is necessary to be done now to prepare for handling this freight business is to connect the tunnels with the freight yards and the buildings by means of a system of elevators and conveying belts. The company has expended to date \$5,000,000 and present plans contemplate the expenditure of \$20,000,000 more.

The company's telephone business has reached such a stage that contracts have just been awarded for the installation of an exchange of 100,000 telephones. The present exchange in the business section of the city, which will accommodate 10,000 subscribers, is to be maintained separately from the other and operated entirely as a business men's telephone exchange.

Wants Interurban Enjoined.

Peter Koontz, of Dayton, O., has applied to the courts for a permanent order restraining the Dayton & Muncie Traction Co. from occupying the street in front of certain business properties belonging to the plaintiff in Union City, Ind. Mr. Koontz takes the position that inasmuch as the defendant is not a street railway company with the special mission of serving the citizens of Union City, but is operating a through line, that therefore any franchise that might be granted by the city to the defendant company could not estop the owner of the fee to set up his rights, and that before the defendant company can encumber that part of the street in which he owns the fee, it must do so with the consent of the fee owner.

Change in C., D. & T. Management.

Cincinnati interests acquired control of the Cincinnati, Dayton & Toledo Traction Co. at the stockholders' meeting at Hamilton, O., September 1st. Messrs. Claude Ashbrook, Williams E. Hutton and George B. Cox, of Cincinnati, were reported to have held proxies representing 21,000 shares of stock, while the Cleveland holdings were represented by M. J. Mandelbaum and H. C. Lang, president and secretary of the company, whose proxies aggregated about 12,000 shares. The following directors were elected: George B. Cox, W. Kesley Schoepf, J. B. Foraker, jr., C. C. Richardson, Claude Ashbrook, Lewis A. Ireton, all of Cincinnati; and M. J. Mandelbaum, H. C. Lang and W. C. Shepherd, of Cleveland.

The directors elected George B. Cox president in place of M. J. Mandelbaum; W. K. Schoepf first vice-president in place of Will Christy; C. C. Richardson second vice-president in place of O. V. Parrish; J. B. Foraker, jr., secretary and treasurer in place of H. C. Lang; F. R. Williams, assistant secretary and treasurer, and F. J. J. Sloat, general manager. The operating office will remain at Hamilton, while the executive office will be removed from the Garfield Building, Cleveland, to Cincinnati.

The Cincinnati, Dayton & Toledo Traction Co. operates 66 $\frac{2}{3}$ miles of suburban railway connecting Cincinnati with Dayton, and 9 miles of railway in Hamilton, O. The road was built by Cleveland and Hamilton people. The company was reorganized May 19, 1902. It is a consolidation of the Southern Ohio Traction Co., Hamilton & Linderwald Electric Traction Co., Miamisburg & Germantown Traction Co., and the Cincinnati & Northwestern Railway Co.

The Washington (Pa.) and Canonsburg Electric Railway, seven miles long, was opened for traffic last week.



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SAVE THE "DAILY REVIEW."

Do not forget that the page numbers of the "Daily Street Railway Review" follow consecutively those of the "Street Railway Review" for August 20th, and that this issue begins with page 711, following the Saturday "Daily." Keep all the "Dailies" in order to have your file complete for binding.

NEW LEGISLATION.

As supplementing the very complete and systematic report of the decisions of courts of last resort in cases involving legal points of interest to street and electric railways, which is recognized as one of the important features of the "Review," we announce a comprehensive summary of the legislation for 1903 that affects the electric railway field. The first installment appears on page 757 of this issue.

LEGAL ADVICE FOR EMPLOYEES.

The Boston Elevated Railway Co. is one of the large corporations which has always been mindful of the welfare of its employees, and has availed itself of every opportunity to demonstrate that fact. As recent examples of the generous policy of the company its action in importing coal during the winter of 1902-3, and the establishment of a pension system will be recalled. On another page we publish an order of the management announcing that the Legal Department has established a bureau for the purpose of assisting employees by furnishing free of charge legal advice regarding their personal affairs. This is, we believe, the first instance of a corporation employing so many men—nearly 10,000—undertaking to render such a service. We consider this action of the Boston Elevated Railway to be a most commendable one, and that the bureau will be of vast good to the men. Every one familiar with the conditions in cities of the size of Boston knows something of the methods of collection agencies and loan sharks whose opportunity is afforded by the ignorance of their victims as to the law. By thus placing at the disposal of its employees the services of its own legal counsel, the company has provided a substantial bulwark against extortion, and furnished an example that might well be followed by other corporations.

THE ACCOUNTANTS' ASSOCIATION.

The proceedings of the Street Railway Accountants' Association at the Saratoga Convention were characterized by the same business-like methods which have prevailed at all the former meetings of this association. As pointed out by Secretary Brockway, an association can be organized from two standpoints, for entertainment or for work. These two elements can only be combined under the most careful administration and by the members keeping clearly before them where one leaves off and the other begins. The association can certainly point with pride to its achievements during the last few years in the direction of standardizing the system of street railway accounting. The fact that this work has been favored not only by large financial interests throughout the country but that the government has also stamped it with its approval by incorporating the association's standards into its statistical work gives evidence of the care and thoroughness with which the work of the association has been carried out.

Representation by membership in this association is of real value and vital interest to every street railway company, and many of the roads not now members of this association would be greatly benefited by taking part in the deliberations of this body. It has been found by experience that the small roads gain comparatively more by membership in the association than do the large ones and for this reason every road, no matter how small, should avail itself of the privileges of this association. Moreover, the greater the membership the broader will be the effect of the association's work.

OUR CONVENTION REPORT.

The four issues of the "Daily Street Railway Review" published Sept. 2, 3, 4 and 5, gave to our readers a far more complete report of the meetings of the three associations than any one person could have secured by a personal attendance. With three conventions in session at the same time the "Daily Review" proved a veritable boon to those who desired to gain a comprehensive idea of the work and keep in touch with the proceedings; without the "Daily" even the delegates would have to wait one or two weeks to get the full reports of what had transpired at the meetings of the other two asso-

ciations which they could not attend because of the obvious impossibility of being in three places at once. As it was, full and accurate reports of each day's meetings were in the hands of the delegates at 8:30 the following morning.

During the four days of the Saratoga meeting we published 164 pages of reading matter devoted to the conventions. This is a showing of which we feel proud, the more so that others who attempt to emulate it must reckon in weeks and not in days.

A summary showing the growth of the "Daily Review" was published in the "Daily" for September 5th, but we repeat it here:

| City. | Year. | Issues. | Pages. | |
|-------------------|-------|---------|----------|--------|
| | | | Reading. | Total. |
| Chicago | 1899 | 5 | 102 | 212 |
| Kansas City | 1900 | 4 | 88 | 188 |
| New York | 1901 | 4 | 125 | 252 |
| Detroit | 1902 | 4 | 132 | 300 |
| Saratoga | 1903 | 4 | 164 | 368 |

The "Daily Review" will be there in 1904.

THE NEWARK ACCIDENT.

Accidents that result in death or serious personal injury are always to be deplored, but equally deplorable is the spirit which so often shows itself in attempts to fasten criminal responsibility upon the chief executive officers of corporations, whose servants have been concerned in an accident. Feb. 19, 1903, a car of the North Jersey Street Railway Co. got beyond control of the motorman and slid down a sharp grade in Newark onto the tracks of the Delaware, Lackawanna & Western and was struck by a fast train, nine persons being killed and many injured. A number of the directors of the North Jersey Company were indicted for manslaughter, but at the trial, the first week in September, after the state had rested its case the court directed the jury to return a verdict of not guilty. This result may be taken as an indication that the grand jury and its adviser, the state's attorney, were actuated by passion rather than a desire to enforce the law.

In the trial of the case it was established that the rules of the company were adequate, if carried out, to insure the safety of passengers, as evidenced by the fact that for two years cars had been operated down the grade and in no case had a motorman lost control of his car. The fatal accident resulted because the track on this occasion was not sanded as required by the rules, and this omission, direful as were its consequences, was not one for which the directors of the company were criminally liable. The court also held that the company had not been negligent in failing to provide derailing switches.

What we have said is not to be considered an apology for conditions which make grade crossing accidents possible, but as a protest against a not unusual attitude on the part of the public. Laws are the index of public opinion and when the state permits the construction and operation of railroads with crossings at the same grade the public must share with the railroads the moral responsibility for the occasional accidents that result. The railroads, as a rule, will of their own accord adopt greater precautions than are required of them by law, because they recognize that a serious accident is more expensive than the most costly means of preventing it.

A NEW BURDEN ON THE FEE.

When electricity became accepted as the best motive power for street railways one of the legal questions at once raised was whether the use of the new power did not constitute an additional burden on the fee of abutting property for which the owners were entitled to compensation from the street railway. This was decided in the negative in every case, we believe, that reached a court of last resort, and for several years the doctrine has been settled so far as street railways are concerned. The same question has now been raised, however, as affecting electric interurban roads using the tracks of urban companies under traffic agreements, a property owner in Indianapolis having attacked the right of the local street railway to lease trackage to interurban companies operating cars in the city.

In the argument of this case it will undoubtedly be claimed that a company recognizing the advantages of owning a right of way in fee in the country districts, and perhaps organized under the general railroad law of its state, is not entitled to exemptions merely because

it is operating within the limits of a city. This proceeds upon the assumption that the conditions governing the operation of steam and electric railways are identical within the city as well as without its corporate limits, which, however, is seldom the case. But when an interurban car crosses the corporate line it in most cases changes the character of its service and becomes to all intents a street car; the management is no longer free to regulate the halting points but must stop to receive and discharge passengers at all street crossings, and even though a passenger does not leave his seat his position is not analogous to a passenger on a steam railroad, but rather to one, a farmer for instance, who drives to the city limits in his own conveyance and there transfers to a street car. It is the character of the service rather than the type of vehicle or the owner of it that should determine the rights in the streets, and it would certainly be a backward step to curtail the terminal privileges of interurban lines, which have been so potent in making such lines popular. The fact of handling freight should not affect the situation, because this service also is one that may be called an improved and not an enlarged use of the street; it is for the benefit of the general public both in giving quicker service and reducing the amount of trucking which congests the streets.

A. S. R. A. CONVENTION.

The 22d annual convention of the American Street Railway Association is past, and the time is opportune for comments on the work done and discussion as to the plans for the future. The association is to be congratulated upon the papers which were presented before it; these were good in themselves, all giving evidence of careful and painstaking work on the part of their authors. The limited discussion had upon these papers is greatly to be regretted and the authors might well take exception to the scant consideration given them.

The want of adequate discussion on papers presented at the annual meetings of the association has been apparent for several years. The low water mark of debate, if the expression may be permitted, was reached in 1900, at Kansas City when less than 7,500 words sufficed for a verbatim report of the convention. At that time it was recognized that the subjects before the association were no longer such as to permit of extemporaneous debate; and such discussion was all that could be offered because the delegates had their first knowledge of the views of the author when he read his paper at the meeting. Accordingly, to remedy this condition, it was decided to print the convention papers in advance of the meeting, and read the papers by title, thus not only giving opportunity for the preparation of discussions but also affording more time at the meeting for their presentation. The result has been a substantial increase in the volume of debate, although in some instances the dilatoriness of the authors in getting their papers into the hands of the secretary of the association has partially defeated the principal object of the advance publication. However at New York and Detroit as well as at Saratoga the discussion has been limited to a comparatively few papers, some of the most important being merely read by title.

At the Saratoga convention, of the three days the convention was nominally in session, the time given to the consideration of technical papers was about five hours, and besides the Report of the Committee on Rules, only three papers were discussed at all. Responsibility for this condition of affairs is divided—delegates were late in reaching Saratoga, those present were tardy in going to the convention hall, and early adjournments were made in order to permit the entertainment features of the program to be carried out.

Several delegates, including the presiding officer, placed themselves on record as recognizing the fact that the American Street Railway Association has developed to such an extent that its annual meetings can no longer be conducted according to the plans in vogue heretofore, if it is desired to realize to the fullest extent the opportunities before the association. Another point made on the floor of the convention was that the program as arranged for the Saratoga convention did not give sufficient opportunity for the inspection of the very extensive exhibits made by the electric railway manufacturers and supply houses. These various matters will be taken under consideration by the recently elected executive committee, and next year we may expect the recommendation of several important changes. One of the questions now before the committee is that of changing the name to the American Electric Rail-

way. A second charge that was urged by the "Review" in September, 1907.

We believe the principal reason why the papers read before the American Street Railway Association have not been more thoroughly discussed is that the papers have dealt with subjects in which the chief executive officers of companies take only a general interest, and with the details of which they are not familiar, these details being delegated to subordinate officials. For example, at Saratoga the papers on "Electric Welded Joints" and "Alternating Current for Large Cities" were not discussed by the A. S. R. A. Now, we venture the assertion that had these papers been presented before a body composed of electrical engineers and superintendents of power houses there would have been no lack of debate that would have brought out many interesting points. On the other hand, the subjects of "Freight and Express" and "Right of Way" elicited discussion, these dealing with matters of policy and not involving engineering.

Since the Accountants' Association was organized accounting subjects have not been considered by the A. S. R. A., and now that the first convention of the American Railway Mechanical and Electrical Association has demonstrated the ability of that body, it would seem desirable that power house and shop subjects be left to that association, reserving to the A. S. R. A. those matters more intimately concerning the managerial department. Some of the questions that suggest themselves as being most appropriate for an association attended by presidents and managers are matters of policy in dealing with the public and the municipality; the desirability of inaugurating or extending special classes of service; the principles on which systems of discipline should be based; the adoption of standards recommended by the allied associations of specialists; the relations between railways and their employees; legislative reforms.

With papers on subjects of special instead of only general interest to the delegates, and publication of these papers a sufficient time in advance, there should be no difficulty in securing adequate discussion.

DEPRECIATION.

The address of President Davies before the Street Railway Accountants' Association at Saratoga was one of the most important papers that has ever been read before this association and treated in a straightforward and fearless manner a subject which figuratively speaking has heretofore been handled with gloves. The subject of depreciation of street railway plant and equipment is one of the most difficult with which the accountant has to deal, and owing to the position taken by the boards of directors of many street railway companies the accounting departments have felt constrained to touch upon the subject of depreciation but lightly. For this reason the appeal of Mr. Davies for honest accounting in this respect is especially commendable, particularly at this time when the vast amount of promoting of new electric railway properties makes the subject one of unusual importance.

A large proportion of the electric roads which are being built today are built with borrowed money, and in order to dispose of bonds issued for construction purposes such bonds have to be sold considerably below par and are often accompanied with a stock bonus. The bonded indebtedness of some roads represents almost the full value of the properties, and is a debt which must be paid sooner or later, or else the value of the stock must ultimately dwindle to nothing and the properties revert to the bondholders. Under these conditions the only proper course to be pursued by the directors of a company is to set aside annually a sum adequate to provide for the depreciation of the property so that all necessary repairs and renewals can be made and the property kept in a condition equal to new. If this is not done the security of the bondholders is being diminished constantly. In addition to the allowance made for depreciation a sinking fund should also be established from which the bonds can be paid off as they become due.

In the language of Mr. Davies, the accountant should explain to his directors (if they lack that knowledge) that the bonds of a company should be considered as a debt to be paid, and that the payment of the interest does not in any way reduce this debt. The only way in which the stock can ultimately approach its true value is by making sufficient allowance for depreciation and by paying off the bonds as they become due. There is, of course, a strong tempta-

tion to make the stock appear as valuable as possible by declaring as large dividends as the earnings will stand, but it cannot be doubted that this is a short-sighted policy. To declare dividends which have never been earned, by applying the difference between the gross earnings and the operating expenses plus the fixed charges to dividends without creating the proper reserves for depreciation or sinking fund, means that stockholders receive money to which they are not entitled, at the expense of the bondholders. Under this method of accounting the day of reckoning for the stockholders comes when the bonds become due. These unearned dividends of the stockholders are paid at the expense of their principal and when reorganization comes, as it inevitably must under these conditions, their stock is comparatively worthless.

The question of the proper amount of depreciation to be allowed on a street railway property is perhaps difficult to determine and it will vary greatly on the different parts included in the whole property. The amount, however, should be greater than will cover ordinary wear and tear for the reason that as engineering practice changes and improvements are made, it frequently becomes necessary to discard apparatus which is in comparatively good condition, but which, by reason of improvements, is no longer to be used with economy. A discussion of the proper allowance for depreciation on the various parts of a street railway plant would be one of the most important subjects that could be undertaken by the Accountants' Association.

The practice of railroads in the matter of reconstruction charges which is closely allied to depreciation accounting has varied greatly. At one limit are companies that have had practically no reserves, and to meet the exigencies of reconstruction have charged the cost of rebuilding to capital. The other limit may be represented by some of the older steam railroads which have recently established the policy of charging reconstruction and renewals to operating expenses. For instance, if an old frame station be replaced by a much larger modern and perhaps fireproof structure, the management can very justly argue that the new building has in nowise increased the earning capacity of the property and does not serve any purpose that the old one did not serve. In opposition to this view it may be said that improvements of the character mentioned make a better road and a more costly one, and that the greater assets should be represented by correspondingly greater capital liabilities. The Massachusetts rule, applied by the Railroad Commissioners to both steam and electric roads, is in case of reconstruction to survey the work and charge to operating expenses or maintenance the sum estimated to be necessary to replace the original construction, and charge to capital the excess over this estimate that the new work actually cost; the cost of the new work is usually greater than the estimated cost of replacement, because heavier rails, more ties, etc., are used in the new than in the original work, and in the case of buildings larger structures are erected. A half-way measure, condemned by Mr. Davies, is that of charging renewals to operating expenses, in lieu of all other depreciation reserves.

The conservative policy of the steam railroads which have been charging betterments to operating expenses has within the year been criticised by the Interstate Commerce Commission which takes the ground that betterments should be charged to capital, and future surplus earnings avoided by reducing rates. Such a theory as this may be very pretty and not difficult of application in times of prosperity; but in view of the fact that transportation companies are ever subject to great loss by flood and storm, and to reductions in earnings during periods of business depression, the policy of creating reserves and charging the cost of improved facilities thus furnished to the public to operation and not to capital, is the wiser one. Take as an example the railroads in the Mississippi and Missouri valleys that suffered the loss of millions by flood last spring; unless they had reserves set aside for the purpose of meeting just such demands the only recourse would be to increase the capital account by borrowing. If overcapitalization is an evil, it is not lessened because done by direction of public authorities.

The public clamor for lower fares, for greater compensation to the municipality for franchise grants, or for municipal ownership, is, we believe, largely due to false accounting methods which swell dividends at the expense of reserves. It is the usual thing now to capitalize a business on its earning capacity, a very proper course provided the true earning capacity is made the basis. A short term street railway franchise is far from being the "valuable grant" that the public reads about in the daily press, when reserves for sinking

fund, for depreciation of capital investments, and for extraordinary expenses made necessary by the progress in the art, have been provided. The diversion of reserves to dividends, while it may for a time appreciate the stock, eventually cuts both ways; it leaves the stockholder with less assets than he should have at the end of the franchise term, and it makes him pay more than he should for a new franchise grant.

What is called overcapitalization, that is excess of stock and bonds over cost of construction (which excess for the street railways of the United States, according to Mr. W. H. Steuart, of the U. S. Census Office, in his paper before the Accountants' Association, "Daily Review" page 631, amounts to nearly one hundred forty-one million dollars) is not necessarily a needless or improper expenditure. Capital is timid and the man of money takes no chances unless he is well paid for the risk. For instance the bonds of a railroad may sell for no more than 70 or 80 per cent of their par value because the capitalist considers the risk worth that much, and may only take them at that price when given a further premium in the shape of a stock bonus, perhaps demanding enough stock to give him control of the property. That a given road is overcapitalized is not a reflection upon the management, but it does entail responsibilities in the matter of accounting to provide for making good the excess.

Mr. Westinghouse on Overhead and Underground Electric Railway Operation.

Mr. George Westinghouse, in a recent letter published in the New York Times, discusses the precautions that electric railways operating over elevated structures or in tunnels should adopt in order to prevent such catastrophes as that on the Paris underground line. Mr. Westinghouse enumerates the following requirements as among those that could be met easily:

"1. Trains to be constructed of iron or steel, with the interior finish of incombustible materials.

"2. The division of the third rail for the supply of electric current into suitable sections, each section being supplied with current only when required to propel a train.

"3. The limitation, by suitable devices, of the amount of current supplied to each section so that in the event of a short circuit on the train the current will be automatically and instantaneously cut off at a point some distance from such section of the third rail.

"4. Provision for the cutting off of the current from each supply section of the third rail at the will of the motorman.

"5. No other live conductors than the third rail to be in close proximity to the line.

"6. No wires carrying high voltages except upon motor cars, and motor cars only at the ends of a train.

"The state of the electric art has so advanced that compliance with the foregoing requirements is simply a matter of additional expense, incomparable, however, to the financial losses which the companies will suffer if they do not make the electric operation of their railways absolutely safe."

Marion-Wabash Interurban Line.

The Indiana Northern Traction Co. and the Marion (Ind.) Light & Heating Co. have been consolidated. A power house is to be erected at North Marion, and work on the proposed electric line between Marion and Wabash is to begin October 1st. This is the road that was to have been built by the Wabash-Marion Electric Co., of which G. A. H. Shideler and B. F. Burk were the projectors, the Indiana Northern being the successor to this company. These gentlemen were also the largest owners of the Marion Light & Heating Co. The contract for building the new road has been awarded to J. G. White & Co., and the road is to be in operation next June. From Wabash it will be extended north to Warsaw and later to Goshen. The capital stock of the company was increased to \$500,000.

The officers of the Indiana Northern Traction Co. are as follows: President, J. J. Coleman; vice-president, R. E. Breed; secretary, F. S. Katenback; treasurer, H. F. Coleman.

The Mansfield (O.) Railway, Light & Power Co. has purchased land in Mansfield upon which to erect a car barn and storage battery "booster" plant.

New Cars for St. Louis.

The St. Louis Transit Co. recently ordered 450 new cars from the St. Louis Car Co., which will make a total of 1,350 cars which will be in operation by the time the World's Fair opens. The new cars are to be built on hygienic lines; all carving or fancy finishing liable to catch dirt will be avoided, and instead of wooden beams and sills steel will be used. The latter can be more readily cleaned and, being smaller, will present shallower crevices. The seats are to be so arranged that dirt cannot accumulate, and the window sockets will be closed by a panel whether the window is open or shut. The front platform only will be vestibuled, the rear platform being a broad, double one designed by Mr. A. B. du Pont, vice-president of the company.

Westinghouse air brakes are to be placed upon all the cars, new and old, and it is thought that the brakes can be delivered and installed at the rate of 40 per week. The brakes are now being delivered and the work of equipping the cars with them has begun. In addition to the sanitary precautions in the construction of the cars the company will appoint a physician as inspector to keep the cars in a sanitary condition.

Consolidation at Salt Lake City.

Negotiations are pending and will probably be consummated, by which the Utah Light & Power Co. will obtain control of the Consolidated Railway & Power Co., of Salt Lake City, Utah. The transfer will involve \$6,000,000. The president of the Utah Light & Power Co., Joseph F. Smith, is also president of the Mormon Church. The first and second vice-presidents, John R. Winder and Thomas G. Webber, are also prominent in the church. It is authoritatively stated, however, that the plan to consolidate the two companies has nothing to do with the church. The Utah Light & Power Co. has been furnishing power to the traction company for five years, and it has added about \$500,000 worth of railway equipment during that time. Its present contracts with the railway company expire in about four years, so it is necessary to make some new permanent arrangement, for should the railway company acquire a plant of its own the value of the light and power company's plant would be depreciated. If the consolidation is effected an interurban system, including a line to Saltair, will be built and many improvements made.

Harmony of Color in Finishing and Furnishing the Modern Passenger Coach.*

BY CHRIS CLARK, NEW YORK, CHICAGO & ST. LOUIS RY.

So many and varied articles necessarily compose the equipment of a modern passenger coach that it presents a somewhat crowded appearance and to secure harmony of the whole requires artistic ability of no mean order.

The color of the wood, style of carvings and trimmings with which it is embellished, the color and pattern of the carpet and the material with which chairs or seats are upholstered, must all be considered, as they form the keynote, as it were, to which the painter must attune his work. This requires on his part a keen sense of the perception of the harmony of colors, which, like a correct ear for music, is a natural talent, to a large degree, but, also like it, may be cultivated and improved by study. We must remember that this perceptive quality is also possessed by the people that travel in the coaches, who, although not painters, have a knowledge of the same definite facts as to colors that suit each other that we have.

Harmony does not necessarily demand that similar colors, or only those of a like nature, be used, as harmony may be assisted by contrast produced by the employment of colors which are opposed to each other; as, for instance, a warm and cold color—red and blue—in suitable quantities and location, form a harmonious contrast.

To secure a desirable effect, due regard must be given to the quantity of each color, as well as to their relative positions, in order

*A paper read before the thirty-fourth annual convention of Master Car and Locomotive Painters' Association, Chicago, Sept. 8-11, 1903.

to mean what is known as the balance of color, which is also essential to harmony.

The correct juxtaposition of colors is also important, and is exemplified when a red and a blue stripe are next to each other, which then have the appearance, especially at a distance, of their secondary color, or purple, and, if this be on a green ground, purple and green being a discord, the effect is inharmonious, but by placing yellow or gold between the red and blue, quite a different and harmonious effect is produced.

Thus we see two primary colors in juxtaposition change the effect of each, although yellow—which is also a primary—and blue do not assume their secondary hue—green—when placed next to each other. Yellow next to red, however, lightens the red, giving to it an orange cast. This harmonizes with blue. It is well known that some colors have a direct effect on others, adding to their strength and power, or softening their influence, as the case may be; for instance, black near white appears blacker, and white whiter near black.

Blue, red and yellow not only harmonize perfectly, but mutually heighten their appearance.

"Each gives each a double charm
As pearls upon an Ethiop's arm."

Red loses much of its power in the presence of green, while black and green neutralize each other, and black between red and green looks dull.

Green, as a rule, lends brightness to other colors, and, in addition, is restful to the eye. It is now very generally used for groundwork on ceilings and side linings, and is undoubtedly a most suitable color in that capacity.

In addition to green, nearly all light colors brighten those of a deeper kind, as white with blue or yellow with red.

Green and gold look well with red for a border, but where different tones or shades of the same kind of green are used in striping or ornamenting the ground should always be of the darker tone, i. e., a dark green should not be placed upon a light green ground. Gold is useful on a green ground for the purpose of harmonizing purple, or other color that would not harmonize with green, without the aid of gold or yellow.

The proper arrangement and selection of color is of importance, as, for instance, when blue, which has a very unpleasant and forlorn appearance as a border or at the edge of an ornament, if carried in to the center of a panel or pattern, is heightened in effect and looks much better.

Selection and arrangement may also be employed to give additional height to a ceiling, as some colors appear distant, while others in the same location appear nearer. Blue, for instance, recedes, while red appears to approach the eye. The correct arrangement of colors is also necessary to display each with distinctness and to avoid confusion. Bearing in mind the afore-mentioned general conditions governing the requisites for harmony in color, let us apply them to the finishing and furnishing of a modern coach.

Somewhat bright colors in furnishing are pleasing and do not appear gaudy or glaring if employed in moderate quantities and with due regard to their suitability to each other.

The pattern and color of the carpet or aisle-strip is an important factor, and, both in color and character of pattern, it should correspond with, or, at least, bear a harmonious relation to every other color in the coach—to the ceiling and side lining in particular—and must not contain anything that either overwhelms, dwarfs or suggests incompatibility with its surroundings.

The same rule applies in regard to the plush or other materials with which the chairs or seats are upholstered. This should be of a bright color, forming a pleasing contrast with the wood of which the coach is built; while the window curtains should be of a lighter and subdued tone of the same color.

The ceiling and side lining have a very potent influence on the aspect of a coach, and, as a rule, the same general colors should be used in its decoration that are contained in the carpet, taking care, however, that the groundwork is sufficiently light and soft to add as much as possible to the apparent height of the ceiling, while avoiding heavy and dark shading, also the use of bright red, which seldom looks well on a ceiling for the reason before stated, that red always appears nearer to the eye than other colors.

Let the composition of all colors in the ceiling be of a subdued tone, selected and arranged both as to quantities and location of each, so as to lend distance to the whole.

The design of the ornaments on the ceiling should agree with the carvings and other woodwork in general style and character in order to preserve harmony of design, which is of equal importance with harmony of color. With this end in view, we should avoid all incongruities, duly considering the suitability of our subject, or, in other words, display a sense of the fitness of things.

It may be well in this connection to call to mind the "artist" that, having painted a picture of Adam and Eve in the Garden of Eden, to enhance the effect, painted the figure of a man in the background carrying a double-barreled breech-loading shotgun over his shoulder.

As to the second-class coaches: There is no more reason for lack of harmony in a second-class coach than for a woman to disregard its principles in a dress because made of inexpensive material. The same fundamental rules as to color prevail as with a first-class coach, and a like care should be taken in the selection of color for painting floor, seat ends, ceiling, etc., because harmony, like civility, costs nothing, but positively adds value where its principles are applied.

Flowers and foliage are not so extensively used as ornaments in decorations of coaches as formerly, but for a second-class coach ceiling they are both inexpensive and effective. If used, however, it is necessary to be true to nature, giving to each its correct form and color, but which, of course, must be of such a tone as to convey the impression of proper distance.

To illustrate the necessity of being true to nature I will mention the "artist." I guess he was of the same school, if not a relative, of the man that painted the Garden of Eden picture. This man had painted a view of the seashore, and on returning to Chicago, Pittsburg, or some other inland city, a bright idea struck him—to paint some crabs and lobsters in the foreground. So he forthwith sent to the fish dealer for models and innocently painted these red in his picture, as indeed were his models, which, of course, had been boiled.

Let me urge the necessity of harmony in every detail. For harmony is the equilibrium of nature; our senses are attuned to it; the keenest susceptibilities of mind demand it; completeness and proportion are contained in it; perfect composure and repose are impossible without it. It is definite, positive and indivisible in its nature; incapable of sustaining violence to any one part of its minute organism without a sympathetic protest being excited in every other part.

An appreciation of harmony is possessed in a greater or less degree by all, though perhaps unconsciously by some. Therefore none can escape its benign influence or fail to be affected by its absence.

It is far from my intention that any remarks or rules contained herein shall be considered as of a dictatorial nature; but, on the other hand, I hope there are those present whose longer and wider range of experience will enable them in pointing out the errors, to stimulate discussion that will be of benefit to all concerned, and thus fulfill the intent of this paper, which is to learn, rather than to teach, the principles of harmony in color as applicable to the finishing of a modern coach.

In closing, I would invite attention to the very marked improvement that has taken place during the last two or three decades in the decoration of coaches. Each succeeding effort in this direction has outstripped the former, until, in place of the erstwhile circus bandwagon exterior, and heavy and squatty appearing interior with small Gothic windows, and landscape painted panels, we now have the cheerful, light, artistically decorated and richly furnished coach.

The Elizabeth, Plainfield & Central Jersey Street Ry. has apparently been the victim of a very clever swindle. About a year ago one Ainet was killed in a collision and shortly afterwards the company settled the resulting claim for damages with a woman who claimed to be the widow of the deceased, but who did not sustain that relation to him.

The city touring car "400," which has been making five two-hour trips daily over four different routes in Cleveland, O., was to have been taken off and the touring season closed on September 15th, but it was decided at the last moment to continue the car in service until further notice. Mr. J. W. Butler, the excursion manager for the Cleveland Electric Railway Co., states that the touring car experiment has been such a success that next season the company will put on a new car with easy chairs and luxurious fittings.

How the Telephone Operator Assists the Electrician.

BY ARTHUR B. WEEKS.

The extent of the demands made upon the telephone operator at a great power plant during times of emergency or unusually busy periods is seldom realized. The position is an important and responsible one, since the operator must not only be quick and accurate, but must in a measure anticipate the messages which the electrician in charge would deliver, thereby greatly facilitating changes in switching in various stations, and frequently preventing disaster. For there are times when the entire attention of the electrician must



ELECTRICIAN IN CHARGE ON DUTY.

be centered on his switching. At times, also, on such occasions, the night watchman and assistant electrician come to him for instructions he may wish to give to the telephone operator.

One of the illustrations shows a night scene at the telephone exchange of the Niagara Falls Power Co. There the operator is almost always busy. At the right is the night lineman, whose duty it is to patrol the transmission lines at night in cases of necessity, looking out for leaky insulators, burnt poles, or more severe troubles after a short circuit.

This telephone exchange is in direct communication with the main switchboards, all of the local sub-stations and the transformer stations of all tenants, as well as with all stations along the transmission lines, such as La Salle, Tonawanda, Lockport, and a number of sub-stations in Buffalo.

Everything here runs smoothly as long as there is no trouble; but as soon as the electrician foresees a possible complication, he puts the operator on his guard, and in times of thunder storms or a heavy run of grass or ice in the river, sees that regular communication is kept up every half-hour between the stations liable to be called upon to reduce load, should such necessity arise. Some electricians prefer to do their own telephoning, but it saves time to leave this to the operator when he is thoroughly reliable, giving the electrician opportunity to devote his attention at once to all the details of the entire plant.

Supposing a severe east wind blows up during the grass season; the grasshopper foreman may have dozens of extra men out raking grass, while a heavy rain is pelting down, and the steam crane constantly hauling away car loads of grass. And, in spite of all efforts, the grass may be getting the best of them, with the result that the water is greatly reduced at one or more penstocks. The load must be at once reduced by an amount determined by the judgment of the electrician. He telephones the operator and advises him to call a certain power tenant and instruct him to take off a stated amount of load at once. The request complied with, the attendant telephones the power house exchange to that effect, and the operator in turn notifies

the electrician; though the electrician, who keeps a constant watch on the output of the 50,000-h. p. plant, is aware of the change before the message has been received. The only way to operate a switch-board successfully is to keep thus in touch with the whole plant.

The storm may increase in severity and require more load reduction; perhaps even a third or fourth reduction; and each time it must be so timed that there will be no burned-out bearings. The load is not all taken off from one concern, but the reduction is divided among several. This is one of the ticklish things to be encountered, and at times the electrician must call upon his superior officers beforehand to learn where the reduction can best be made. He would be very neglectful, to say the least, if this information were ascertained too late to save trouble, for difficulties of another sort would await him if he failed in this. "He must predetermine his exact course in all cases of trouble."

Quickness is essential in all concerned; for when a turbine governor shows that it is taking on excessive "rack" and the generator load is diminishing at the same time, the corresponding dynamo must be shut down at once. Different methods of operation prevail on each shift, all acting according to their best judgment; for there can be no fixed rules for emergencies like these. Indeed, though the Power company has laid down rules to cover every point possible, for the guidance of all departments, it stops short here. Each electrician in charge must run his shift according to his best judgment in times of emergency, and must frequently decide almost instantaneously.

Here the telephone operator comes to the assistance of the electrician again. It may be there has been a great run of ice, and the local load has been reduced; and Buffalo, which is last to be reduced, gets a hurried call to throw off load; the blast from a semaphore, also, which means the immediate shut-down of the dynamo corresponding, calls for another immediate reduction of load. If it is impossible to get the parties in time to accomplish this before a bearing becomes dangerously hot, as indicated by the thermometers in the oil of the bearings, the electrician must resort to the last



THE NIGHT OPERATOR

means at his disposal—throwing the emergency switch, which opens all the fields of the dynamos involved.

There is a busy time now for the telephone operator. Besides the numerous inquiries as to "What's the matter?" "How long will the power be off?" "Any damage done?" etc., all of which must be promptly and respectfully answered, he must be ready to carry out at once the electrician's orders.

The method of starting depends upon the nature of a shut-down. The long-distance lines always have preference. The electrician

will then close a dynamo air switch and put on the field in starting up, no current being on the a. c. bus-bars. He will then synchronize the next generator and telephone to Buffalo and Tonawanda to put on a certain load, according to the conditions. Before they can get on their load, he will have another dynamo in operation, and all safe for the time being. So many conditions exist which are liable to change this plan that no set regulations can apply.

There have been times when the local and long-distance bus-bars have been paralleled and the voltage averaged accordingly. All three of the long-distance lines are then put in parallel to assist the voltage and all four of the a. c. bus-bars; both sets of both boards are paralleled through the cross-connecting switches under No. 2 board. The electrician encounters many puzzling combinations at such times as these, and without a minute understanding of his switching and load, he may be sending an enormous current through a switch. He must have enough feeder switches on both bus-bars to carry the current safely.

When a shut-down is due to a short-circuit on local or long-distance lines, the method of starting is the same; and the order of giving current to the numerous tenants is usually the same.



INTERIOR OF POWER HOUSE.
Switchboard No. 2 in foreground, No. 1 in distance

Ordinarily, only one party is affected by a short circuit on the local service, and that feeder is left open until the repair men report all right.

A short circuit on the transmission lines, however, usually affects the whole system, though occasionally a Lockport breaker may drop out without shutting down everything.

Should there be trouble any time on a certain line, that line is cut out, and the remaining lines carry the load. There must be great accuracy in telephoning at these times, for the electrician must give instructions to Tonawanda to make certain changes, and different instructions must go to the terminal house at Buffalo. He also instructs his assistant at the power-house what changes are to be made in switching in the transformer room across the bridge. Besides this, a return call must be received from each party interested.

A short circuit is manifested in differing degrees of severity. Should it hang on, and the tenants' breakers not open after the lapse of a few seconds, the electrician may deem it best to use the emergency switch. When this occurs on the local service, the telephone operator, as well as everybody else on the shift, has a busy time of it. Before starting, in order to avoid accident, the assistant electrician must examine every switch, to ascertain whether they are all open. The electrician can see none of the switches he opens

and closes, having only short levers to throw, which pneumatically control the main switches.

The switches must also be examined to see that they enter right; for if thrown in considerably out of step, a buck takes place and the switches stop, entering only on the shunts. In this case, the electrician opens the switch when notified and synchronizes over again. If not discovered, when the load is put on, the switch would naturally overheat and burn out with disastrous effect, and another complete shut-down follow.

When one dynamo is on and the most important feeder is also closed, the tenant at this plant immediately proceeds to start his machines which supply direct current for electrolytic purposes. Another dynamo is put on, and, as generators are started and feeders closed, load is given out in a certain order until all are served. This is an exciting period, and the work is carried on swiftly with rarely an accident in any way.

Synchronizing requires special attention, and if the governor attendant is alert, he can generally assist in shortening this period, which varies from one-half minute to one-half hour. Some men are over-careful and timid, whereas confidence should be the watchword of every electrician in this position. It is not suited to a timid person. He must never lose his nerve. If he does, he had better give up at once and save his reputation, as well as thousands of dollars to the company. If one mistake is made, another is liable to follow at once; for, always fearing trouble, one is almost certain to do the wrong thing when it comes. The electrician is under constant nerve-strain.

To intelligently carry on his work, the telephone operator must know the amounts of power used by the various tenants. These have increased rapidly. Some concerns have only to trip a circuit-breaker, and all is clear. Some changes are necessary at other plants before it is safe to open breakers under load, as they hold the arc, which would burn down an entire panel in less time than it takes to tell. A remarkable occurrence at the Niagara Falls powerhouse was the actual warping of a marble barrier between two circuit breakers at 2300-volt mains. Barriers under similar circumstances had been blown to atoms.

This description of the work of electrician and telephone operator in emergencies will serve to show the importance of these positions, and the qualities required for their successful filling in the power-house of a large electric plant.

Progress of the Western Illinois System.

The Western Illinois Railway Co., of Milan, Ill., which was incorporated to build an electric line between Aledo and Rock Island, has just completed the field work from Aledo to Milan, a distance of 47½ miles. It found a natural grade practically all the way, passing through a rich farming and stock raising country. The towns touched by this section of the line are Millersburg, Buffalo Prairie, Illinois City, Edgington and Andalusia, none of which has a railway, and which are from 6 to 10 miles from the nearest railroad point. At Aledo the Western Illinois will connect with the Chicago, Burlington & Quincy, and at Milan with the Rock Island. At Aledo, also, a connection will be made with the Tri City Street Ry., to Rock Island and Davenport, and suburbs, as well as with the Moline, East Moline & Watertown Railway Co., which also has a line to the new Rock Island railroad shops at East Moline.

DO keep awake and find seats for passengers that may be standing.

DON'T forget that little things make the road and its employees popular.

DO remember that a bad temper is an awkward thing to have but a worse thing to lose.

DON'T forget that it takes two to make an argument.

DO remember that Rockefeller made his money by attending strictly to his own business.

DON'T forget that you have the same opportunity.

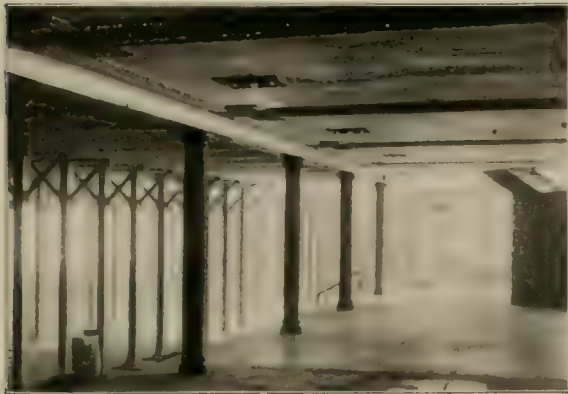
DO look out for has-beens. Their tale is sad.

DON'T become one of them.

DO remember that success is often killed by misdirected ambition.—Buzzard's Bay Philosophy.

Subway Stations in New York City.

The Columbus Circle station of the Interborough Rapid Transit Co., of New York City, is the first of the subway stations to be completed. There are 38 stations in all in the Rapid Transit subway as at present laid out. Five of them are express stations; that is, they have island platforms for receiving and discharging passengers from the two inside tracks, which are express tracks. The Columbus Circle station, near the entrance to Central Park, is one of the most important on the line, and it is typical of all the underground stations. They vary in length and in width of



SUBWAY UNDER COLUMBUS CIRCLE.

platforms, but the conveniences for the public are about the same in all. An interesting feature of these stations is the use of different colored brick and tile at each station, so that travelers in the subway will know by glancing out of a fast moving train whether they are approaching the station at which they wish to alight. In the treatment of the stations five or six different color designs were adopted and each design is repeated every five or six stations. That is, each station on the line is not different from all the others, but there are five or six different general color designs or treatments which are carried out in recurring order, beginning at the



ROOF AND WALL DESIGN

City Hall station. Regular passengers will soon become familiar with the general color scheme and can tell at a glance what section of the city they are traveling through. The accompanying views show the application of the brick and tile at the stations.

The Columbus Circle station has an east and west platform, each 200 ft. in length. They vary in width from 43 ft. to 91½ ft.

At each station there are two entrances and two exits, arranged so that passengers leaving the tunnel will be separated from those taking a train. All the tunnel stations are widest in the middle, so that when the crowds are going out of the tunnel there will be sufficient room for comfort near the stairways. The station platforms are narrowed in many instances to 9 ft. at each end. The color scheme of the Columbus Circle station is of dark green, with faience and terra cotta decorations. Faience is a dull glazed terra cotta. The platform floor is of granolithic, divided into squares



VAULT LIGHTS AND ENAMELED BRICK BORDERS.

measuring 3 ft. on each side. This pavement is nearly white in color. Where the platform connects with the side wall there is a "sanitary curve," so that there are no corners or crevices to gather dust or filth. The wainscot just above the "sanitary curve" is of Norman brick, 2½ to 3 ft. in height, and above this is a marble cap of green veined white Vermont marble extending the whole length of the station. The side walls over the marble cap are made up with glass, art ceramic and mosaic work. The cornice in this station is designed in Gruby faience and set in place are many art plaques in terra cotta displaying in distant relief the caravels of



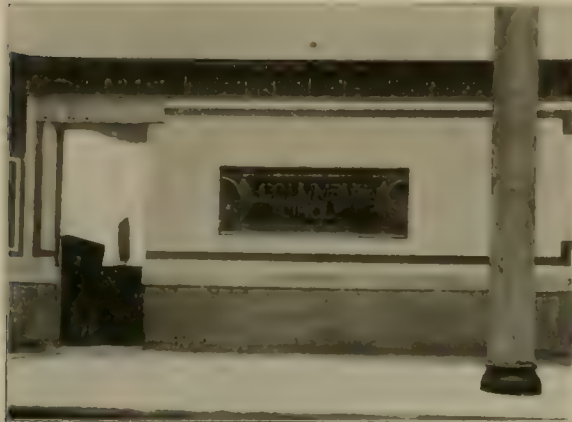
SPECIAL BRICK WORK AT CITY HALL.

Christopher Columbus. From the top of the cornice there is a "sanitary curve" of cement to the ceiling, which is of wire laths. The ceiling is broken up into panels by heavy molding conforming to the panels on the side walls. The ceiling panels measure 15 ft. from center to center and in each will be an electric light, except in the portions of the station which can be illuminated from the vault

lights overhead. Each ceiling panel is composed of ceramic mosaic pilasters supporting a faience platter, with a decorative design on each.

Near the center of each platform is a toilet room for men, and another for women. In each room there is one closet having a ceramic tile floor and side walls of glass, with partitions of marble and red slate, entrance to which can only be gained by dropping a nickel in the slot.

The height of the Columbus Station varies. At one point it is 19 ft. from the platform to the vault light above. The average



DECORATING AND DESIGNATING PANELS.

height is 9½ ft. The platform of each station will be "valleyed," so that a hose can be used in washing down the platforms and the water will run into drains near the side walls. The Columbus Circle station will be fitted with automatic pumps to force the sewage into the sewer, which at this point is above the station. Special ventilating appliances will be placed in all the stations. Each stairway will be 5½ to 6 ft. in width. In the center of each station there will be two large tile panels of decorative design, with the name of the station in large letters.

One of the accompanying illustrations shows the arched roof construction of the subway at the City Hall loop. This is made by special brick furnished by R. Guastavino Co., of New York, and it is known as Guastavino brick.

Power Brakes in St. Louis.

In order to lessen the number of street car accidents in St. Louis an ordinance was passed in 1902 requiring all street cars in the city to be equipped with brakes of a design approved by the Board of Public Improvements. The ordinance grants this Board the right to revoke any certificate of approval which may have been given, forbids the use of brakes which are broken or dilapidated and prescribes penalties for violation of the ordinance. After the passage of this law the Board made extensive investigations of power brakes adapted to use on street cars. There were several different makes of brakes approved by the Board among which were the Christensen air brake, Standard air brake, Westinghouse electromagnetic track and wheel brake and the Neal hydraulic brake. If at any time any other air brake company should wish to have its brake approved for use on St. Louis street cars the Board will take the matter under consideration and if the brake meets the requirements the Board will give it its approval.

The St. Louis Transit Co. operates about 1,500 cars varying in weight from 16 to 24 tons which are to be equipped with the Westinghouse brake. Each car will have a regular air brake but will not carry an air compressor. The air will be supplied from a central compressor plant located near the car barns. Each car is to be equipped with a storage tank to carry air at an initial pressure of 300 lb. and there will be an operating tank connected to the high pressure tank through a reducing valve so as to supply air for the brake at a pressure of 40 to 60 lb. The tanks are estimated to hold enough air to make three round trips of 12 miles with a 24-ton car. This system has been in operation but a short time.

The St. Louis & Suburban Ry. operates 150 cars which are nearly

all equipped with Christensen air brakes and motor driven air compressors. The same make of air brake is also used on the St. Louis Water Works Ry. These brakes operate on from 60 to 80 lb. air pressure.

Nearly all of the street car lines enter the small business section of St. Louis which is only about six blocks square, and there are far too many cars in this section for rapid service. The speed of a car in this congested district is naturally slow as it must take its turn in passing around one of the several loops, each of which is used by several different lines. In case of any accident or delay all the cars on a loop are put behind their schedule time and this lost time must be made up in some less crowded portion of the city. The cars are usually limited to the very best speed it is possible to make safely, and where time is to be made up hand brakes are often too slow and too weak to stop a 24-ton car in time to avoid accident.

The Cincinnati Traction Building.

We have received from J. P. Hornaday & Co., dealers in investment securities, a general description of the new Traction Building in Cincinnati in which are located the general offices of the Cincinnati Traction Co. The building was erected in a little more than a year in spite of many obstacles. It stands at the southeast corner of 5th and Walnut Sts., and is 14 stories high. It is the direct outcome of the efforts of Mr. W. Kesley Schoepf, president of the Cincinnati Traction Co., who organized the Cincinnati Traction Building Syndicate; this is composed of W. A. Elkins, P. A. B. Widener, Thomas Dolan, Randall Morgan, J. B. Foraker and Hugh McGowan, and Mr. Schoepf is trustee and manager.

All the modern methods of construction were used in the new building. The walls are of what is known as rain-drop brick. Each floor is different in finish and design. The offices of the traction company are on the ninth floor, and the private office of President Schoepf is said to be the most handsomely finished and furnished of any in the country. The rest of the building is occupied by railroad and insurance men, brokers, and others. The furnishings throughout are expensive and handsome, and the building is also equipped with the United States mail chute system. The building cost upwards of \$500,000.

Hudson River Water Power Co.

On August 26th the first wheel turned in operation of the Hudson River Water Power Co.'s dam at Glens Falls, N. Y. The reservoir is nearly five miles long, with an average width of nearly five miles, and a greatest depth of 135 ft. Three of the 10 generators are connected with the canal, which was filled on the morning of August 26th, with a head of 50 ft. of water available for the turbines. On September 17th the company began to supply the Schenectady works of the General Electric Co.

The Hudson Valley Railway Co., operating between Lake George and Troy, has practically closed with the power company for 2,000 h. p. to be delivered at its Glens Falls station. This is now a steam plant and it is to be used for an emergency station. Wires are now being strung from the dam to the station.

Quick Work on Rockford-Freeport Line.

Indications point to the speedy completion of the Rockford & Freeport (Ill.) Electric Railway Co.'s system, and it is believed that the line will be in operation by November 15th, the date originally set. The construction work was begun only last May, yet in spite of more or less inclement weather the contractors, Bracey, Howard & Co., have completed grading for 28 miles. The work called for the setting of 3,120 poles after the grading and ballasting are completed, 28 miles of double trolley wire and 23 miles of high tension wire to be strung. There will be seven miles of direct feed wire. The sub-stations at Pecatonica and Ridott are practically completed and that at Winnebago is well under way. Four miles of track has been laid, six cars are nearly ready and the overhead work has been started. The company has arranged for a depot in Freeport in the heart of the city.

Recent Street Railway Decisions.

EDITED BY J. L. ROSENBERGER, ATTORNEY AT LAW, CHICAGO.

REFUSING TO ACCEPT FARE AND ORDERING ARREST OF PASSENGER EVIDENCE OF MALICE.

Kelly vs. Durham Traction Co. (N. C.), 43 S. E. Rep. 923. Apr. 21, 1903.

That a conductor, after an altercation with a passenger, in which he had repeatedly demanded the fare, refused to accept the fare when tendered, and ordered the arrest of the passenger, the supreme court of North Carolina holds, tended to show malice, although the tender was not made until just before the passenger's being taken from the car; his claim being that he had already paid his fare.

DUTY AS TO FURNISHING A SAFE PLACE TO TAKE CAR OR ALIGHT.

MacKenzie vs. Union Railway Co. (N. Y. Sup.), 81 N. Y. Supp. 748. Apr. 17, 1903.

The general rule of law that a street railway company is bound to ordinary care in furnishing a safe place to passengers to enter upon or alight from its cars, the first appellate division of the supreme court of New York says, is well established; but it would be extending the rule of liability far beyond what has been adjudged in any case to which the court's attention has been called to hold that a street railway company guarantees or insures the safety of a public highway along which an intending passenger chooses to move in order to reach a car which has overrun its usual stopping place and is waiting for that intending passenger to enter.

FAILURE TO LOOK AND LISTEN CONTRIBUTORY NEGLIGENCE—MOTORMAN MAY ASSUME THAT PERSONS STOPPING NEAR TRACK WILL LET CAR PASS.

Wolf vs. City & Suburban Railway Co. (Or.), 72 Pac. Rep. 329. May 1, 1903.

Where a man was crossing a public street, in broad daylight, at a place where his view was unobstructed, the supreme court of Oregon holds that it was his duty to look and listen for a car before crossing the track, and, if he did not, he was guilty of such contributory negligence as would preclude recovery, notwithstanding the company may have been negligent in running the car at a dangerous rate of speed. The testimony showing that he saw the approaching car, and stopped when near the track, but afterwards concluded that he had time to pass safely in front of it, the court holds that, when he stopped, the motorman had a right to assume that he intended to wait until the car passed before crossing the track, and was not guilty of negligence in releasing his brakes at the time.

HOW A CONSOLIDATION IS EFFECTED—LIABILITY UPON JUDGMENT RENDERED AFTER CONSOLIDATION AGAINST OLD COMPANY.

Chicago & Joliet Electric Railway Co. vs. Ferguson (Ill. App.), 106 Ill. App. 350. Jan. 27, 1903.

The appellate court for the second district of Illinois says that the statute provides that in all cases when any company or corporation chartered or organized under the laws of this state shall consolidate its property, stock or franchises with any other company or companies, such consolidated company shall be liable for all debts or liabilities of each company included in said consolidated company, existing or accrued prior to such consolidation; and actions may be brought or maintained, and recovery had therefor, against such consolidated company. A consolidation, not a purchase, is effected by the transfer of the franchise and all the property of one corporation to another under an arrangement by which the

stockholders of the former company exchange their stock for stock in the latter company. A consolidated railroad company is not relieved from liability upon a judgment rendered against one of its constituent companies after the consolidation.

A COMMON CARRIER OF PASSENGERS—BURDEN OF PROOF IN PERSONAL INJURY CASES.

Omaha Street Railway Co. vs. Boeson (Neb.), 94 N. W. Rep. 619. Apr. 9, 1903.

It may be stated, as a general proposition, it is said in the commissioners' opinion in this case, that a street railway company is a common carrier of passengers for hire; that ordinarily it will be sufficient for one to show that he was a passenger, that while such passenger he was injured, and the extent of such injuries. It will then devolve upon the company to show that the injury occurred without any negligence on its part, and that by the exercise of the highest degree of care it could not have prevented such injury. It will be found, however, that this doctrine has been laid down in cases where there was a collision, or where the person injured had been struck or run over by a street car—in short, in cases where the undisputed cause of the injury fairly raised the presumption of negligence. And it would seem that where there was no collision, and the plaintiff was not run over or struck by the street car, but he alleged, as a substantive part of his case, that he was thrown from the car by a derailment of it caused by the negligence of the company, before he could make his case, it would be necessary to show at least that he was thrown from the car as alleged in his petition, before any presumption of negligence could arise.

CARE REQUIRED OF COMMON CARRIER AS TO CARS, APPLIANCES AND SERVANTS WHETHER MOTIVE POWER IS STEAM OR ELECTRICITY—NOT AN INSURER—DUTY OF PASSENGER—FAILURE TO DISCOVER CLOSING OF SNAP SWITCH.

McAllister vs. People's Railway Co. (Del. Super.), 54 Atl. Rep. 743. Feb. 27, 1903.

"Common carriers of passengers are responsible for any negligence resulting in injury to them, and are required in the preparation, conduct, and management of their means of conveyance to exercise every degree of care, diligence, and skill which a reasonable man would use under such circumstances. This obligation is imposed on them as a public duty, and by their contract to carry safely, as far as human care and foresight will reasonably admit. A railroad company, using as it does the powerful and dangerous agency of steam, is bound to provide skillful and careful servants, competent in every respect for the posts they are appointed to fill in their service; and is responsible not only for their possession of such care and skill, but also for the continued application of these qualities at all times." The superior court of Delaware said this in the case of Flinn vs. P., W. & B. R. R. Co., 1 Houst. 469 (499), and adds, in this case, that the degree of care required in these matters is the same whether the motive power be steam or electricity. A common carrier is not an insurer of the safety of its passengers, but is required to exercise the highest degree of care and diligence that is reasonably practicable in securing their safety by keeping its cars and appliances in a safe condition, and at all times under the control and management of skilled competent servants. There is at the same time a duty resting upon the passenger to act with prudence, and to use the means provided for his safe transportation with reasonable circumspection and care, and, if his negligent act contributes to bring about the injury of which he complains, he cannot recover.

The court further holds that if the jury found in this case that the snap switch on the rear of car No. 5 was closed, without regard

as to how or when it was closed, if by the exercise of due care and caution the crew of the company might or should have discovered that it was closed, and that by reason thereof the air brake failed to act effectually, as it was designed to act, and that the resultant failure so to act was due to the carelessness, incompetency, or negligence of the servants of the company in not discovering that the switch was closed, and that, as a result of the failure of the air brake to work, the motorman lost control of car No. 5, and by reason thereof car No. 16 was forced against car No. 12, causing the party suing to be thrown therefrom and injured, then the failure to make the discovery and open the switch would constitute negligence.

RELATIVE RIGHTS AND DUTIES OF STREET CARS AND VEHICLES OR PEDESTRIANS ON TRACKS—DUTY OF MOTORMAN TO AVOID COLLISIONS AND INJURING PEOPLE.

Southern Electric Railway Co. vs. Hageman (U. S. C. C. A., Mo.), 121 Fed. Rep. 262, Mar. 9, 1903.

The rules of law which prescribe the duties and liabilities of those who go on the track of a steam railroad at other places than street crossings, the United States circuit court of appeals, eighth circuit, says, have little, if any, application to those who go upon the track of a street railway. The former are trespassers, while the latter are not. One who has occasion to drive upon a public thoroughfare wherein a street railway track is laid at grade has the right to use any part of the street which he finds it necessary or convenient to use. He may drive along a street railway track, if occasion exists for so doing, the only limitation upon his rights in this respect being that he must not unnecessarily obstruct the movement of street cars; and, being free to move, he must turn off the track as soon as he can conveniently, if he sees a car approaching, and he must also be on the lookout at all times for cars. On the other hand, companies who operate street cars in the public streets owe certain duties to the public that are equally imperative. Those persons whom they place in charge of their cars must be on the lookout for vehicles and pedestrians who may be expected to be found traveling on the street, and who have an equal right with the railway company to use the street. They must take all reasonable and proper precautions to avoid running over pedestrians or into vehicles, and must not move at such a high rate of speed as will endanger the lives of others and imperil the safety of their own passengers. In other words, a motorman in charge of a car has no right to act on the assumption that he is entitled to a clear track at all times and that pedestrians and vehicles are bound, at their peril, no matter what may be the inconvenience, to get out of the way. In short, a motorman is under the same obligation to exercise care and prudence, so as to avoid collisions and to avoid injuring people, as these are to exercise care not to get in the way of street cars, so as to be run over and injured.

STATUTE MAKING JUDGMENT AGAINST "ANY RAILROAD CORPORATION" FOR INJURIES A PRIOR LIEN NOT APPLICABLE TO STREET RAILWAY COMPANY—SUFFICIENCY OF INCORPORATION UNDER INDUSTRIAL ACT—GIVING OF MORTGAGE NOT PROHIBITED ALIENATION OF FRANCHISE IN AVOIDANCE OF LIABILITIES.

Central Trust Co. vs. Warren (U. S. C. C. A., Mon.), 121 Fed. Rep. 323, Feb. 2, 1903.

Section 707 of the fifth division of the Compiled Statutes of Montana of 1887 (section 914 of the civil code, approved February 19, 1895), which provides that "A judgment against any railroad corporation for any injury to person or property, or for materials furnished, or for work or labor done upon any of the property of such corporation, shall be a lien within the county where recorded on the property of such corporation, and such lien shall be prior and superior to the lien of any mortgage or trust deed provided for in this act," which was part of "An act in relation to railroads," the United States circuit court of appeals, ninth circuit, holds was intended to relate to the railroads of commerce, and is not applicable to corporations formed for the purpose of operating street railways; and holds that a judgment rendered against a street railway corpora-

tion for personal injuries has no priority over the existing lien of a mortgage upon the corporate property.

Section 446 of chapter 25 of division 5 of the Compiled Statutes of Montana of 1887 providing that three or more persons may form a corporation, among other things, to carry on any "branch of business designed to aid in the industrial or productive interests of the country and the development thereof," the title of the chapter being "Corporations for Industrial or Productive Purposes," the court holds furnished sufficient authority for the formation of a corporation for the purpose of owning and operating a street railway.

Section 17 of the constitution of Montana, which provides that "The legislative assembly shall not pass any law permitting the leasing or alienation of any franchise so as to relieve the franchise or property held thereunder from any of the liabilities of the lessor or grantor or lessee or grantee contracted or incurred in the operation, use, or enjoyment of such franchise, or any of its privileges," the court holds was not violated by the giving of a mortgage, for a valuable consideration, in the due course of business, with nothing to show that the mortgagor was insolvent, or gave the mortgage in anticipation of insolvency, or gave it for the purpose of hindering or delaying other creditors; and holds that the provision gave a holder of a subsequent judgment for damages for personal injuries no right to have his judgment declared a prior lien to that of the mortgage.

INJURY TO PASSENGER RIDING ON RUNNING BOARD THROUGH TUNNEL, CLOSE TO WALL—DUTY OF COMPANY USING CITY TUNNEL—RISK ASSUMED BY PASSENGER—LATTER NOT BOUND TO USE HIGHEST CARE—NEGLIGENCE A RELATIVE TERM.

North Chicago Street Railroad Co. vs. Polkey (Ill. App.), 106 Ill. App. 98, Feb. 13, 1903.

Carelessness and negligence, the branch appellate court for the first district of Illinois holds, are relative terms. What is negligence in operating a train in one place would not be necessarily in another. It might be entirely proper to permit passengers to ride upon the footboard extending along the side of a car in an open street where there are no obstructions and where there is plenty of space outside of the car so that passengers thus riding would not be liable to suffer injury from outside obstructions, and negligence to allow them to so ride under different conditions, where dangers would be encountered of which the passenger had no notice. And the court regards it as a question for the jury to determine whether, in this case, it was or was not negligence for the company to so run and operate its trains when passing so close to the wall of a tunnel where stones projected several inches and the space between the wall and the footboard was from three to twelve inches, that a passenger riding upon the footboard should be injured.

It might be true, the court says, that the character and construction of the tunnel wall were outside of the company's control, if, as was said, the tunnel was the property of the city, but the operation of its cars when passing in close proximity to the wall of the tunnel was not beyond such control. It was entirely within the power of the company, either to prohibit passengers from riding on the footboard of the car while going through the tunnel, or if it permitted them to so ride, to warn them of the danger and to operate the car at such a slow rate of speed with such precautions as to prevent the occurrence of accidents like that under consideration.

It is probable that few, if any, of the multitudes of people who pass through the tunnel in question (the La Salle street tunnel, in Chicago) on the company's cars, day after day, have any knowledge of the particular source of danger from which the passenger in question received his injuries. The company invites passengers when the seats upon the car are full to place themselves upon the running board where he was riding. These passengers have a right to presume that when so riding they will not be brought into such close proximity to the projecting stones of the tunnel wall, that ordinary movements of the body, whether caused by the passenger putting his hand into his pocket to get at his fare, or changing his position from one foot to another, or allowing his body to project two or three inches beyond the outer edge of the footboard, will thereby endanger life. A passenger may assume the increased risk that may result in the ordinary course of things from riding upon a footboard of the car when properly managed in a place ordinarily

safe, but he does not assume as a matter of law a risk that results from running the car so close to a fixed obstruction of which he has no knowledge that while standing in a perfectly natural position and making only such movements as are ordinarily safe and natural he will be brought into contact with such obstruction. But it is the duty of the company to so operate its trains, where they pass so close to a fixed obstruction, that a passenger who has not been warned of any danger, and who simply lifts an arm or raises a shoulder to put his hand in his pocket, or makes any similar movement, shall not thereby endanger his life. The passenger is not bound to use the highest degree of care. When the company laid its tracks through the tunnel so close to the tunnel wall as the evidence showed it had done in this case, it thereby assumed the responsibility of using all the care, vigilance and foresight reasonably necessary and practicable in the operation and management of its cars to protect its passengers against being brought in contact with an obstruction caused by the close proximity of such wall.

DUTY TO EMPLOYEES OF TELEPHONE COMPANIES AND TO OTHERS TO INSULATE SPAN WIRES, DETECT AND REMEDY LEAKAGES—FREQUENT INSPECTIONS NO DEFENSE—PRIMARY OBJECT OF INSULATION—ENGAGING IN DANGEROUS OCCUPATION NOT CONTRIBUTORY NEGLIGENCE.

Potts vs. Shreveport Belt Railway Co. (La.), 34 So. Rep. 103. Feb. 2, 1903. Rehearing denied Apr. 13, 1903.

An employe of a telephone company, who was the foreman of a line gang engaged at the time in stringing wires, received a fatal shock from the telephone wire which he was stringing coming in contact with an uninsulated span wire of the railway company through an assistant stumbling, letting the wire slack. But the supreme court of Louisiana holds that the fact that he knew there was, at that point, leakage from the trolley wire to the span wire, and yet continued working there, was not, of itself, negligence barring recovery. He could still work there notwithstanding knowledge of the "hot" span wire, and would not be chargeable with negligence unless he failed to take due precaution and exercise due care to shield himself from harm. It is not of itself contributory negligence to engage in a dangerous occupation. Where a person is employed in the presence of a known danger, to constitute contributory negligence it must be shown that he voluntarily and unnecessarily exposed himself to the danger.

A company maintaining electrical wires over which a high voltage of electricity is conveyed, rendering them highly dangerous to others, is under the duty of using the necessary care and prudence at places where others may have the right to go either for work or pleasure, to prevent injury. It is the duty of the company under such conditions to keep its wires perfectly insulated, and it must exercise the utmost care to maintain them in this condition at such places. And a company maintaining such wires must see to it that its lines are safe for those who by their occupation are brought in close proximity to them. It must see to it that its wires are perfectly insulated, and kept so, or else it must provide adequate guard wires or other sufficient safety appliances, as means of protection against the dangerous wires. In the instant case the fact of the span wire being heavily charged by leakage from the trolley wire subjected the workman to greater risks than those which belong to the employment he was engaged in. For this the railway company must be held liable under the circumstances disclosed.

The fact that frequent inspections of the line were made to ascertain the condition of the wires and remedy defective insulation, did not relieve the company of liability. If the span wire had become dangerously charged with the electrical current, the company's inspection should have been thorough enough to have detected it. It was the company's business to know the dangerous defects in or along its lines, and, knowing, to safeguard the same. Using an agency of such subtle and dangerous power as electricity, the burden of the utmost care and vigilance to keep all wires connected with the trolley perfectly insulated was upon the company.

The current should be confined to the trolley wire. Had this been done and the employes of the telephone company had been so careless as to get the wires they were stringing mixed up with the trolley wire and injury or death resulted, there could be no recovery. But it is different as regards the span wires suspending the trolley. It is the duty of the car company to keep these immune from elec-

trical contagion, free from dangerous and deadly electrical energy. Such is intended to be and should be their usual condition. When it is otherwise and injury or death ensues to those who have not accepted such risks, owners of the offending wire must stand the responsibility. Courts of justice will not consider it the primary object of insulating span wires to keep unimpaired the efficiency of the power which drives the cars where danger to humanity lurks in span wires. They will consider the primary object of the insulation to be to obviate such danger, and the efficient propulsion of the cars a secondary object.

RUNNING DOWN BICYCLIST WITH NORTH-BOUND CAR ON SOUTH-BOUND TRACK.

North Chicago Street Railroad Co. vs. Irwin (Ill.), 66 N. E. Rep. 1077. Apr. 24, 1903.

It appeared that, the company having two tracks on a certain street, it was its invariable custom to run all south-bound cars engaged in conveying passengers on the west track and all north-bound cars for the conveyance of passengers on the east track. But two cars, which, during the daytime, were used by the company on another line, were, after the work of conveying passengers was over, about midnight of each day, taken northward on the west track, to the car barns. Under these circumstances, where a man was riding a bicycle northward, at about 11:40 p. m., the portion of the street on either side of the outermost rails of the tracks being covered with snow, ice, and slush, and impassable for a bicycle, and one of the two cars mentioned was run on the west track northward at a rate of 12 to 16 miles per hour, and the motorman saw the man riding in the space between the tracks, and when within from 25 to 35 feet rang his bell or gong, but did not slacken the speed of his car, besides which there was evidence tending to show that the man believed the car which was approaching from the rear was on the east track and turned to go from the space between the tracks upon the west track, in order that he might be beyond all danger of being struck by the car, the supreme court of Illinois holds that whether the motorman was in the exercise of ordinary care for the safety of persons who might be upon the street, or the bicyclist guilty of contributory negligence, were questions of fact for the jury. Moreover, while there was no allegation that propelling the car northward upon the west or south-bound track was an act of negligence, the court holds there was no error in permitting the existence of the custom of running all north-bound cars on the east track and all south-bound cars on the west track to be proved. It says that the existence of the custom entered into the consideration of the question whether the motorman was in the exercise of ordinary care in propelling the car northward on the west track at such a rate of speed as 12 or 15 miles per hour, and also bore upon the question of the carefulness or negligence of the bicyclist in leaving the space between the tracks and going upon the west track in order to be out of danger from a car moving northward. However, the court holds that an instruction was erroneous from which the jury might understand that the bicyclist had a right to rely upon the continued observance by the company of what it was contended he understood to be a fixed and established custom, and that, if he did rely thereon, it should be deemed, as a matter of law, that he had exercised ordinary care. It says that it was the province of the jury to determine whether he had exercised ordinary care for his own safety. If ordinary prudence would have dictated something more should have been done than merely to rely upon the observance of what he may have understood to be a universal custom governing north-bound cars, then reliance alone upon such presumption would not avail to relieve from the imputation of contributory negligence.

ILLINOIS STATUTE CONSTRUED TO CONFER NO AUTHORITY TO GRANT FRANCHISES TO INDIVIDUALS—FRANCHISE DEFINED.

Goddard vs. Chicago & Northwestern Railway Co. (Ill.), 66 N. E. Rep. 1066. Apr. 24, 1903.

The Illinois act in regard to street railroads, approved March 7, 1899, provides "that any company which has been or shall be incorporated under the general laws of this state for the purpose of constructing, maintaining or operating any horse, dummy or street railroad or tramway, * * * may, subject to the provisions con-

tained in this act locate and construct its road upon and over any street," etc. Section 3 provides that "no such company" shall have the right to locate or construct its road upon or along any street, etc., in any incorporated city, town or village without the consent of the corporate authorities, nor upon or along any road, etc., without any incorporated city, town or village, except upon the consent of the county board, etc.

The supreme court of Illinois holds that this statute conferred upon the board of supervisors of a county no authority to grant to private individuals a right to construct and operate a street railway in the highway. It says that if the act should be extended beyond its terms, so as to embrace individuals, it would extend to them the right to exercise the sovereign power of eminent domain for the purposes of their street railways, and statutes conferring such powers are to be construed strictly. The question was not whether a natural person, if the law so provided, might acquire a right of way, exercise the right of eminent domain, and enjoy the franchise to operate a street railway, but whether the law did so provide. The legislature had power to limit the authority of the county board to grant a license to incorporated companies created under the general laws of the state for the purpose of constructing and operating street railways, and it is not material what reason existed for prescribing the limit. It was a case for the exercise of the legislative judgment, with which the court is not concerned.

Furthermore, the court holds that the operation of a street railway is not one of the ordinary avocations to which the constitutional provisions securing to every individual the right to choose his own occupation, to pursue any ordinary calling or trade, and to acquire, hold, and sell property, apply. It is a special privilege conferred by the government, which does not belong to citizens of the country generally, by common right. The right to operate a street railway and collect fares for carrying passengers, and the power to exercise the right of eminent domain, are franchises. A franchise is a special privilege conferred by grant from the sovereign power, not belonging to the citizen of common right. It must be derived from the laws of the state, and emanate from the sovereign power, and it cannot be exercised by an individual on his own lands without the consent of the state.

LIABILITY FOR INJURY TO EMPLOYEE RIDING HOME ON PASS DUE TO OPENED SWITCH—MAINTAINING FULL SPEED—DIVIDED OPINION ON DUTY TO PLACE TARGET OR LIGHT ON SWITCH.

Noe vs. Rapid Railway Co. (Mich.), 94 N. W. Rep. 743. May 12, 1903.

An employee, who had been engaged with others in constructing an addition to a power house, while riding home from his work on one of the company's regular employee passes was injured by the car being wrecked at a switch which was thrown open by some one, though whether by a malicious person or the act of children was not determined. The supreme court of Michigan holds that there was a case for the jury, and affirms a judgment for damages. The negligence charged was failure to have a light or target at the switch, failure to keep the switch locked, and failure to provide for slowing up the car at that point.

The court says that the fault, if any, was not that of the motorman, if conceded to be a fellow-servant, but was in not providing a safe system in running the cars, as the motorman was quite within his orders in running the train at full speed in disregard of this switch. The fault, then, if there was a fault, was the fault of the master—the company. As to the contention that the employee had assumed the risk of these appliances, the court says that he had no duty which would bring to his attention the defects complained of. His work was performed at a distance from the switch, and no notice of the defects would come to him through his work, as his duties had no relation to the track. He simply rode over the track, as did any other passenger.

It was contended that the testimony showed that target lights and locks were not used in street or electric railway lines, and that, if the company had shown that it had observed the same care that other electric railways had exercised, this must be held to be due care. Two members of the court, Justices Montgomery and Moore, say that if it be assumed that it is not negligent to conduct a business in the usual manner (as to which, see *Railway Company vs.*

Judson, 34 Mich. 507), it remains to consider what shall furnish the standard. Can the defendant company neglect precautions which are taken by steam railroads against the same character of disaster as the defendant is called upon to guard against? We think not. It can make no difference whether the force which propels a car freighted with human beings and going at a rate of 35 or 40 miles an hour, is propelled by one power or another. A misplaced switch is as sure to result in serious damage in one case as in the other. The question, more properly, is, what has human foresight provided as a safeguard against such a disaster? And common prudence would suggest an investigation into the methods of such business as involved such contingencies as confront the operating company. Justice Carpenter says, in concurring in the result for the other reasons stated in the opinion, that he doubts the right of the jury to find that a street railway company is under an obligation to place a target or light, which may possibly be an obstruction to travel, in the public highway. Hooker, C. J., and Grant, J., dissent; the former writing a dissenting opinion, concurred in by the latter.

INJURY TO MOTORMAN FROM CAR AHEAD RUNNING BACKWARD ON ACCOUNT OF DERAILMENT OF ANOTHER CAR—WANT OF NECESSARY RULE MUST BE SHOWN—RISK FROM KNOWN METHODS ASSUMED—ABSENCE OF RED LIGHTS ON REAR OF CAR AND TELEPHONE CONNECTION WITH Y—CONDUCTOR JUMPING OFF BEFORE COLLISION—INCOMPETENT SERVANT AND FELLOW-SERVANT RULE.

Secombe vs. Detroit Electric Railway (Mich.), 94 N. W. Rep. 747. May 12, 1903.

At a switch at a point where there were two tracks, and cars were not expected to run both ways upon either, a car was derailed, it was asserted, in consequence of a worn rail. The next car to arrive was sent back to carry word to the car barn, a distance of a mile and a half. While running backward, this car met, in collision, the car which had been following it before, injuring the motorman on the latter. The supreme court of Michigan holds that a verdict was properly directed for the company. It holds that the worn rail was not the proximate cause of the motorman's injury, if it was a remote one. It also holds that the trial judge did not err in declining to submit to the jury the question of whether this accident was not due to the want of some reasonable and necessary rule for the backing of cars. It says that the record showed that a printed rule required that "motormen must not start their cars until receiving two bells or the word 'Right' from the conductor, nor start the car backward before receiving three bells from the conductor, who must remain on rear platform while car is moving backward." The court was not advised that any other or different rule was in use on any street railway in the country. Counsel suggested that the company should have established telephone connection with the Y, or should have required red lights on the rear of cars. It requires more than the production of authorities asserting that it is the duty of railroads to promulgate reasonable rules for the running of trains to establish the fact that a company has been negligent in that respect.

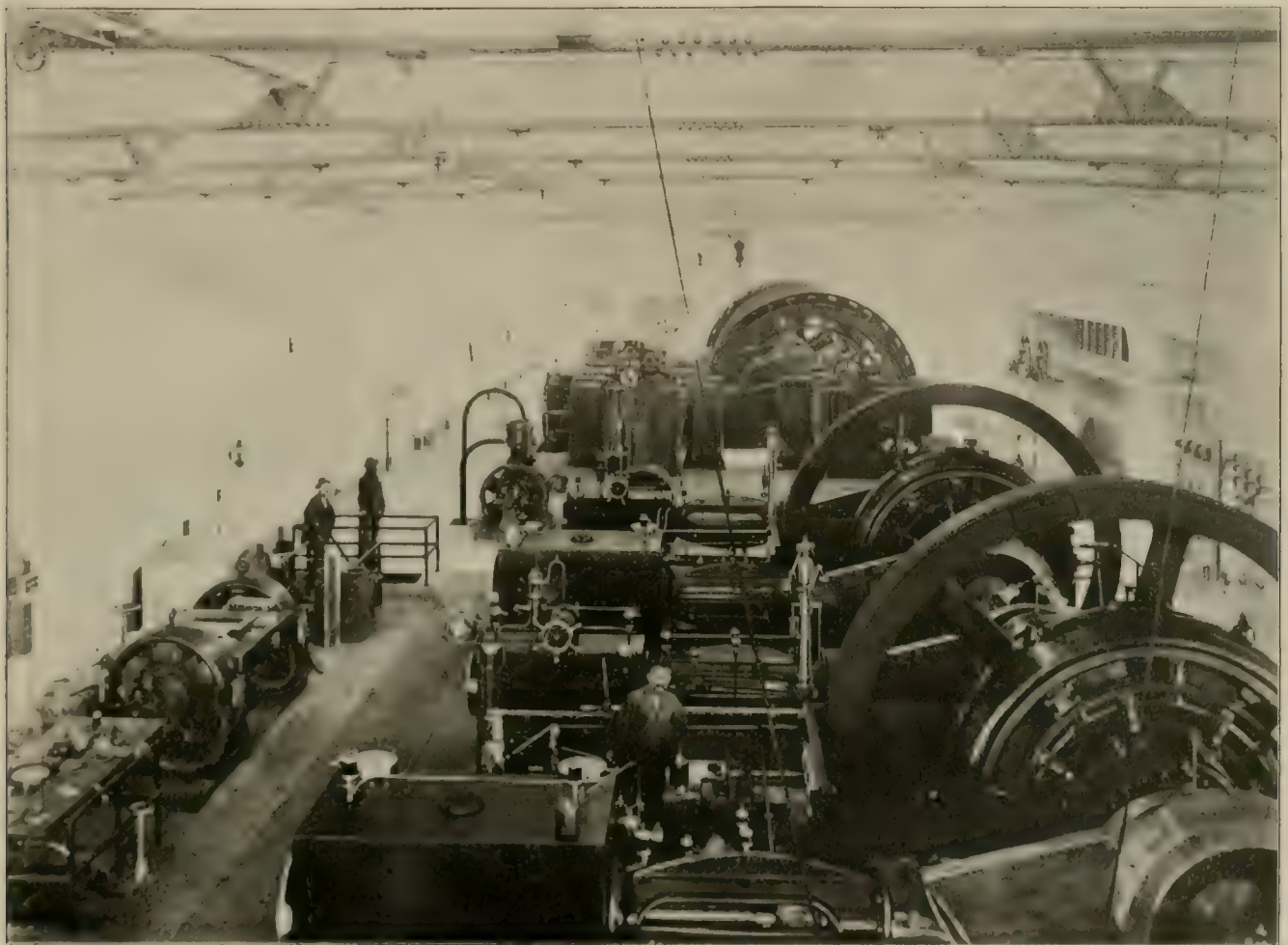
As another reason why the plaintiff's contention should not prevail, the court says that he was not a passenger, but an employee, who was familiar with the company's methods and rules; he knew that cars had been backed on this piece of road, and that it was likely to happen again; he knew that the cars did not carry red lanterns upon the rear, as is customary upon steam roads, and he knew what, if any, means there were of determining whether a car was approaching or going away from him; and, under such circumstances, he may be said to have assumed the risk of such methods. The conductor of the backing car jumping therefrom after giving the signal to stop, and when he could do no good by remaining on the car, the court holds, would not be culpable or negligent. On the other hand, it holds that the fellow-servant rule was clearly applicable, unless the company's negligence in relation to such conductor's competency were proved to relieve the motorman from the effect of such rule. But before a master can be held liable on the ground that he has in his employ an incompetent servant, it holds that it must appear that he has been negligent either in employing or retaining him, and the burden of proof is upon the plaintiff.

The Columbus, London & Springfield and the Dayton, Springfield & Urbana Railways.

BY H. C. REAGAN.

The Columbus, London & Springfield and the Dayton, Springfield & Urbana railways are owned by the Appleyard syndicate and together constitute one of the finest interurban systems in the middle west. The geographical location of these roads is admirable, from a financial standpoint, as the system reaches the three principal cities of middle Ohio. The Columbus, London & Springfield Ry. passes through a rich farming country and several large towns between Columbus and Springfield, midway between which is the town of London which is the county seat of Madison County. This has a population of 3,500 and contains many business places and

for a short distance over the tracks of the local railway. After leaving the station the road passes through a picturesque country in the Mad River valley. The track parallels the Dayton branch of the Erie and the Big Four railroads. This line traverses some of the richest farming countries in the state of Ohio. Among the numerous towns through which it passes may be mentioned Harshman, Osborne and Medway, and just west of Springfield on this line is situated the beautiful Masonic Home of Ohio. The power house of this system is one of the largest in the middle west and is located at Medway. Springfield and Dayton, the two principal



GENERAL VIEW OF ENGINE AND DYNAMO ROOM.

landsome residences. Columbus, the capital of Ohio, has a population of 150,000 and Springfield, the terminus of the road, is a prosperous city with a population of 40,000 and is the county seat of Clark County. The passenger traffic between these is very heavy. The terminal building at Columbus is located at 36 W. Gay St. and is known as the Interurban Union Station. The Columbus, Buckeye Lake & Newark, the Columbus, Delaware & Marion, the Central Market and the Grove City lines all start from this station making it an easy matter to reach any point on these lines from the Columbus, London & Springfield Ry. The Springfield terminus is at the Arcade in Fountain Square which is also the terminus of the Dayton, Springfield & Urbana Electric Ry. The latter road starts at the corner of Third and Main streets, in Dayton and runs

cities, contribute a heavy passenger traffic to the road. The latter city has a population of 100,000. The Urbana division which acts as a feeder to the system is now being extended to Bellefontaine and Kenton, Ohio, and a branch line extends from the main line to New Carlisle which is to be extended to Troy. In order to complete the system to Cincinnati the Appleyard syndicate has secured control of the Dayton, Lebanon & Cincinnati which is a steam road but which will be converted into an electric railway as soon as possible. The combination of these two roads with other lines owned and projected by the Appleyard syndicate will form one great system between Pittsburg and Cincinnati. The Columbus, London & Springfield and the Dayton, Springfield & Urbana railways are located at about the middle of this system.

In addition to the passenger service these companies have a very large freight and express business for which they use the most modern express cars. By referring to the map, the territory covered and the population reached by this system will be seen.

Roadbed

These companies intend to own their own private right of way wherever possible and the roadbed is built according to the highest standards, thereby insuring solidity and safety. The rails are laid on standard white oak ties and the gravel ballast is well tamped under and even with the tops of the ties. The rail through the country districts is a 70 lb. T-rail in 30-ft. lengths joined by 6-hole fish plates and bonded with a No. 0000 bond at each joint. The lines are single track with suitable turnouts and switches. An automatic signal system is now being installed. The bridges along the line are built of steel and concrete. The roads traverse a level country so there are very few heavy grades. Cattle guards are used at all country crossings, and where traffic demands it, neat stations are provided for passengers.

Direct Current Overhead Lines.

The direct current overhead lines are very substantially built. Except in the cities the overhead construction is of the bracket

was necessary to tear out the end and side of the old building back to the switchboard compartment and this had to be done without in any way stopping the operation of the machinery in the old station. All steam pipes and connections, steam mains and discharge lines had to be connected under the same conditions, and further, an entrance was made in the old stack for the new breeching, all of which was done without stopping or interfering with the operation of the old station for one minute. One of the illustrations shows the exterior of the present power house with the outgoing line and the wire tower for the high-tension lines at the front of the building. The distributing rack is also shown for the high tension lines going east and west and where they leave the line anchorages in front of the tower. This building is very substantial. The main walls are of brick with monitors over the engine rooms and boiler houses, which are provided with ventilating windows. Ample provisions for light are made in the front and ends of the building by means of large double windows 7 x 7 ft. in size trimmed with gray sandstone sills between the pilasters. At each end of the building there is a large double door provided with iron steps and landing. The gable ends and the top of the wall over the wire tower have a coping of gray sandstone, giving it a neat appearance. The area of the engine room is 194 ft. by 47 ft. 2 in. and from the floor line to the bottom of the trusses is 18 ft. 2 in. There are pilasters on the



MAP OF THE C. L. & S. AND THE D. S. & U. RAILWAYS.

type using straight, sound, well-set poles 35 ft. long and 8 in. at the top. In other places span wire is used. The trolley wire is No. 0000 grooved section and No. 0000 feeders are tapped in at intervals. Glass insulators are used for pull-off and strain insulators. On the Dayton, Springfield & Urbana Ry. two trolley wires are used, thereby avoiding switches on the overhead lines. On the Columbus, London & Springfield double bracket arms are used at turnouts, the poles being set between the tracks.

Power House.

The power for this system is furnished from the power house situated at Medway, O., about half way between Columbus and Cincinnati and is near the Mad River. This was formerly the site of an old woolen mill which was run by water power, the old race taking water from a dam across the river. This race now provides plenty of water for condensing purposes and for boiler feed and the station is situated close to the Big Four and Erie railroads, making it convenient for coal shipments. The power house is located at the load center of the system. The new building is a combination of the Dayton, Springfield & Urbana power house, which was built about three years ago, and a new portion which was built for the Columbus, London & Springfield Railway Co., making together a large and handsome power house, of which the writer is the constructing engineer. In order to incorporate the two buildings into one it

side walls of the engine room on top of which are mounted cap stones which will carry the track for an electric crane which is to be installed. The roof over the engine room is supported by iron trusses on top of which nailing pieces are bolted. Rafters are placed between the trusses, the whole being covered with a sheathing of yellow pine. On top of this is tar paper and slate making a tight and substantial roof. The south wall of the engine room is a fire-proof wall provided with fire-proof iron doors. To the rear of this wall is the boiler room. The basement of the new part of the building is 13 ft. deep and that of the old part has a depth of 10 ft. All of the basement floors are of cement. The engine room floor is built of steel girders with brick arches and has a cement surface. This makes a strong floor to resist weight and vibration. Cast iron steps lead from both the engine room and boiler room to the basement. The interior of the main building is painted white and the exterior wood work is painted olive green with lake red window sash. The basement has double windows along the front and both ends, with doors at each end.

Boiler Room.

The boiler room is situated on the south side of the engine room and is 136 ft. long by 41 ft. wide. The height of the room from the floor to the bottom of the trusses is 23 ft. The roof is composed of sheathing with a covering of tar and gravel and ample ven-

tilation is provided by two monitors. The top of the wall has a gray sandstone coping. This room contains seven Babcock & Wilcox boilers, each having a rated capacity of 207 h. p. These are designed for a working pressure of 160 lb. being tested at 240 lb. hydrostatic pressure. The boilers are fired by hand. The coal bunkers extend the whole length of the boiler room, being 136 ft. long, 13 ft. 7 in. wide and 12 in. in height to the bottom of the girders which run along the top of the bunkers. These girders carry stringers to which rails are spiked and the coal cars are run upon these rails over the bunkers and unloaded. There are also tracks on the boiler room floor on which steel coal cars are used. These are loaded and run on a surface scale in the boiler room where the coal is weighed as it is used. The tracks extend out to the ash bank.

Heaters.

Two Sorge-Cochrane heaters of 1,500 h. p. each are installed. These heaters have a maximum capacity for heating and purifying 90,000 lb. of water per hour. They receive the exhaust steam from the condensers, steam pumps and engine exciter which is sufficient to heat the water to between 180 and 205° F. The Sorge chemical system is used the tanks being placed in the boiler room and



POWER HOUSE.

pipied to the heater. These heaters are connected so that either one may be by-passed and the other connected on both sets of boilers; both may be by-passed, or water may be taken from both or either one separately. Previous to the installation of the heaters there was constant trouble from boiler incrustation due to the impurity of the water which contained magnesium, 5.684 grains per U. S. gallon, silicon, .105 grains, oxide of iron, .099, sodium chloride, 1.584, potassium carbonate, 9.907, potassium sulphate, .664 or a total of 18,337 grains per gallon. This formed a hard incrustation which required constant cleaning; but since installing the heaters and using soda ash the incrustation is being cut off rapidly. The blowing down of the boilers is accompanied with sediment and lime in vast quantities.

Pumps.

In the boiler room there are four duplex steam pumps with steam cylinders 10 in. x 12 in. and water cylinders 8½ in. x 12 in. These pumps are of the latest Blake pattern having composition pistons and are packed for hot water. The valves in the water end are of hard rubber. These pumps are placed two in each section of the boiler room, or two to a heater. Each pump can take water from the heater or direct from the cold water supply. There are three sources of water supply; from a well in the building, from the canal, or from a creek, and suitable valves are provided to allow for drawing water from either place. One pump is gen-

erally used to supply water to the heaters as there is no head to allow the heaters to be supplied otherwise. This makes one pump a supply pump and the other a delivery pump to the boilers. Either set of pumps can supply water to each section of the boilers or one set can deliver water to both sets of boilers. These pumps are set on brick foundations with a cement top in which anchor bolts are embedded making a compact and rigid base. Lubricators are used which are operated from the valve motion lever. The steam ends of the pumps have a metallic packing and all drips are piped into a drip line. There is a safety valve on each delivery line located near the pumps.

Condensers.

The basement of the engine room contains five Blake vertical twin jet condensers three of which are in the old part of the building and two in the new part. The two new condensers are placed between the engine foundations while the old ones are located back of the foundations as shown in the plan of the station. The two large condensers are each attached to a 1,500-h. p. engine. They have two 14 in. x 21 in. steam cylinders and two 32 in. x 21 in. air cylinders. The steam and air cylinders are connected by means of four heavy stretcher rods. A walking beam is connected to each piston rod by links, a cross-head and guide being provided in this style of pump to prevent the springing of the piston rod and the leaking of the packing.

In order to know that the force feed pump for each condenser is working, without going down into the basement, the writer had the lubricators mounted on the hand rail around the opening in the engine room floor. A shaft was placed across this opening with a link and a lever attached to a bell crank of the pump; a rod connects to the ratchet wheel of the force feed pump. This operates the feed and can be seen by the engineer or oiler without going below to the basement. It acts as an indicator showing the movement of the condenser. All oil pipes are brought up above the floor and all valves are worked by floor-stand wheels in the engine room. The injection pipe comes in from the intake and is connected to each condenser, a 10 in. check valve being placed between each condenser and the injector pipe. The injection line has diameters of 14 and 10 in. and has cast iron bell joints. The discharge line of piping is composed of a 14-in. and a 24-in. section. The 14-in. section takes the discharge water from the small condensers and the 24-in. section the water from the two large condensers. These lines have bell joints except where they are joined to the condenser where the joints are flanged. The three condensers in the old part of the station are of the twin type having dimensions of 9 x 20 x 12 in. These condensers also take the water of condensation from the canal through a separate line. Between the condensers and the low pressure cylinders are Goubert primary heaters through which the exhaust steam passes on its way to the condensers or to the atmosphere. The water from the supply pumps passes through the heaters and is then delivered into the Cochrane open heater in the boiler room.

Piping.

The accompanying illustrations give a general diagram of the piping of this station. The piping is all extra heavy. The steam pipe from each boiler is an 8-in. wrought iron pipe with screwed flange. These pass over and down the back of the boilers to a 12-in. steam header which is carried from one end of the boiler room to the other on cast iron brackets with rollers. This main is a wrought iron pipe and is divided into sections by 12-in. gate valves with by-pass valves so that in case of leak or accident any section can be cut out. There are three valves in the old main and two in the new main. The steam pipes from the boiler to the header have 8-in. gate valves near the header and also stop valves on top of the boilers. There are three 6-in. steam pipes leading to the high pressure cylinders of the engines in the old station and two 10-in. pipes to the engines in the new station. These are all extra heavy wrought iron pipes with screwed flanges peened over. A gate valve is placed in each pipe to the engines.

In joining the old mains to the new piping the problem of how to pass between the wall and the old stack arose. This was overcome by forming a loop between the two mains having a 10 ft. radius which carried the pipe up to a point between the wall and the stack where the space was sufficient owing to the taper in the stack. At the same time this formed an expansion loop. The exhaust pipes in the old station from the low pressure cylinders are 10-in. cast iron pipes with

a branch to each condenser. The exhaust main is a 16-in. cast iron pipe leading to a 16-in. galvanized spiral riveted pipe and exhaust head. There are three back pressure valves in the exhaust line, one for each engine. Between the condenser and the low pressure exhaust is a primary heater and the live steam passes through a Goubert separator in the old station. An auxiliary exhaust pipe of 5 in. diameter leads to the open heater. The feed water pipes are on top of the boilers and are in duplicate, one line being of brass pipe and the other of iron. The brass line is in service most of the time. Branch lines with check and stop valves pass down in front of the or from both heaters by both sets of pumps or by any single pump.

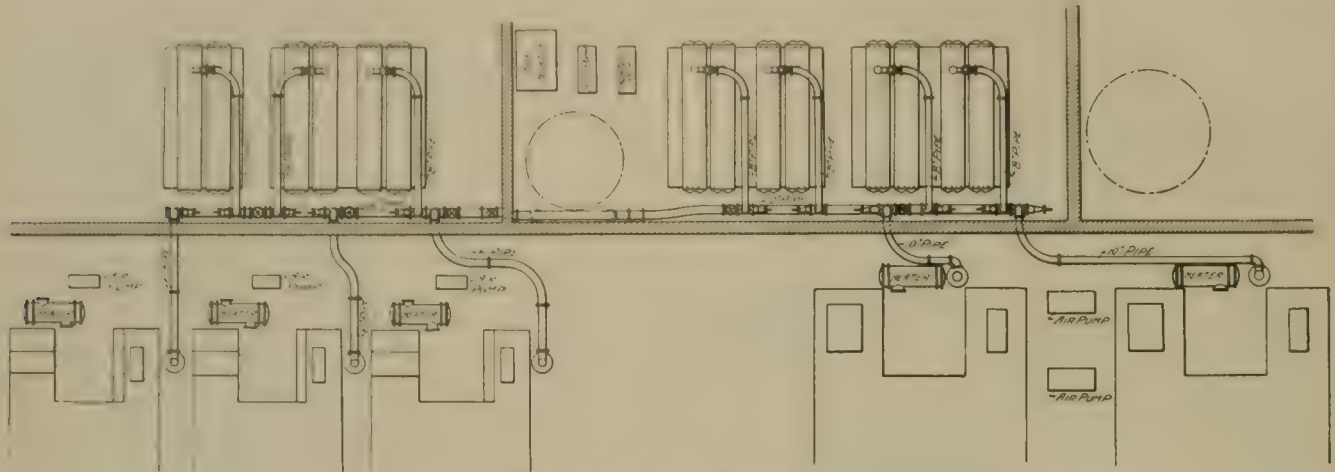


DIAGRAM OF STEAM PIPING.

The open heaters can be by passed and the water pumped from either so that either battery of boilers can be fed from either heater steam drums. The feed water lines for both stations are connected by a set of pumps through the primary heaters into the boilers, or cold water can be pumped direct into the boilers. This makes a very flexible system. All the pumps have a 5-in. suction line of cast iron with suitable valves arranged for taking water from three different points. Cochrane separators are used in the new installation and Goubert separators in the old plant.

Holly Return System.

The Holly return system is used to return all the water of condensation to the boilers. There are two distinct systems, one in the

Engines.

The new part of the power house contains two Hamilton-Corliss cross-compound condensing engines having a normal capacity of 1,250 h. p. and a maximum capacity of 1,500 h. p. These engines can be run either condensing or non-condensing and in the latter case have a capacity of 1,190 h. p. with an initial steam pressure of 150 lb. The indicated horse power running with condensers at one-quarter cut-off is 1,250 h. p. and at one-third cut-off, 1,425 h. p. These engines are very massive in construction in order to withstand the heavy work which they are called upon to do. They are placed on foundations laid in portland cement. The foundation bolts

were grouted in with portland cement and sharp sand and the engines show no perceptible movement under operation. They run at a speed of 94 r. p. m. and are guaranteed to regulate within two per cent. The fly-wheels are made in six sections which are fastened together by T-head links in the sides of the sections. The spokes are bolted to disks on the shaft between which they fit. The weight of each wheel is 110 tons, diameter 18 ft., face of rim 18 in. and width of hub 3 ft. 6 in. at shaft. These wheels are guaranteed to run up to a speed of 114 r. p. m. and as erected they run very true for a built-up wheel of this type. The cylinder dimensions of the engines are 26 and 50 x 48 in. and the other general dimensions are as follows: Cross-head pin $7\frac{1}{2} \times 7\frac{1}{2}$ in., diameter of piston rods 5 and 6 in., crank pin 8 x 8 in., diameter of shaft at largest part

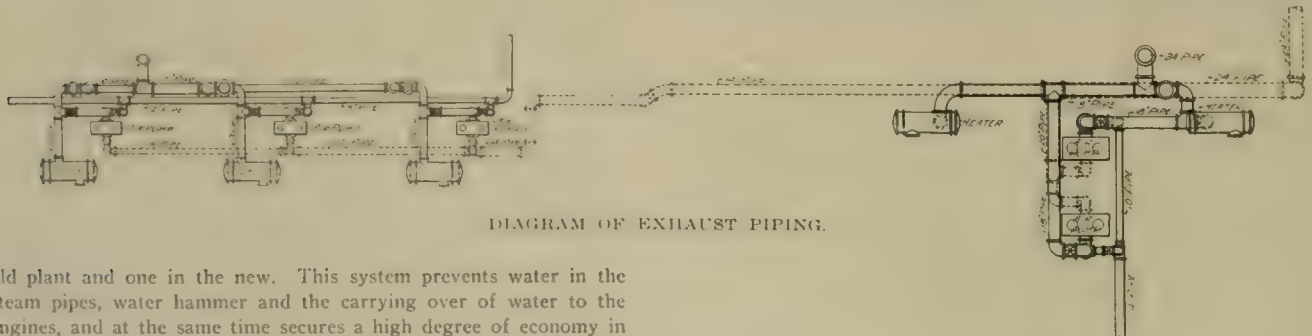


DIAGRAM OF EXHAUST PIPING.

old plant and one in the new. This system prevents water in the steam pipes, water hammer and the carrying over of water to the engines, and at the same time secures a high degree of economy in returning the water of condensation to the boilers. Below the steam main, back of the boilers, is run an auxiliary drip line connected directly with the steam main and the Holly receiver. There is a receiver for each section of the boiler room and the pipes between the steam mains and the drip line have gate valves so that the main can be cut off for repairs. The drip line also has stop valves so that the two sections can be separated permitting each receiver to collect the water from the separate steam systems; or the two can be operated together. The separator for each system is placed in a weather-proof house on top of the boiler house roof and the water of condensation is returned to the mud drum of the boilers, suitable check and gate valves being provided in the line. All water of condensation from the separators and re-heaters is returned by the Holly system.

23 in., diameter of journals 20 in., length of journals 36 in. The engines are equipped with the usual oiling devices and with indicator rigging. The valve motion is of the two wrist plate type with independent movements for the exhaust and steam valves. The valves are double ported. The governor is of the Porter weighted type with adjustable weights, and there is provided the usual knock-off to prevent running away. There are cross shafts between the high pressure and low pressure motion to regulate the cut-off, with a hand adjustment on the low pressure side. In order to prevent any side strains on the wrist plate shafts A-shaped frames are attached to the end of the bearings to hold them rigid.

In the old portion of the power house there are three Slater-Corliss cross-compound condensing engines of 450 h. p. each. These

engines have the Slater valve motion with separate eccentric, no wrist plates being used for the steam valves.

The cylinder dimensions are 16 and 32 x 42 in. Other general dimensions are: diameter of main bearings 13 in., length of bearings 22 in., diameter of shaft 15 in., diameter of fly-wheel 15 ft., weight of fly-wheel 15 tons, width of rim 12 in. The fly wheels are made in two pieces. The cranks are of the counter balanced disk pattern with crank pins 5 x 5 in. The engines run at a speed of 100 r. p. m. and are mounted on brick foundations built upon a 4-ft. concrete base.

The Hamilton-Corliss engines have the 10-in. steam pipe connected to the side of the high pressure cylinder steam chest and the 12-in. exhaust to the receiver is attached underneath the high pressure cylinder, a stop valve being placed between the cylinder and the receiver. The receiver is of the vertical re-heating type, the re-heating portion being in the center, and is formed by a number of tubes surrounded by live steam from the boilers through which the exhaust steam from the high pressure cylinder must pass on its way to the low pressure cylinder. The water of condensation in the re-heater is returned to the boilers. The pipe leading from the receiver of the low pressure cylinder is 16 in. in diameter and contains a gate valve. Leading from the low pressure exhaust side is an 18-in. pipe with a gate valve. This pipe is connected to the primary heater as shown in the plan of the engine room. In order to run either cylinder separate from the other, there is a 12-in. pipe connected between the high pressure exhaust and the low pressure cylinder with a suitable gate valve. Also in order to run high pressure steam in the low pressure cylinder the live steam pipe to the high pressure engine is connected across to the 16-in. exhaust pipe leading to the low pressure cylinder. This connection has a Davis reducing valve in it and a gate valve for shutting it off. All valves have by-passes and the pipes are provided with pop valves. The re-heating pipes are tapped into the 10-in. steam pipes and the receiver is provided with a Nason high pressure trap. By this system of piping the engines are run as compound condensing, or non-condensing, compound or independent condensing or each as a high pressure engine, making the system very flexible. All valves for the engines and condensers are provided with floor stands with indicators.

Generators.

The generators in the new part of the plant are 2,300-volt three-phase revolving field General Electric machines of 800 kw. capacity each. These are direct connected to the cross compound engines. These generators have 32 poles and the principal dimensions are as follows: diameter of armature over all 19 ft., width 3 ft. 13/4 in., width of hub 2 ft. 10 in., diameter of bore 23 in. The fly-wheel effect of the armature does not exceed 37,000 lb.

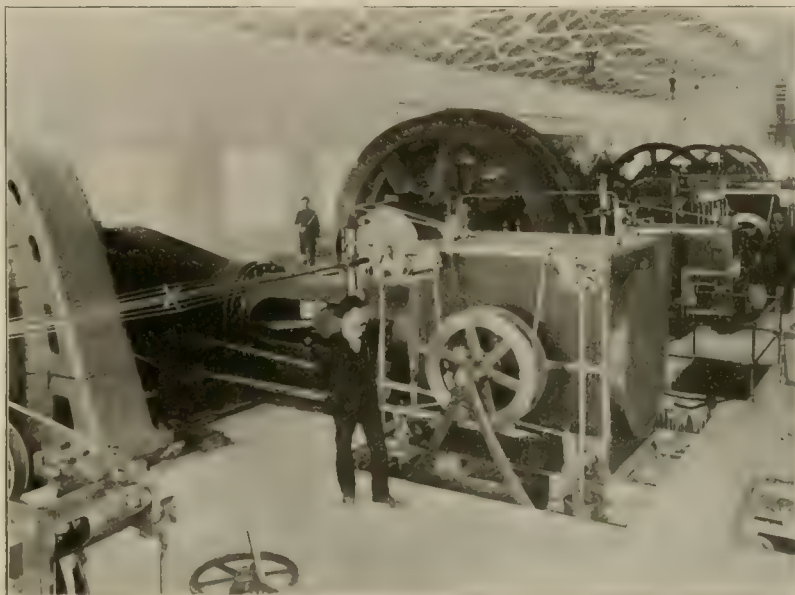
The direct current generators in the older portion of the station are Westinghouse 8-pole machines generating a current of 542 amperes at 600 volts and are compounded for a 10 per cent raise in voltage. These machines have carried the load for three years under all conditions and are direct connected to the Slater engines.

There are two exciters shown in the accompanying illustration, one of which is steam driven and the other motor driven. The steam driven exciter is a 35-kw. machine of the General Electric standard marine type running at 305 r. p. m. and delivering 280 amperes at 125 volts. This makes a very compact unit which is used to start up the alternating current machines when all are shut down. After the machine fields are built up the steam driven exciter can be shut down and the motor driven machine used. The lighting system is operated from this unit when the main generators are shut down after the load is off. This unit furnishes light to the car barn as well as to the power house. The lights in the power house are enclosed arcs of the General Electric type and are wired in multiple series so that they can be run on either the 500 or the 125 volt circuit. The other exciter is a 3-phase induction motor generator of 35 kw. capacity and consists of a 50 h. p. motor and a direct current generator giving 280 amperes at 125 volts. The motor takes 2,300 volts

and is connected to the circuit of the main alternating current generator. This set is used generally after one machine is started by the steam driven exciter. The two exciters can also be run in multiple with each other if desired. This exciter can be run from either alternating current generator, as leads are taken from the three leads or phases of each generator to a three-position oil switch on the 2,300-volt motor panel. The engine exciter is set on a brick and cement foundation and the induction exciter is set on top of heavy I-beams and a brick arch and is grouted in. All the wires to these machines are brought up through the floor in heavy porcelain tubes.

Oil Switches.

The main switches in this station are the General Electric motor driven type H with oil break. There are two outgoing line switches and two generator switches, one set for each bank of transformers. Each switch is divided into three compartments with a soapstone barrier between the compartments. The outside of the cell is built of pressed brick and there are three independent doors in front of each cell the upper portion of which contain heavy plate glass so



VIEW IN ENGINE ROOM

the connections can be seen at the yoke and switch points. Indicator lamps are placed on the switchboard to show whether the switch is open or closed. When the switch is closed a red lamp burns and when open a green lamp. These oil switches are operated by a small control switch on the board which can be operated by hand or they are operated automatically by reverse relays and overload relays which cause the switch to open for a reversal or overload of current. To operate the indicating lamps there are three cams on the crank shaft of the oil switches which operate three contact arms or terminals which open and close the lamp circuit in either position of the switch.

Transformers.

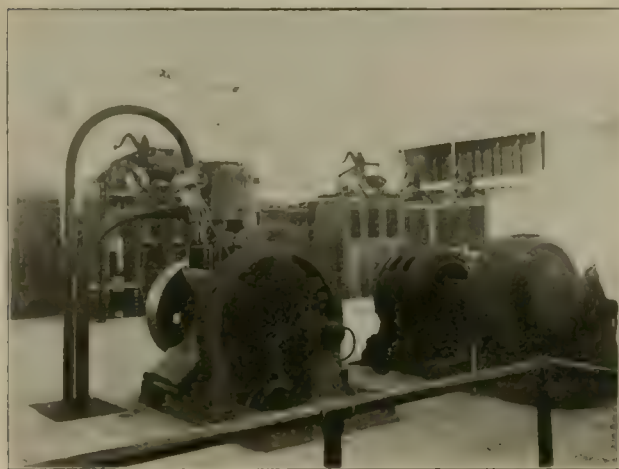
The transformers are of the General Electric air blast type with a capacity of 275 kw. each. All the connections between the transformers and the machines and switches are carried below the floor. There are two banks of transformers, three for each generator, and these are located back of the switch cells over openings provided in the floor. The necessary ventilating dampers are provided at the sides and top permitting the transformers to operate under varying loads and on overloads without undue heating.

Switchboards.

There are two switchboards in the engine room, one direct current and one alternating current. These are shown in one of the accompanying illustrations. The one to the left in the illustration is the alternating current board controlling the generators, oil switches and exciter. The right hand portion of the board has three gen-

exciter panels on which are mounted the power factor meters, ammeters and voltmeters, also the recording voltmeter, indicating lamps, field rheostats, and dial, synchronizing lamps and plugs, and the control switch to the generator switch. The two next panels contain three line ammeters indicating lamps and control switch for the line oil switch. On the back of these panels are the relays to open the switches on reverse currents and overloads. The portion of the board to the left contains two exciter panels, one for each exciter set. On these panels are mounted the main switches, volt meters and ammeters, blower switches and oil switch circuit switches. There is a 2,300-volt panel for the three-throw switch from the machines to the motor oil switch. The purpose of the latter switch is to permit the one motor to be driven from each separate generator. The motor switch is provided with trip coils to open on overload or ground. All wiring except that from the generators to the transformers and the wires to the exciters are in iron-armored conduit under the cement floor and all the wires come to the back of the switchboard through openings in the floor.

The direct current switchboard is made up of three generator panels, four feeder panels and two booster panels, the latter not being in use at present. The generator and feeder panels have the usual direct current instruments with circuit breakers. A total recording wattmeter is about to be installed on this board and the circuit breakers are operated by the Monarch circuit breaker trip when for any cause the engines should start to run away. One of the illustrations shows a rotary converter which is an inverted



CONVERTERS AND OIL SWITCHES.

rotary that was used temporarily to carry part of the load on the Columbus, London & Springfield Ry. before the large units were installed. This unit took current from the positive bus of the direct current board at 600 volts giving on the alternating current side 370 volts which was stepped up by the transformers to 26,000 volts. This current was carried over the transmission line to the sub-stations. This unit operated very successfully under varying conditions.

Bus Bar Compartment and Air Cell.

The bus bar compartment and air cell is very substantially built and is divided into two sections each of which contains a set of bus lines. These bus lines are situated at right angles to each other forming a tee, one being situated in the air-tight compartment. The three phases are separated from each other in separate tunnels. Each of the compartments contains a bus line of No. 1 copper wire supported on Locke "Imperial" insulators. Where the bus lines meet at right angles they are supported on two insulators and a joint made between them. At each end of the bus compartment there are placed strain insulators of porcelain supported by wooden pins. At each side of the bus bar compartment are two sets of barriers with openings into the bus bar tunnels through which the wires are carried up to the oil switches overhead. There are three wires for each switch cell and by this construction each phase is kept entirely separate so that the danger of short circuit is reduced to a minimum. At present there are two sets of switches in use between the transformers and bus lines. Over the bus line compartment outside of the air-tight compartment are placed the two motor driven

oil switches with wires leading from the busses between the barriers to the switches. There are two outgoing switches installed and provision has been made for two more in the future. In order to get the high tension wires out of the building there are four chimneys leading from the bus bar compartment to the outgoing line anchorage. Each of these chimneys contains three lines from the oil switches carried on insulators. The air tight bus line compartment is 30 ft. long, 38 ft. wide and 13 ft. high. This gives ample room for the wiring between transformers and bus lines and ample space between bus lines and side walls. It also provides a large air space. Two blowers are placed over the opening in the floor leading directly into the compartment. An air lock is provided containing two doors, the inner door containing a small equalizing door to equalize the air pressure between the lock and the bus compartment when it is desired to enter.

Station Wiring.

The electrical wiring of this station follows the latest practice. All the wires leading from the switchboard to the exciters, oil switches and generator fields are placed in iron armored conduit and are concealed beneath the floor in concrete. The wires from the main generators are carried on porcelain insulators mounted on iron racks and these racks are bolted to oak blocks built into the wall. These blocks are made widest in the back to prevent their pulling out of the wall. Asbestos covered wire is used on the exciter mains and none of this wiring shows above the main floor. The leads from the main generators enter the bus bar compartment or air cell where they are connected to the low tension side of the transformers. The three leads to the induction motor oil switch on the switchboard are tapped on the generator lead in the air cell and are brought up to the switch under the floor back of the switch panel. There are six wires leading to the oil switch from the induction motor, three for each generator so that the motors can be run from either generator through this one switch. The transformers are connected in delta on the low tension side and are star connected on the high tension side. The potential and current transformers are placed in the air-tight bus bar compartment and the field rheostats for the generators and exciters are suspended below the floor in a clear space having a 10 ft. head room. The field break switch resistance is also in this compartment.

Stacks.

The station has two stacks, one for each of the sections. The one to the left in the illustration is the first stack built and is a double shell with a diameter of 14 ft. at the base. The diameter of the flue is 7 ft. In order to have draft for the new boilers before the new stack was built the writer had to make an opening 4 x 6 ft. in the stack opposite the old flue entrance. This was satisfactorily accomplished without interfering with the operation of the old boilers. The crown was sprung in quarters and the forms were made in two parts, an opening being made to take half of the form. The half arch was laid up which closed the opening then the other half was opened, the form put in, and the rest of the arch laid after which the opening was cut in and closed temporarily. A second arch was sprung between the inner and outer shell and the inner shell was then taken out to the last brick which was the fire brick lining. The crown was then sprung over the opening of the inner shell after which the breeching was put in position and the damper closed. Then the inner course of brick was taken out and the opening of the stack was complete without any loss of draft or interference with the operation of the boilers.

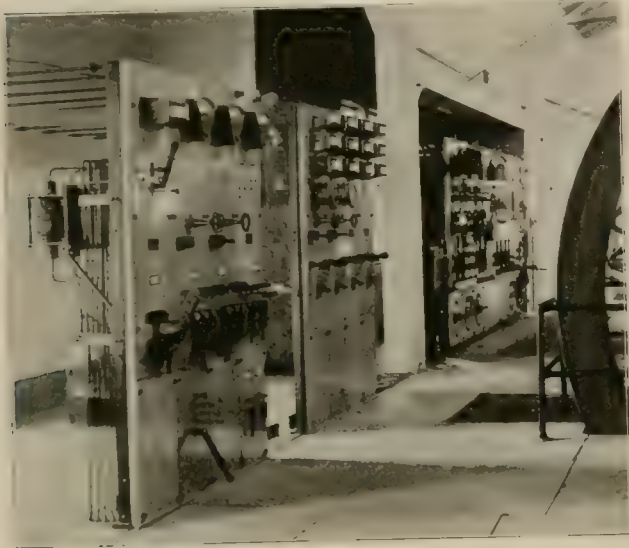
The new stack is a Custodis chimney built by the Alphons Custodis Chimney Construction Co. of Chicago. The stack was placed on a concrete foundation 28 ft. square and 9 ft. deep resting on a gravel bottom. The lower part is square, built of hard brick, and above the square part cellular brick of the Custodis pattern was used, each brick being locked to the next by cement mortar in the cavities. This makes a substantial and neat stack of much less weight than where ordinary brick is used. Its height is 150 ft. which is 25 ft. higher than the old stack, its diameter at the flue is 8 ft. 8 in. and at the top 7 ft. 6 in. It was built without scaffolding from the inside with a platform and tripod. The iron ladder is on the inside of the stack.

Sub-stations.

There are at present five sub-stations in operation and under construction, and portable sub-station. These are located at Springfield, Urbana, Brighton, West Jefferson and Columbus. The general ap-

pearance of the exterior of the sub-stations is shown in the accompanying illustration. The buildings are entirely plain and are substantially built of brick with slate roofs and large windows. These stations have concrete floors with structural steel framing in the floors for all openings as well as steel framings for galleries and bus bars.

The Springfield sub-station contains two 600 volt rotary converters with speed limit switches, 6 oil cooled transformers, two 45-kw. oil



SWITCHBOARDS.

cooled reactive coils. The switchboard contains two direct current rotary converter panels and three feeder panels. The bus lines are mounted above the transformers and back of the lightning arrester on Locke "Imperial" porcelain insulators. The lightning arrester is directly above the transformers and there are nine oil switches between the bus bars and transformers. There are two incoming lines and two outgoing lines, the latter running from Springfield to the Brighton sub-station. The high tension lines to the transformers are connected in at the top of the transformers and are carried on insulators while the low tension lines are connected at the sides of the transformers. The high tension switches have trip

load due to holiday crowds, fairs, etc. This car is very substantially built and the incoming lines enter it at one end on heavy porcelain insulators. It is equipped with a 600-volt rotary converter, a three-phase air blast transformer, a blower set consisting of a 370 volt induction motor direct connected to a 40-in. Buffalo blower, one air blast reactive coil and switchboard with the necessary instruments and indicating apparatus. The transformer has the three phases contained in one case, making it very compact. The primary current is 7.22 amperes and the full load secondary 515 amperes.

The West Jefferson & Brighton sub-stations are equipped with single units and provision has been made for an additional unit. These stations are about 15 miles apart. The sub-station at Columbus is somewhat different in its arrangement as provision has been made for the installation of three units with air blast transformers. This station is arranged so that it can connect in with the Buckeye Lake & Newark line, so that in case of any trouble with the high tension system at Medway this circuit can be thrown in on the Buckeye Lake transmission line to prevent a tie-up on the Columbus end of the system. For this purpose one of the units at this sub-station will be used with a compensating transformer. The primary is designed for 220 kw., 110 kw. to be used with the secondary as an ordinary transformer and the remaining 110 kw. as a compensator giving 13,200 V volts, which is the voltage of the Buckeye Lake system.

The arrangement of the wiring of all the intermediate sub-stations, such as Brighton and West Jefferson, is practically uniform. In the Columbus sub-station the wiring is somewhat different in order to provide for the inter-connection between the Buckeye Lake & Newark system and the Columbus, London & Springfield system.

Transmission Lines.

The transmission line reaches from Medway to Columbus, a distance of 50 miles and is a single line at present. The poles are 35 ft. long spaced 100 ft. apart, some being sawed and others dressed. The line follows the railway from Medway to a point near Springfield where it takes a roundabout course so as to avoid the city. In the same way it takes a course around Somerford. Passing back to the track at Lafayette it follows the road to a point near Columbus where it passes into the Columbus sub-station situated in the suburbs. The wires are run in the form of a triangle 3 ft. between each wire and they are mounted on Hemingray glass insulators of the triple petticoat, three-groove type with the pins projecting well up into the insulator. The pins are of locust soaked in paraffine. The size of the wire used from Medway to Springfield is No. 1 and



STANDARD CLOSED CAR

coils which open them in case of an overload and this action is shown by the lighting of the pilot lamps. The rotary converters are compound wound and are equalized on the negative side. These machines have oscillators attached which cause the armatures to move laterally and cause an even wear on the commutator by the brushes. All rotaries are started from the alternating current side through reactive coils. The commercial efficiency of the rotaries is 94 per cent and their weight is 23,500 lb. They will carry an overload of 50 per cent without parking.

The company has a portable sub-station which can be used at any point along its line in case of an emergency or an increase of

from Springfield to Columbus No. 4. This line has withstood severe electrical and rain storms. The top insulator pin is fastened to the top of the pole and all gains are painted with white lead before the cross arms are put in place. All corner poles are well guyed and provision is made to prevent wires from pulling off when on curves by heavy upright pieces from the lower to a top cross arm on the inside of the curve. The transmission line is now being extended to Urbana where a combined sub-station, waiting room, dwelling and baggage and express building has been built. This building is ornamental in design and is arranged to be operated with a minimum of attendance.

Rolling Stock.

The rolling stock of these roads is modern in every respect. The following description shows one of the cars used on the Dayton, Springfield & Urbana line, these cars being 50 ft. long, 8½ ft. wide and equipped with four 50 h. p. motors. They have semi-pneumatic tires, some having electric brakes and B.S. controllers, others are equipped with Christensen air brakes. There are two trolley poles to each car and Wagenhals head lights are used. The cars are vestibuled and have smoking compartments at one end. All the seats have plush cushions and backs and the interior finish is of mahogany. They are equipped with "Providence" fenders. The cars used on the Columbus, London & Springfield division are 60 ft. long, vestibuled at each end and the interior is mahogany finish. The cross seats are plush covered and are arranged with a center aisle. These cars are equipped with four G.E. 73 motors of 75 h. p. and the type M system of control is used. There are side brackets on the

trucks for the third rail system and the cars are equipped with Christensen air brakes and are mounted on swing bolster trucks, making very comfortable riding at high speed. The combination cars have a smoking compartment and baggage section, the latter having side drop seats. The company also has several new 60-ft. express cars in service which are equipped with the G.E. motors and controllers. Its express and freight business is increasing rapidly and large cars are required for this service. Both the passenger and freight cars were built by the Barney & Smith Co., of Dayton, O.

The roads herewith described were built by the Great Northern Construction Co., of which Mr. C. A. Alderman is chief engineer. The power house was also built by the same company, the writer being the resident construction engineer. Mr. Egbert Douglass was the resident engineer for the General Electric Co. Mr. A. E. Appleyard is managing director of the Appleyard system, and Mr. R. Emory is general manager.

Methods of Bringing High Tension Conductors into Buildings.*

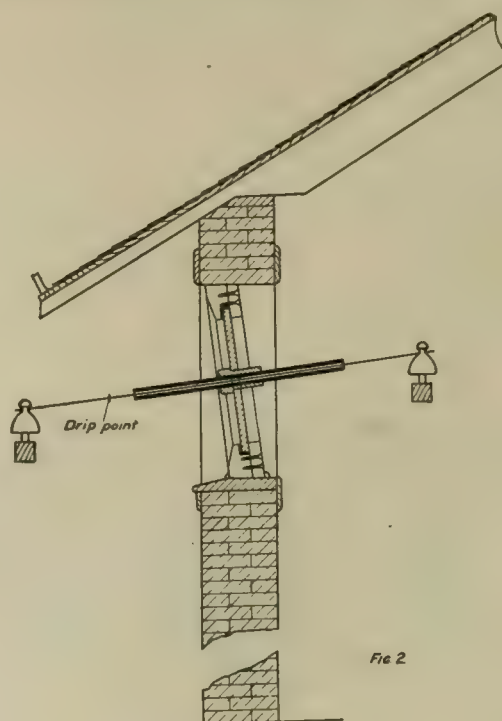
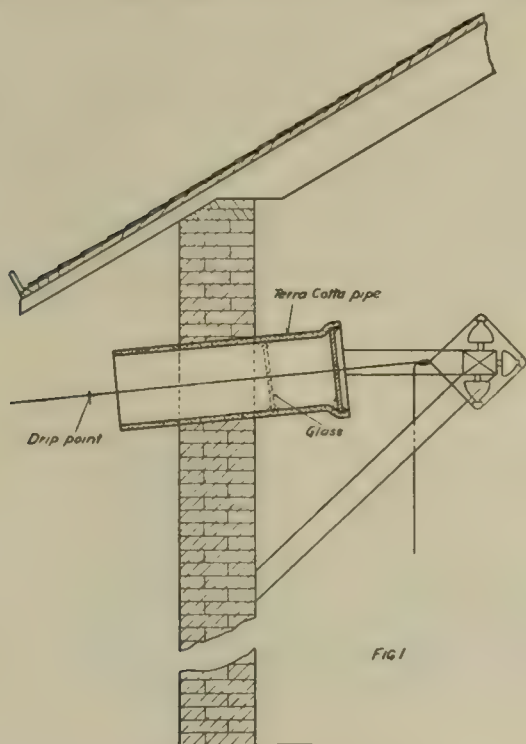
BY C. E. SKINNER

One of the points in the design of high tension transmission lines which seems not to have received general attention is the methods of supporting and insulating conductors entering stations. In some cases the line is brought through a hole in the wall; in others through a system of tubes in the wall; in others through a piece of insulating material set in the wall; in others through an elaborate tower on top of the building, or it is taken directly through the roof of the building.

While no fixed method can be prescribed for all voltages and locations much would be gained if there were some general and accepted scheme which could be followed by designers of buildings.

should be prevented both to avoid damage to the contents of the building and on account of weakening the insulation at the point of entrance. In most climates it is necessary to have all openings closed for at least a portion of the year. Proper mechanical fastenings must be supplied to take up the end strain of the wire. It is also necessary to hold the wire in a fixed position where it passes through the opening into the building. It is self evident that the construction must be such that it will be reliable under all circumstances, and usually as in most other work the simplest form of construction will be found the most reliable.

The simplest form of construction consists merely of an opening in the wall large enough to allow the proper air insulation between



The methods to be followed will depend on the following conditions: (1) The voltage of the transmission circuit. (2) The climate in which the plant is operated. (3) The size of the high tension conductor. (4) The kind and height of building used. (5) The conditions of approach to the building and the location of the apparatus in it.

To maintain proper insulation it is necessary either to allow sufficient open space about the wire, or some insulating medium such as a tube must be used. The entrance of moisture, snow and dust

the wire and the wall, this opening being suitably protected from rain either by means of a large pipe set in the wall sloping outwards or by a sufficient extension of the roof above, or both. The pipe must be of a sufficient size so there will be no possibility of striking across under any conditions. The pipe should always be considered as ground and the cross arms holding the wire both inside and outside of the building should be so located that the wire will remain central in the pipe. This construction can be used to advantage only in dry, warm climates.

With potentials of 15,000 volts or lower a disk of glass or other fireproof insulating material placed over the wire at the inner end

*Abstract of a paper read at the 20th Annual Convention of the American Institute of Electrical Engineers.

of the pipe will usually accomplish this purpose. In this case the tube must be large enough so that the surface insulation of the disk will be ample to prevent trouble under the worst conditions. Where there is any danger of condensation of moisture due to the difference in temperature on the different sides of the disk, two disks a little distance apart should be used. The disks may be placed in the pipe itself or they may be cushioned and swung on the wire itself resting against the ends of the pipe. The surface insulation of the disks should never be less than that of the line insulators, and as they will usually be less advantageously placed extra distance should be allowed if possible.

For voltages above 15,000 a long insulating tube of small diameter and very heavy wall may be placed over the wire and placed through a slab of insulation set in the wall of the building. This should be protected from the rain by an extension of the roof. The tube should slope outward in all cases. Some form of drip point should be provided on the wires just outside of the tube. The slab holding the tube should be large enough to prevent actual breakdown even if the tube is broken. Both tube and slab should be of fire proof material. This form of construction has been successfully used for potentials as high as 50,000 to 60,000 volts. Glass and porcelain are electrically the best materials for this purpose but when these are

used it is generally necessary on account of their lack of mechanical strength to take up the end strain outside of the building.

Tower construction may be necessary where the building is low, but it is generally very cumbersome and bringing the wires through the sides of the tower presents the same problem as bringing them through the sides of the building. The wires may be brought directly through the roof of the building but this requires extra precautions to secure sufficient insulation and to keep out all moisture. This method, however well carried out, will probably constitute a danger point in the system.

No combustible materials should be used near the wire even when separated from it by insulating material, as leakage or brush discharge is liable to cause burning sooner or later. Figs. 1 and 2 show diagrammatically the two plans recommended. Both of these plans are in successful use by important transmission plants. Changes in details to suit particular cases may be necessary, but it is believed that the plan proposed may be made effective for any transmission circuit. The subject of bringing the wires into buildings should be carefully considered when the building is designed and proper provision made. This point is frequently not taken into consideration and the result is an unsightly and unsuitable arrangement made after the completion of the building and at an increased expense.

Some Recommendations Concerning Electrical and Mechanical Specifications of Trolley Insulators.*

BY SAMUEL SHELDON AND JOHN D. KEILEY.

At present there appears to be no standard basis for comparison of relative merits of insulators for overhead trolley line construction. It is obviously desirable that there should be a definite basis upon which a proper selection can be made. With a view to formulating specifications for such materials it was found necessary on account of the lack of published data to conduct a series of tests to determine the electrical and mechanical properties of these materials. The tests were made upon samples obtained in the open market and some of the results of these tests and recommendations concerning specifications are given. Determinations were made of the tensile strength of the samples of the voltage necessary to perforate the insulation or arc between the conducting parts, of their mechanical softening temperature and of the relative magnitudes of the insulation resistances.

Tensile Strength.

These tests were made by pulling the samples apart in a Riehle 30,000-lb. machine. Globe, Brooklyn, and other strain insulators were tested in this way and the results obtained from breaking the samples are given below. The product of different makers is represented by the letters *A*, *B*, *C* and *D*, and the numbers represent the tension in pounds when the sample broke.

| 2½-IN. GLOBES. | | | |
|------------------|----------|----------|----------|
| <i>A</i> | <i>B</i> | <i>C</i> | <i>D</i> |
| 3710 | 5050 | 7725 | 6320 |
| 4510 | 5770 | 7475 | 6890 |
| 3-IN. GLOBES. | | | |
| <i>A</i> | <i>B</i> | <i>C</i> | |
| 4210 | 11190 | 5450 | |
| 5310 | 8930 | 5550 | |
| SMALL BROOKLYNS. | | | |
| <i>A</i> | <i>C</i> | <i>D</i> | |
| 8880 | 10320 | 5520 | |
| 11130 | 9010 | 6150 | |
| LARGE BROOKLYNS. | | | |
| <i>A</i> | <i>B</i> | <i>C</i> | |
| 11490 | 10670 | 18510 | |
| 19510 | 17140 | 18250 | |
| INSULATED BOLTS. | | | |
| <i>A</i> | <i>B</i> | <i>C</i> | <i>D</i> |
| 6370 | 6130 | 7360 | 3280 |
| 4495 | 5490 | 6010 | 2925 |

Some of the samples gave way in the eye, others broke in the insulation. It is very desirable that strain insulators should be so

Abstract of a paper read at the 29th Annual Convention of the American Institute of Electrical Engineers.

designed that when subjected to a test for tensile strength they should give way in the eye. It is important that one may be able to depend upon the fact that if the eyes be intact the insulation is also in good condition.

Breakdown Voltage.

In carrying out these tests the two metal portions of the insulators were connected respectively with the two high pressure terminals of a 1:200 step-up transformer whose low pressure terminals were connected in series with a regulating rheostat to an alternating current supply with a frequency of 60. A dead-beat volt meter was connected to the low pressure terminal. By means of the rheostat any desired voltage could be impressed upon the low pressure coil and its value determined from the volt meter. The high pressure voltage would be 200 times as large provided the insulator was unpunctured and there was no arcing present. The test was started with a low voltage which was gradually raised until a sudden drop in the volt meter reading indicated that a breakdown had occurred. The following results were obtained.

| 2½-IN. GLOBES. | | | |
|------------------|----------|----------|----------|
| <i>A</i> | <i>B</i> | <i>C</i> | <i>D</i> |
| 8010 | 8610 | 5610 | 7500 |
| | 7610 | 5110 | 6110 |
| | | 4510* | 5910 |
| 3-IN. GLOBES. | | | |
| <i>A</i> | <i>B</i> | <i>C</i> | |
| 11410 | 12810 | 8010 | |
| 10810 | 10810 | 9010 | |
| SMALL BROOKLYNS. | | | |
| | <i>B</i> | <i>C</i> | <i>D</i> |
| | 14810 | 6710 | 35000 |
| | | 5510* | |
| LARGE BROOKLYNS. | | | |
| <i>A</i> | <i>B</i> | <i>C</i> | |
| 8010 | 14410 | 11410 | |
| 4210 | 13010* | 7610* | |
| 4010* | | | |
| INSULATED BOLTS. | | | |
| <i>A</i> | <i>B</i> | <i>C</i> | <i>D</i> |
| 12010 | 14450 | 12210 | 5100 |
| 13010 | 14450 | 10010 | 25000 |

The voltage necessary to rupture the dielectric would undoubtedly have been less than the amounts given if the duration of the application of the high pressure had been increased. In practice trolley insulators are seldom subjected to a voltage greater than that of the

generator or motor. The values which are followed by an asterisk were obtained from tests on insulators which were at the time under a tensile strain of about 4,500 lb. The dielectric strength is slightly reduced by strain but in all the samples tested it was sufficiently high to meet the requirements of present practice.

Heat Tests

Often when a trolley wire breaks it becomes heated on account of the grounding of a broken end and often the insulating material in the round top hangers softens under the influence of the heat communicated from the wire and allows the ear and wire to drop to the ground. Efforts were made to determine the temperature of the insulation at the time of softening. A hanger was screwed into

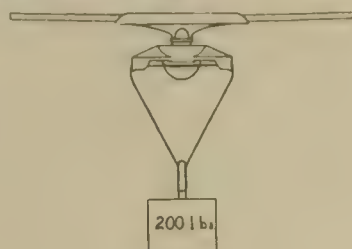


FIG. 1.

a regular ear and was suspended in an inverted position in a double walled oven. A weight of about 100 lb. was attached to the suspended cap, this weight being equal to about 200 ft. of No. 000 trolley wire. The temperature of the oven was raised and noted on a mercury thermometer whose bulb was placed near the ear. Unquestionably the temperature varies greatly at different points inside the insulating material, but the material next to the metal, however, is probably the hottest and its temperature is nearly that of the metal. As the temperature rose the insulating material softened and the weight pulled the round top cap of the hanger away from its bolt. This result was obtained in the case of three samples at the following temperature: A, 168° C.; B, 168° C., and C, 145° C.

Appreciating the uncertainty of such a test, another method was devised which tested the hangers under working conditions. This method gives but relative results but under the circumstances they are more to be desired than absolute values of temperature.

A soft, iron, round rod $\frac{1}{4}$ in. in diameter and 20 in. long was clamped by an ordinary trolley ear $5\frac{1}{2}$ in. long. This was suspended as shown in Fig. 1, and into the ear was screwed the bolt of the round top hanger to be tested. To the cap of the hanger was suspended a weight of 200 lb. A current of 200 amperes was then sent through the iron and the time which elapsed between closing the circuit and the separation of the parts of the hanger was noted. These times in minutes were as follows:

| A | B | C | D |
|----|----|----|----|
| 50 | 34 | 94 | 74 |

Efforts were made to determine roughly the character and composition of the insulating materials employed. Upon ignition each of the materials burned quietly with a very small flame and with the characteristic odor of burning shellac. Each sample when placed in alcohol went partially into solution, leaving a residue. Mica and asbestos were present in some of the residue. If the binding material be in all cases shellac the softening temperature is an indeterminate quantity. Its viscosity rises with increase of temperature. Insulating bolts were placed in boiling water and allowed to remain until they had assumed the temperature of the water, 100° C., and in each case the insulating material softened so as to permit of molding under slight pressure. The viscosity at a given temperature is also dependent upon the relative amount of shellac to the other material present.

Insulation Resistance.

The resistance of an ordinary strain insulator is very large and if it were not for the large number of them connected in parallel no consideration need be given to this point. The following method of determining the relative resistance values was devised. A Holz machine when run at a constant speed owing to its practically infinite internal resistance functionates as a constant current generator. For obtaining the comparative values of the resistances of the insulators such a machine was used as a source of e. m. f. The apparatus was arranged as shown in Fig. 2.

The relative resistances obtained by this method are given herewith in terms of an arbitrary standard.

| 2-IN. GLOBES. | | |
|------------------|----|------|
| A | B | C |
| 61 | 98 | 1.7 |
| 55 | 76 | 12.0 |
| 2½ IN. GLOBES. | | |
| A | B | C |
| 27 | 36 | 1 |
| 55 | 18 | 1.5 |
| 61 | 37 | 1 |
| SMALL BROOKLYNS. | | |
| B | | |
| | 35 | 40 |
| | 35 | 43 |
| LARGE BROOKLYNS. | | |
| A | B | C |
| 0.7 | 39 | 27 |
| 0.8 | 41 | 27 |

Specifications.

Specifications for the various forms of insulators used in trolley construction must vary with local conditions and with the policy of the user. Specifications for Globe and Brooklyn Strain insulators should cover the following points:

1. Dimensions.
2. Size of eye.
3. All samples tested shall break in the eye.
4. The average ultimate tensile strength of all samples subjected to mechanical test shall not be less than A lb., and no individual sample shall show a tensile strength of less than 85 per cent of the average tensile strength of all the samples that are tested.
5. The average break-down voltage, for samples which have been broken in the eye in the mechanical test, shall not be less than B volts, and no individual sample shall break down at less than 90 per cent of B volts.

As to the values to be specified for ultimate tensile strength and breakdown voltage, the following are suggested, where high class insulators for use on 500 volt lines are to be specified.

| | Ultimate Tensile Strength in lb. | Breakdown Voltage. |
|-----------------|----------------------------------|--------------------|
| 2½-in. globes | 6000 | 7000 |
| 3-in. globes | 9000 | 10000 |
| Small Brooklyns | 9000 | 10000 |
| Large Brooklyns | 18000 | 10000 |

Owing to the comparatively low softening temperature of the insulating materials generally used, and to the close proximity of the working conductor when in service, it is important that specifications

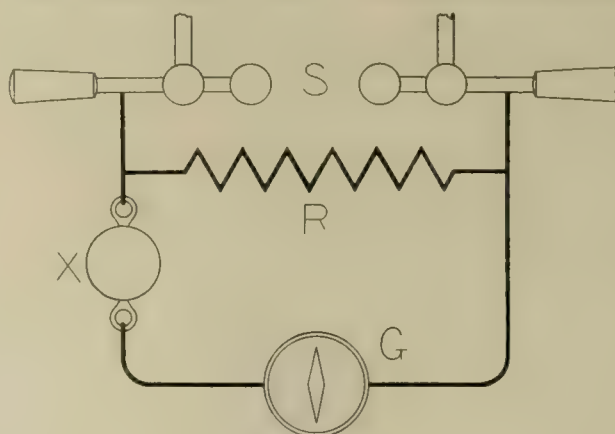


FIG. 2.

for round-top hangers should impose a test for softening temperature. The following "hot rod test" is suggested:

Round-top hangers when suspended free from draught in an inverted position by means of a bronze ear weighing 8 ounces and being $5\frac{1}{2}$ in. long, the ear clamping the middle of a round rod of soft iron $\frac{1}{4}$ in. in diameter and of at least 20 in. length between connectors, must be able, without breaking down or becoming permanently deformed by more than $1/16$ in., to sustain a weight of 200 lb. from the cap for one hour, a current of 200 amperes being passed continuously through the iron rod, the rod being cold at the start.

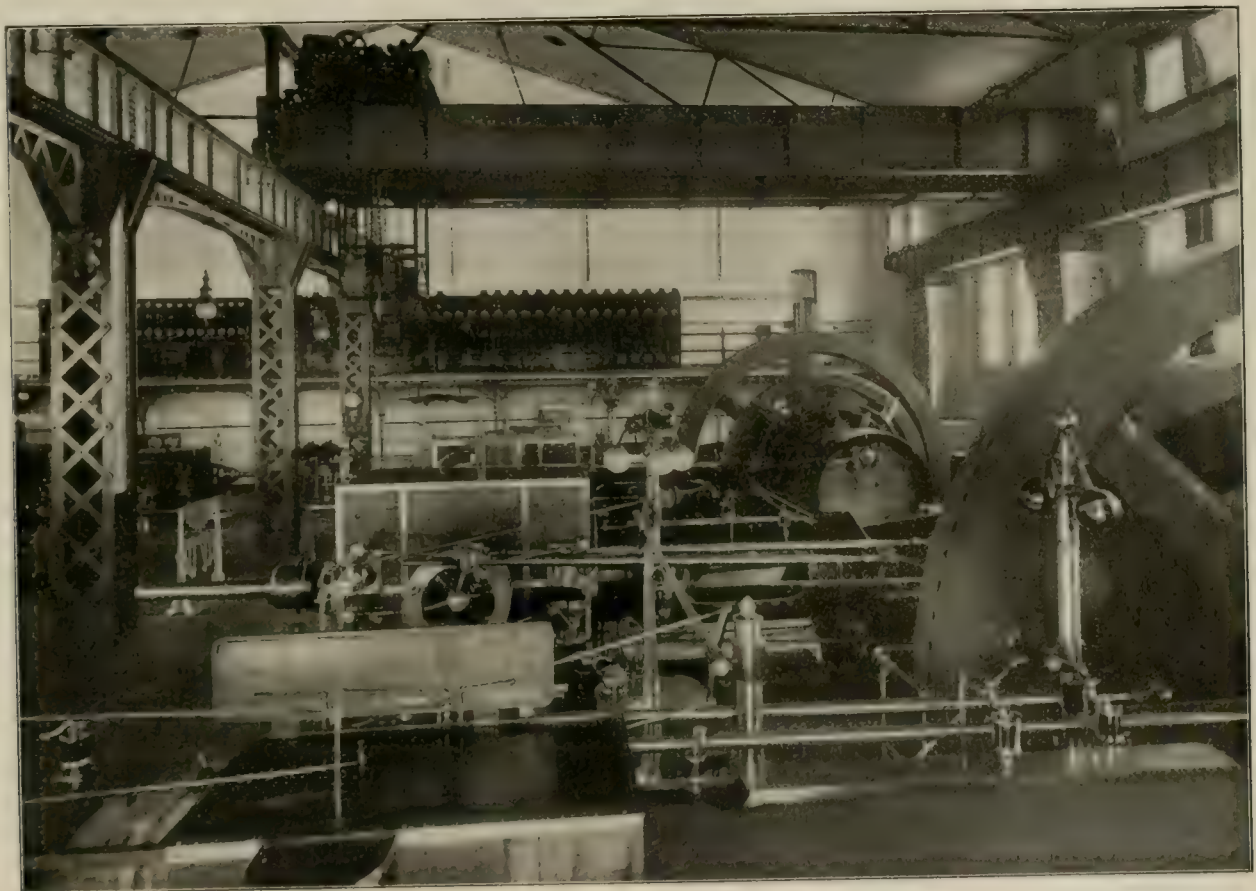
The Tramways of Sydney, New South Wales.

The most complete tramway system in the southern hemisphere is that located at Sydney, the capital of New South Wales. This most important state of Australia is situated on the shores of Port Jackson and has a population of about half a million people. About forty years ago a horse railway was built in Sydney, the rail for which was laid considerably above the street level. This was found so objectionable that the road was discontinued after being in operation but a short time and no further development occurred in the street railway field in this city until 1879, at which time an international exhibition was held in Sydney.

The terminus of the railway system of the state is about a mile and a half from the site of the exhibition and the harbor, and in order to connect this site with the railway a road was built and operated by steam motors. This road proved a great financial suc-

cess, or a cable line constructed, the latter in the meantime having been laid in the adjoining capital of Victoria, Melbourne, and proving a splendid success. Owing principally to this success, it was decided to lay down a further length of cable line.

A few years later again, another discussion took place in connection with further extensions, as to whether the time had not arrived when the new lines should be laid down on the electric system, and the success of American enterprises was so convincing that in 1895 it was decided to build a power house, and to construct tracks through the main streets of the city to be worked on the electric system, and the first electric lines were opened in December, 1899. And not only are new lines in and about Sydney being built on the electric system, but the steam and cable also are being converted to the more modern system, and in a comparatively short



HORIZONTAL ENGINES, ULTIMO POWER STATION, SYDNEY.

cess owing to the heavy traffic from the railway, especially during the time the exhibition was open, and it was so generally appreciated by the public that numerous applications were made for the extension of tramways to the different suburbs. These tramways were undertaken by the government and have throughout been constructed and maintained by the state. Private ownership has not been favored locally although private companies have endeavored to obtain permission to build tramways but without success.

For about seven years after their establishment in 1879, the steam tram were the only ones thought of but cable lines in San Francisco proving so successful, as also in New Zealand, led to inquiries being made in favor of cable trams in directions where there were heavy gradients and a line was laid down in what is known as North Sydney on the opposite shore of Port Jackson to the city proper. A few years later in considering a project for a new tramway to the eastern suburbs of Sydney, considerable discussion ensued as to whether the new system of electric traction should be

time the whole of the lines in and about Sydney will be worked under the electric system. At the present date, the total mileage, single track, on the electric system is 102; there are 5 miles of cable road, while 28 miles are still worked by steam.

Local Features.

Sydney possesses the characteristics of being a very hilly city, and consequently gradients are numerous and steep, and curves are frequent. Grades as severe as 1 in 80 in one case have to be surmounted, and in order to render the working safe at this point, a counter-weight system is adopted. In other parts of the city grades ranging from 1 in 10 to 1 in 20 are met with, and are worked without any special contrivances other than the power brakes.

In regard to the curves, the sharpest is 46 ft. radius on balloon loops, and on the main lines 66 ft. radius.

One difficulty that presented itself when laying out the trams, was

the narrow and sinuous course of the principal thoroughfares. One of the principal streets through which the tramways run has a width of 33 ft. from curb to curb, and in this a double line of tramways is laid, and has been worked without accident, although it necessarily entails great caution, both on the part of the drivers and those conducting the vehicular traffic.

The lines do not possess any special engineering features. The bridges are comparatively few. One long bridge over an arm of the harbor has a total of nine spans, the aggregate length being 1,140 ft.

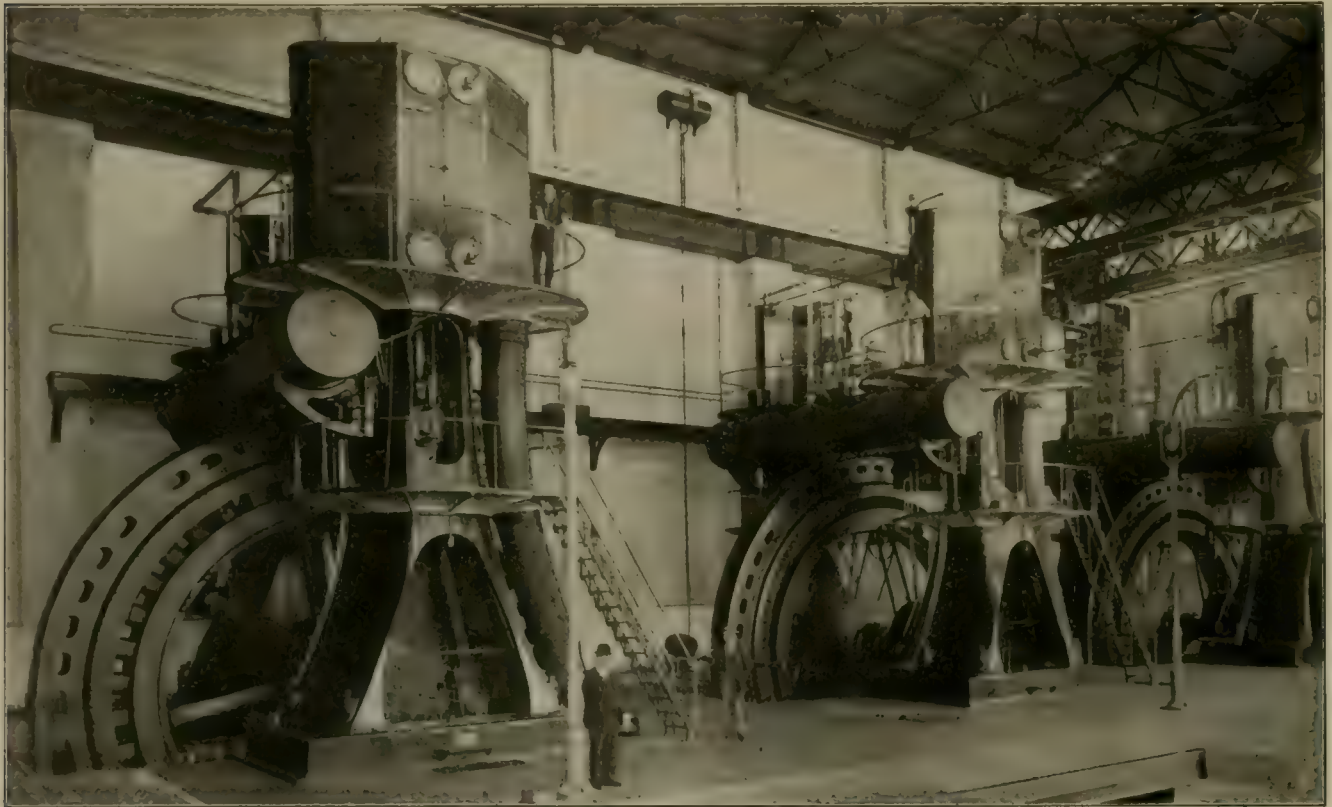
Permanent Way Construction.

The track is laid to standard gage, 4 ft. 8½ in. and the standard rail is an 83-lb. girder rail. T-rails of 80-lb. and 60-lb. sections are also used, to which a 42-lb. rail is attached as a guard, the lines having been originally laid with the last-named section. The girder rail is adopted in the city where the streets are largely laid with wood blocks, but on the macadam roads the T-rail is more generally adopted. The length of rail now used is 30 ft. A special feature in connection with the 80-lb. T-rails is the provision of milled

plastic bond has given the highest conductivity of any, but longer experience is required to fully demonstrate its reliability. The "Crown" type of copper bond has also been largely used, where the type of rail was not suitable for the plastic bond.

Overhead Construction.

The overhead trolley is used exclusively. Side pole, centre pole, and span construction are all used on various portions of the track, the form used depending upon local considerations. In the main streets handsome poles of the Mannesman type are adopted for centre and span poles. In other streets the Morris-Tasker poles, of a minimum size of 5, 6 and 7 in. internal diameter, are used for span poles. In the outlying suburbs local iron-bark poles are used. These are grown and obtained within 50 miles of Sydney. They are straight, 29 ft. 6 in. in length, and have a straight taper from a diameter of 10 in. at the ground level, to 6½ in. at the top. These cost, delivered in Sydney, about £1-15-0 each, and they are estimated to last from 25 to 30 years. Sydney is fortunate in possessing such excellent material both for the permanent way and for



VERTICAL ENGINES, ULTIMO POWER STATION, SYDNEY.

rails and fish-plates, the rails being specially butted, and bolts made a driving fit, no expansion being possible. The bonding is efficiently and cheaply provided for in connection with this joint by the insertion of a thin sheet of copper between the top and bottom edges of the fish-plate and the surface of the rail, all of which are milled. Nothing has so far been done in regard to track welding, although the question is under serious consideration.

In regard to the structure of the permanent way, the tracks through all the principal streets are laid in wood blocks, 6 x 3 x 9 in., made of local hardwood, and this wood is found to give excellent results, either when used for wood blocks or for sleepers. In fact, it is considered that the iron-bark, used for sleepers, is the best timber of its kind for this purpose to be found in the world. After the wood blocks have had a life of 12 years, when the track is being renewed, the old blocks are cut for rails of shorter section, and are found to be perfectly sound. Cross sleepers are used, the dimensions being 9 x 4½ in. x 8 ft., there being 13 laid to a 30-ft. rail.

The cost of a macadamized track when laid down may be estimated at from £2,500 to £3,000 per mile of single track, T-rail, and of the girder rail track, wood-blocked, about £5,000 per mile.

In regard to rail bonding, the experience of the engineers is that

the trolley poles. The poles are placed at an average distance of 40 yards.

A copper trolley wire of .132 sq. in. sectional area is used throughout. Two forms of wire have been in use, the figure 8 and the circular section, but so far experience has shown that the latter appears to answer better. A fixed trolley head is used, and the overhead wiring is laid out accordingly, the wire being located centrally.

The system being one of direct current supply to the area in the immediate vicinity of the power house, and high tension supply to sub-stations in the outlying areas, there are three-phase alternating current feeders to the latter. These are three-core paper insulated lead-covered cables, laid in double hardwood troughing. In order to feed the North Sydney sub-station it is necessary to cross the harbor, and for this purpose two lengths of 2,700 ft. of paper-insulated lead-covered double steel wire sheathed cables have been used. Some little trouble has been experienced so far with the submarine cables owing to seepage of the water, as the result of a faulty joint, but local experience has not been sufficient to demonstrate the merits or value of the paper-covered submarine cable as against other forms, such as india-rubber, which have been suggested. All the

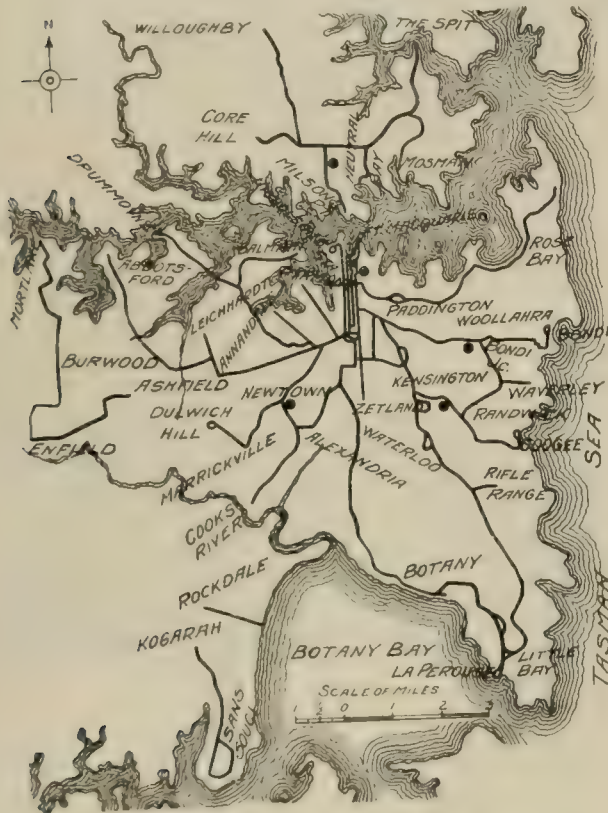
high tension cables are in duplicate and are of the same area, viz, 3 cores of 37 No. 16 S. W. G. each.

The direct current feeders from the power-house are bitumen insulated, drawn into bitumen conduits with man-holes at distances of about 300 ft. apart. More recently laid direct current feeders in the city from the sub-stations have, however, been paper-insulated, lead-covered solid laid, similar to the high tension feeders described above.

Electric Power Station.

The power station is located in a central situation, convenient for the lines of the whole system, and at the same time close to the waters of Port Jackson, so that ample supplies of water are obtainable alongside for condensing purposes. The greatest distance which power has to be transmitted from the power station in any direction is at present seven miles. One of the illustrations shows the exterior of the power house, which is located in a portion of the city known as Ultimo. It has a total length of 318 ft., a width

three cross-compound condensing engines of the vertical type, made by the Allis-Chalmers Co., and rated at 2,850 h. p. each, at 75 r. p. m. Each horizontal engine is direct coupled to an 850-kw. General Electric compound-wound railway type generator, and each vertical engine is direct coupled to a 1,500-kw. three-phase rotating field alternator, also of the General Electric Co's. make, furnishing currents at 6,600 volts, 25 cycles. It is customary to keep one unit of



MAP OF SYDNEY TRAMWAYS.

of 186 ft. and consists of three stories and covers on the ground floor 59,148 sq. ft. The building is a brick structure, on stone foundations, and as will be seen has three chimneys, also of brick, the height of the chimneys being 227 ft. with an internal diameter of 11 ft.

At the present time there are installed in the power house 32 boilers of the Babcock and Wilcox make, and additions are in progress. The boilers are arranged in two tiers. Each is rated at 250 h. p., and has a heating surface of 2,852 sq. ft. B. & W. automatic chain grate stokers are used, and the boilers are fed by coal conveyors, electrically driven. Small coal is used, brought from local collieries, the nearest situated about 30 miles from the power house. A siding leads from the railway into the power house, so that no handling is necessary. The coal is obtained at a cost of from 3s. to 4s. 6d. per ton at the pit, and as it is hauled by the state railways, it is consequently delivered at a minimum of cost. About 200 tons of coal are used per day, and the ashes which result are removed by the same conveyors as are used for the coal.

The engine room has a length of 275 ft., a breadth of 99 and height of 30 ft. There are four cross-compound condensing horizontal engines, made by the Allis-Chalmers Co., of Milwaukee, running at 100 revolutions per minute, and rated at 1,250 h. p. each, and also



ULTIMO POWER STATION, SYDNEY.

each type in reserve and to operate each of the units in work up to 25 per cent overload for a short period at the busiest times of the day. The present output of the station is about 85,000 to 90,000 kw.-hours per day.

The switchboards are of the General Electric Co. make, and this company has been the successful tenderer in each instance for the supply of the generating equipments and switchboards. The original plant was entirely for direct current supply, and the 600 volt switchboard is situated at one end of the power house. This is of the well-known railway type and consists of four generator, one summation and twenty feeder panels in addition to which there are six lightning panels in connection with the railway and tramway work under the commissioners. When the three-phase plant was laid down about a year ago, the alternating current



WAVERLEY SUB-STATION.

switchboard was erected in a central position in the power house. This is a handsome board of blue Vermont marble, and consists at present of six generator, one summation, three exciter and five feeder panels.

The switchboards at the five sub-stations consist of the standard American type of converter and feeder panels, as well as the necessary equipment for booster and battery operation.

Sub-stations.

There are at present five sub-stations, each containing two 150 kw. shunt wound converter, and two battery boosters each capable of boosting a current of 1,000 amperes. Each sub-station is equipped with two batteries of the Tudor type, having 280 cells each of 500 ampere hours capacity. Each is also equipped with six air-blast



INTERIOR, WAVERLEY SUB-STATION

transformers of 175 kw. output each. The location of the existing sub-stations is indicated on the map by heavy black dots. Boosters are also being installed in the power house and sub-stations for dealing with the return current.

Rolling Stock.

In regard to the rolling stock, 150,000,000 passengers are carried annually, and it can be well understood therefore that it is necessary to have a very considerable rolling stock. At the present time the stock in use is 400 electric, 60 steam, and 70 cable cars, the electric cars averaging a seating capacity of 40 passengers, the steam 70 passengers, and the cable about 20. It is not intended to describe the cable and steam cars in detail, as they are not to be continued, being shortly to be superseded by the electric cars. There are several distinct types of electric cars in use, viz.: four-wheeled closed and side-door, double truck California, with longitudinal seats, and double coupled cars with cross seats at one end and the saloon at the other.

All the cars have one deck only. In the early stages, when steam cars only were run, double-deckers were used, but discarded as they were found inconvenient both with regard to the facility with which passengers entered and left, as well as for the collection of fares.

The general practice is to run independent cars, but the demand locally has been for coupled cars, and in consequence of the disadvantage connected with trailers, the motor cars are coupled in pairs.



STANDARD DOUBLE TRUCK COMBINATION CARS, SYDNEY

This has been effected very successfully in connection with both the four-wheeled and the bogie types of motor car. Special couplers have been designed for this purpose, and in some cases the cars are coupled together or disconnected while in service in accordance with traffic requirements. In other instances they are kept permanently coupled. The class of controller used for this purpose is of the

ordinary four-motor type. Some little trouble was originally experienced with the electrical couplings, but this has been entirely surmounted.

One feature of the traffic in Sydney is that a number of very popular resorts are served by the tramways, such as the cricket ground, show ground, and race courses, where, particularly at holiday times, a very large number of people have to be carried at one time, and as many as 14,000 persons are carried from one place in 20 minutes by the trams. In order to deal with this traffic, not only are the single cars used, but trailers seating 70 persons which were used on the steam trams are attached to two coupled motor cars, and run without difficulty.

At the present time each car is equipped with hand and air brakes. Previous to the introduction of the electric cars, the cable cars were equipped with air brakes, the air for which was compressed by an axle-driven compressor actuated by an eccentric strap on the axle of the dummy. In the earlier types of electric cars the same practice was followed but the more rapid service was found to be unsuitable for this type of compressor, and after various tests the commissioners have adopted the Christensen motor driven compressor and brake equipment on all cars. Every car is fitted with a life guard, which is flush with the front of the car, and is released automatically. Heaters are not used in the cars, the climate being equable, and the cars are electrically lighted.

Originally 25-h. p. motors were used on the four-wheeled motor cars, but the present practice is to equip them with 35-h. p. motors, and the bogie cars with 40 or 50-h. p. motors. Every motor car is equipped with two motors. The controllers found most satisfactory up to the present are the G. E. type K6

Car Sheds

Car sheds are provided at convenient localities for the convenience of working, and are seven in number. They are substantially



CAR HOUSE, PORT MACQUARIE.

built of brick and provided with pits throughout, and hold from 70 to 187 cars each. They are fitted with all conveniences, such as lavatories for the drivers, conductors and repair staff, offices for the revenue clerks, dining rooms, and the necessary offices for the collection of revenue, etc. One feature is to make the comfort of the staff a consideration.

The cars are built by private companies, but there is one general repair shop for the system. Ordinary running repairs are effected at the car sheds, but periodical overhauling and larger repairs are carried out at the general repair shop. This shop is a special feature of the system, and is equipped throughout with traversers, overhead cranes, and every class of labor-saving appliances.

Traffic Arrangements.

The service is practically a continuous one throughout the 24 hours, but of course is more frequent during the business times of the day, and in the principal thoroughfares trams are run on a headway of 30 seconds. The average speed per hour within the city is 8 miles and outside the city 10 miles. The lines are divided into convenient penny sections, such sections averaging two miles in length, but passengers on entering a car are able to pay for the

a half millions, the return paid upon the capital for the last financial year being about $3\frac{3}{4}$ per cent.

The average hours worked by the running men are eight per day. The conductors' wages average 7s. per day, with a maximum of 7s. 6d., and for the motormen the average is 8s. 3d., with an ordinary maximum of 8s. 6d.

The magnitude of the operations is evidenced by the total staff employed, which at the present time numbers four thousand.



STANDARD SINGLE TRUCK SIDE DOOR CARS, SYDNEY.

through journey, tickets being given by the conductor for either 1, 2, 3 or more sections. The longest through run is $11\frac{1}{2}$ miles, the fare for which is 6d.

Financial.

The total revenue collected for the six months ended December 30th last was £356,000, or say £700,000 per annum, and up to date the total amount spent in the capital cost of the line has been two and

The administration of the tramway system of Sydney is in charge of the railway commissioners of New South Wales who are: Charles Oliver, chief commissioner; David Kirkcaldie and W. M. Fehon. The operating staff comprises: John Kneeshaw, traffic superintendent; O. W. Brain, electrical engineer; G. R. Cowdery, tramway maintenance engineer; W. Thow, chief mechanical engineer.

The Province of the Street Railway Accountant.

BY HENRY W. BROOKS, JR.

Some weeks ago I had occasion to examine an extensive quarry property. Leaving the office where a staff of chief engineer, purchasing agent, sales manager, auditor, paymaster, and accountants were busily engaged, we visited the power plant with its engineers and firemen, the crushing plant with its engineer, foremen and laborers, the ledge with its superintendent, foremen, channelers, drillers, laborers and others. Standing on top of the ledge and overlooking the extensive operations, the vast, well organized army of men and rapid, labor-saving machinery, the owner told me how he had started the industry with less than two hundred dollars and two men. He quarried the stone, then sold and shipped it, raised the money for pay rolls and sat up at night to keep the books and study the engineering features of quarrying.

What is true of this business is true of all other lines—the growth from a simple beginning to a complex, specialized, organized business of great magnitude. The same has occurred in transportation—in steam railroading it has been a steady evolution extending over nearly three-quarters of a century, but in street railroading the development has been more rapid and recent.

It takes any new business years to perfect the different branches and departments; consequently the mechanically operated street railway being of recent origin, has only neared perfection within the last few years. In this specialization process accounting talent is becoming recognized as a necessary element of practical value in the efficient organization of a street railway property. The practical old-time railway manager has a tendency to look upon the expert accountant as a "gentlemanly luxury" or a "necessary evil," but nevertheless the accountant is being more and more appreciated because of his usefulness and practical value.

I want to emphasize this point, that the intelligent accountant is just as much a "producer" and necessary element in a proper railway organization as the man at the controller or the man in the shop.

There is reason for this opinion or prejudice of managers. For in the past there was not a necessity for particular accounting skill, and no doubt the work has been carried on in a more or less slipshod manner with great inaccuracies and incompleteness, and little

understanding of the principles of railroad operations. But, at the same time, due credit should be given to those railway accountants who have labored faithfully and intelligently, often with scant recognition of their efforts, to bring the accounting of this important branch of transportation to the perfection it has generally reached at the present time.

Many of our large street railway systems have revenues equal to and an organization as complete as the average steam road. The detail and complexity of the street railway business has become such that there is a decided demand for talent in the accounting as well as in the mechanical, engineering and other departments.

The qualifications of the ideal railway accountant are many and varied. He should be a man of ability, of honesty and of accuracy. Not only should he have all the qualifications of an expert book-keeper, but should have a general, practical knowledge of railroading in its various branches of finance, construction, maintenance and operation. Not only should he have this knowledge, but he should be in close touch with the various departments of his road. He must possess the ability of the statistician for the nice work of separating cost elements properly and accurately, of discrimination in cause and effect, of measuring the effect of certain causes or tracing certain effects to their causes. In one respect he is somewhat like a doctor in diagnosing a disease, but it is for the manager to apply the cure.

Now, what is the special province of the accountant? It is as right-hand man to the manager, in tabulating accurately the exact condition and trend of the business in general or in minute detail. Most managers are eminently practical men with a pretty definite idea of what they want to know but don't know how to get at it. The forceful, executive man often lacks the keen discrimination and detail that an intelligent accountant often possesses.

As a right-hand man to the manager he must join with him in studying railway operations; the manager's part to act, the accountant's to measure the results of those acts.

Even the most skillful managers are liable to errors of judgment, to prejudices in favor of or against some policy, to exaggerate or underestimate certain conditions, to estimate and "guess work"

may be wrong, but figures, when properly arrived at, do not lie—they state the case exactly as it is—they tabulate facts precisely.

For lack of complete statistics, how many managers have had to base their opinions and decisions on "estimates," almost the only knowledge of the results of their efforts in certain directions being what they could see by general observation, a rough approximation at best. In these days when railroading has become a science the same precision should be used by the accountant in measuring causes and effects as is used by the civil engineer or master mechanic.

In having the exact figures the manager can conduct his business more understandingly, with a better knowledge of the relative value of things. The manager and accountant should work in unison, with the same object in view—to reduce expenses, increase profits and promote the general prosperity of their road.

One of the first and most important fields for the accountant's efforts is in providing statistics as to the efficiency and economy in operating—tracing this down minutely in the various departments. Undoubtedly his intelligently and diplomatically directed efforts in this line will be of great assistance to the manager, as he will present facts and figures that will enable the latter to reduce some necessary expenses, and put a stop to needless drains upon the earnings.

The manager finds his road is carrying a large number of passengers a comparatively short distance. The statistics show the traffic is dense and the car service well regulated to the volume of business. Still the road does not earn satisfactory dividends. The company is conservatively capitalized, not overburdened with excessive fixed charges, nor are their franchises or taxes onerous. We have traced the trouble down to the operating expenses—there is a leak somewhere—but where? It is for the accountant to point out, through statistics, the source of the leak. Of course it is not presumed that he should know just what each detail of operating should cost—that is the manager's business, but working together they get at the seat of trouble. By his statistics, comparative statements and groups of relative items, the former points out where the loss is—in car service expense, repair of track, shop work, production of power, wages or elsewhere. The manager, thus aided, quickly discovers the cause of the leak and promptly applies the remedy.

Of course, it is understood that the accountant does not point out errors, ignorance or incompetency on the part of the manager, but simply aids him like a loyal lieutenant in what they both have at heart—the success of their road.

In all large lines of industry, commerce and transportation great weight is laid on accurate and complete cost accounts. Only by having the most minute information of the cost of production of each unit, can the modern manufacturer fix his selling price, reduce the cost and know how far competition can be met. The same applies to railroading, although the latter is at a disadvantage in that his selling is limited. But perhaps it is just as well we have no rate wars in street railroading. Therefore the manager in his aim for a large margin of profits, must look to reducing operating expenses more particularly, but increasing traffic as well. It is therefore most necessary that the most accurate and complete statistics of cost—or, in other words, operating accounts be kept.

The satisfactory classification of operating accounts now in general use may be supplemented by further division and by statistics recorded in the various departments. It is the custom of most of the large roads to prepare most of these detailed statistics in each department and under the general supervision of the head of that department—for instance, the master mechanic keeps those relating to the repairs and construction of cars, trucks, motors, etc.; the chief engineer those relating to the operation of the power plant. This is right, as their working tools (statistics) are handy and it keeps them well and currently posted. At the same time the scheme and work of the department clerks should be under the joint control and supervision of the department head and accountant.

Quite naturally the head of a department wishes to make a good showing for his department, or some pet innovation, and is more or less apt to be prejudiced in compiling statistics thereon. Consequently the joint supervision has a tendency to make them more impartial and authoritative, as well as better classified.

In these detailed records of operating costs, as kept in the various departments, it is essential to keep not only the cost in dollars and cents, but in amount of work done—and that the cost per unit be compared to check the economy of shop or track work.

Some of the important department statistics that the accountant should see are kept in order to properly inform the general management, are briefly given below.

Statistics of Roadway and Track.—Records in relation to renewal of rails, paying special attention to the cost, cost of laying, tons laid, patterns and composition, life, cost of maintenance per mile of the various sections of rail and per car mile run. Where a road has different sections, weight and composition of rail, department records should be kept of the maintenance cost and life, making due allowance for the volume and severity of traffic, whereby the relative efficiency of each pattern of rail can be determined. Data in reference to the cost and maintenance of switches, castings, joints, rail bonds, etc., should be kept. Regarding ties, records should show number laid or renewed, kind of wood, size, whether treated or not, where laid, cost of ties and laying, average cost per mile, condition of old ties removed, etc.

Now that many of the street railway companies have to pave the streets they run through, for the cities this item becomes one of considerable importance. This line of work being open to waste or economy, records will be valuable of the cost of paving, repairs, amount done, quantity of blocks, tar, gravel, sand, asphalt or other paving material used, labor, tools, etc.

Memoranda relative to overhead construction may mention cost of maintenance per mile, per car mile, cost of setting poles, painting, kind and number set, renewal of trolley wire and feeder system, ducts.

A few detailed records may be kept in regard to street cleaning, removal of snow and ice, cost of same, labor and material, approximate quantity of snow removal, cost per cubic yard.

The cost of maintaining buildings is usually small and requires but a few simple records of cost, work done, and cost per unit.

It is well to investigate the expenditures for bridges, should there be any on the line. If too small, considering the type and date, the maintenance may be neglected until there is a bridge accident, probably serious, and then the dividends for several years to come are wiped out perhaps.

Statistics of Car Equipment.—The two principal things the manager wishes to know in reference to car equipment are whether the rolling stock is being properly kept up to standard, and whether the work is being done in an economical manner.

We will refer to the matter of standards and depreciation later. In reference to the latter point, it is very essential that the management should have accurate records of the economy of shop methods and daily work.

The master mechanic should, as also the man at the head of every other department, be able to tell, when called upon, the cost and amount of any kind of work under his charge. In order to be well and accurately informed about his work, he must rely on a good system of shop records, not necessarily elaborate.

The manufacturer is very careful to keep a minute cost account of the very articles the railway uses or makes in its own shops. Repair work affords many opportunities for unnecessary expenditures and leakages, often and easily overlooked. The drains are often small, but continuous. This line of expenditure must be closely watched and checked by shop records.

Shop records must be simple, correct, definite and the elements of cost properly separated. They must be sufficiently explicit, yet free from useless detail, and cost as little as possible to compile. Some statistics I have seen cost more to compile than they were worth. An important field for the accountant's usefulness is in designing a system of shop accounts, eminently practical, yet cheap, being specially adapted to the size and particular needs of his road, if one is not already in satisfactory use.

While many roads, the larger ones particularly, have an efficient system of shop accounts, yet it is surprising to find how many have scarcely any system, or very faulty or cumbersome ones. It is impossible within the limits of this article to set forth a perfect system of shop work records, however much such a contribution to street railway literature is needed. The best that can be done by way of suggestion is mentioning some of the salient points that should be recorded.

The master mechanic should know, through shop accounts, the detailed cost or cost per unit of repairing and rebuilding car bodies, painting, varnishing, relettering, upholstering, repairs to trucks, brakes, fenders, etc., renewal of wheels, axles, and brake shoes, cost

of repairs or renewals of motors, or parts of same, controllers, trolleys, etc., showing also the life of various parts per car mile run, as wheels, axles, motors, etc.

These records, upon close scrutiny and intelligent, careful consideration, will result in checking many little leaks, and discovering many mechanical economies that can be instituted.

Shop tools and machinery must not be overlooked.

Statistics of Maintenance of Power Plant.—Along similar lines to shop accounts, the power house log, together with the corresponding operating accounts, will give a record of the cost of maintenance of boilers, engines, pumps, generators, and other power plant machinery. These statistics should be based on the work they perform—the power they produce.

Transportation Statistics.—Detailed statistics showing the cost of car service per car mile and the relation of car service to traffic, comparing it with similar records of other roads, and the same road for previous periods, will help the manager. The superintendent needs certain transportation figures, such as the cost of labor, consumption of oil, waste and sand for cars, cost of lighting and heating cars.

The efficiency of car cleaning gangs and other car house expenses to be based on number of cars.

The importance of economical production of power is manifest, and the accountant's work in this direction will be of considerable monetary value.

The operating accounts show in considerable detail the cost—labor, light and supplies, water and fuel—of operating the plant. Comparison of these accounts by months or years, in totals of dollars, and in unit costs based on power produced, can be made with profit. These statistics, together with those of the power house log, showing quantities of fuel, water and supplies consumed, will give a good idea as to whether the plant is being managed economically.

Statistics of power plant and sub station operations should be kept separate. And here it may be remarked that comprehensive statistics, which will include construction, maintenance, and operation in units, such for instance as in the comparison of two power plants—cost of buildings, steam plant, electric or cable plant, interest charges and taxes on fixed investment, maintenance of buildings, steam plant, electric or cable plant, cost of labor, supplies, fuel and water, may be made the subject of special statistical investigation.

When in the course of consolidation of companies, it becomes necessary to take under consideration proposed operating changes, the nice work of the statistician is required. For instance, the consolidation of power houses, and the saving resulting therefrom.

The limits of this article will permit of but a few general remarks on depreciation, a subject worthy of close study and analysis. This being an important feature, often determining whether or not dividends should be declared, and one which is extremely difficult to accurately determine, it calls for the nice work and discrimination of the trained accountant. It is his duty to the stockholders and bondholders as auditor to ascertain and allow for depreciation, that their property may not be diminishing in value and their investment weakened. If due allowance, in one form or another, is not made for wear and tear to roadway, plant and equipment, the bondholders who perhaps have furnished the bulk of the money for construction, will find after a term of years and when their bonds are nearing maturity, that they have only claims against a worn out property, whose standard is so low the company is on a non-competitive basis. At the same time the stockholders have been receiving dividends not fairly earned and far in excess of the actual earning capacity of the road, which amounts should have been spent for proper maintenance. Plainly, they not only received their profits but were paid back part of their capital from time to time.

Every ambitious manager takes a pride in keeping the standard of his road up to date, and up to the cheapest possible method of operation. The accountant's difficult task is to show him by figures just what the standard is at present and its tendency, whether falling behind or improving. I say "difficult task," because it is a difficult task to gage the depreciation of a railway property, where repairs and renewals are made from time to time and not charged to any regular depreciation account, and it is no easy matter to make the books fit the conditions and facts. Through his various comparative statements of outlay for maintenance and detailed statistics of departments, he can give the manager a pretty clear idea of the physical condition and maintenance of standard

From time to time will arise plans for effecting operating economies, and the expediency of any such move can only be determined by actual figures. Definite accounting as to first costs, operating expenses and maintenance charges are required. Is the saving sufficient to warrant the outlay?

While a certain spirit of seeking innovations and improvements should be encouraged, yet a check should be put to over-zealous heads of departments with a costly inventive genius, or who may wish to hoist some pet theory on the road. They keep on inventing one thing or another, never considering the expense and that the cost of experimenting exceeds the saving. Shop records put a check to this.

At the same time very valuable experimental work with a view to the discontinuance of money-wasting methods, has been done and is being done by nearly all roads with up-to-date management. The accountant's figures of the cost under old methods, comparatively small cost of experimental work and great saving effected, will often be extremely gratifying to the manager, and speak for itself as to the manager's enterprise and ability.

The accountant's figures in such matters, being from an impartial officer, give more weight and are more accurate than the interested head of a department.

As the result of consolidations, changing conditions and the effort to reduce operating costs, the subject of choosing the method of traction comes under consideration by the directors and management. Before taking a step that will necessitate the outlay of hundreds of thousands, perhaps millions of dollars, very definite, reliable and comprehensive figures of construction costs, cost of operating under horse, trolley, cable, conduit electric, storage battery, compressed air or other motive power, and cost of maintaining different systems of mechanical traction are necessary and call for the accountant's best work. I am speaking, of course, of where figures can be obtained from past experience and present operations, rather than the technical estimates, also taken under consideration. During this change and afterwards his accounting will be valuable, as to the costs and results of change from horse to trolley or compressed air, or from cable to conduit electric traction.

Along this line his work should be so comprehensive as to include also the traffic changes resulting therefrom. The increase in passengers carried was marvelous, after the change from horse to conduit electric railway in New York City.

Along this same line of work the accounting in relation to new construction, new competitive lines, extensions to trolley parks or other centers of traffic, will be invaluable. It will be seen the accountant will have to be well versed in railway operations and finances to take up these various matters and compile figures that will actually and comprehensively measure and illustrate the conditions themselves.

Take, for instance, his figures relative to the establishment of a railway park, showing the cost of construction or investment, attendance, increase of traffic actually from that source, average cost of carrying a passenger from the city to the park, cost of maintenance of park, expenses, receipts from various sources, profitability of different attractions and many other details.

On new lines the growth of traffic, the securing new or competitive traffic for the main line, together with the cost of operating and general wisdom of the construction should be tabulated.

Particularly will the manager appreciate the accountant's statistics in various forms, setting forth traffic conditions. By way of suggestion I would mention tables showing volume of traffic, total and by lines, direction of traffic or current of travel, traffic centers, density of traffic. Other groups showing the tendency of the volume of traffic, whether temporary or permanent, increase by new lines, competitive lines, feeders, establishment of amusement resorts, better car service and accommodations. Again we may classify into competitive and non-competitive; business, shopping, amusement or general; fixed or within the power of the management to regulate; volume according to the hours of the day and in fact the field for analysis and tabulation of traffic conditions seems limitless.

These various investigations of particular or regular conditions should be made from time to time or periodically as each demands. Their expense is usually far less than the results accomplished through them. Simply the compilation of figures brings no results; it is putting the knowledge derived therefrom into practical execution, and upon examining the various tables, they should not be put

out of mind because they show an increase of traffic or a reduction of operating expense, but followed up to see if we are getting all the increase of business or decrease of expense we might.

Avoid useless, impractical figures; furnish fresh, accurate, practical tables to a purpose. Understand the conditions; separate the elements of cost first, then measure those conditions by means of statistics.

In the foregoing I have tried to set forth the province of the railway accountant, and some suggestions along that line. I wished to point out he must keep well informed on railway operations, that

he must be something more than a mere bookkeeper and that he can be a money-saver and money-maker for his road.

I am firmly convinced, and believe most managers agree, that in his province, the accountant is a most valuable assistant, particularly in informing the manager upon the efficiency and economy of operating departments, the maintenance of the property, the results of outlays for effecting operating economies, of extensions or new construction, of the cost and relative economy of operating under different methods of traction, the capability of subordinate officials, traffic conditions and general financial affairs.

Some Practical Notes.

BY W. A. B.

The following descriptions of many special designs often required about a power house, sub-station, or other places where electrical work is done, will undoubtedly be of value to the practical man. One is frequently at a loss to devise a solution for some peculiar problem, and while many can work from a drawing, they may not be able to successfully plan the work for themselves.

Occasionally it becomes necessary to fasten a marble slab to a brick or stone wall, as in Fig. 1. Perhaps a heavy switch or circuit-breaker is to be secured to the slab. This construction sometimes is required where a switchboard is already crowded and there is lack of space for a new panel.

In "plugging" a brick wall if one can space the holes in the slab after those in the wall are made, so much the better; for one can

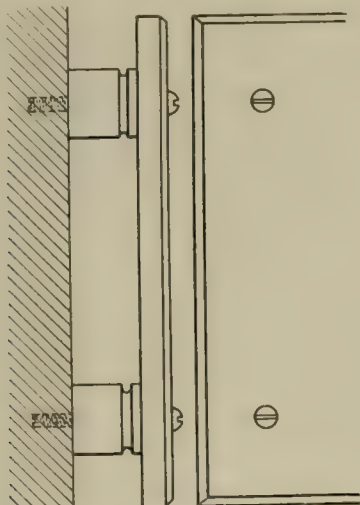


FIG. 1.

cut out the mortar between bricks with a flat chisel and drill the holes in the slab accordingly. For ordinary construction, a hole is made for a wooden wedge 3 in. long, $1\frac{1}{2}$ by $\frac{3}{4}$ in. at the large end and tapered about $\frac{1}{2}$ in. Drive it home with a very heavy hammer and cut off any projecting portion. For heavier work, leaf lead rolled up and driven into a hole made with a gas pipe is just the thing. The pipe should have teeth cut in one end all the way around and afterward hardened by the blacksmith. The same kind of pipe is used to cut holes through brick walls for inserting porcelain air tubes for the passage of wires. The size of the pipe is of course determined by the outside diameter of the tube. Wires and cables should fit as tightly as possible in the tubes.

Do not overlook the fact that when punching holes through brick walls large portions of brick may be forced through and damage done to the other side if proper precautions are neglected. The writer has seen this occur back of switchboards and where there was running machinery in an adjoining room. Falling debris may also get into belts. Porcelain insulators are sometimes placed between the wall and marble slab or hardwood board. If fastened to a surface of iron, drill and tap the same and use porcelain insulators between. Where the wall is plugged with wood or lead, wood screws or lag screws can be used as the case demands. Drive a drift into the lead, if necessary, to get the screws started.

The small wires back of the switchboard will need fastenings. Single wire porcelain cleats come into frequent use. The holes for the wood screws are best made with a breast drill, and twist drills are probably more used than flat, for they can be more readily ground and do not need re-dressing as do flat drills; and the holes

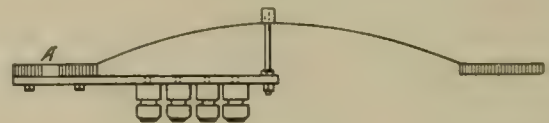


FIG. 2.

can be made more true. A great deal depends upon one's skill in manipulation.

The fronts of marble slab switchboards are often drilled and plugged for fastening on name plates to indicate the bus-bars, feeder and lightning mains, etc. Large holes in switchboards for the addition of any special apparatus are made by the use of an "old man." It often requires considerable ingenuity to secure the ratchet drill to the panel. Do not use undue force, lest the marble crack; especially when the drill is about to go through the marble. Keep the drills as sharp as possible. One unaccustomed to sharpening drills must remember that the heel of the drill must be lower than its cutting edge.

Another method of securing wires from switches to bus-bars, etc., is for use at the rear of switchboards. Angle irons are commonly used, secured by means of bolts to the T or channel iron, and porcelain insulators or knobs are fastened at the proper distances on the angle iron by means of stove bolts or machine screws. If tie wires are not used, two porcelain insulators are fastened side by side, and the wire passed between them. The grooves should be small enough so that when the knobs are fastened in place the wire will be snugly gripped and prevented from moving.

This method of wiring is not confined to switchboard work, as heavy cables are also secured in this manner when strung through subways, or on ceilings or side walls. This system should not, however, be used exclusively, for there are cheaper methods of construction.

One is sometimes confronted with a condition like that shown in Fig. 2, where wires are run in a subway along the ceiling. The

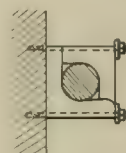


FIG. 3.

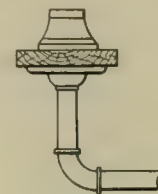


FIG. 4.

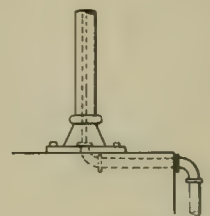


FIG. 6.

wires come under arches as shown. A is the lower part of an iron girder to which a strap of iron is secured by means of cap screws. Since there will be a great strain on the insulators to keep the wires taut it will be necessary to brace the other end of the strap. This is done by plugging the arch with lead and hammering it in well. Then drill and tap for a machine bolt, or weld a lag screw on an

iron rod. Have a nut on the rod at the proper distance, and force the lower one up to place. As many insulators can be put on as may be required. It would of course be cheaper to do all the necessary drilling even for the future at this time.

Large conducting cables have specially designed insulator fastenings each usually formed of two pieces of porcelain set in an iron

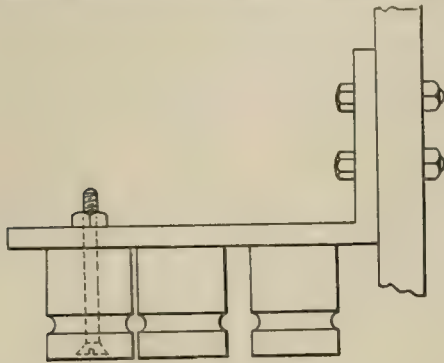


FIG. 5.

frame. When the wire is pulled up tight, the parts are drawn together with nut and bolt, and the cable is securely locked. Very heavy cables in a subway are usually placed on insulated iron brackets. Still another make of insulator for heavy cables is shown in Fig. 3.

Cables from generators of large capacity are frequently run below the machine, and along the iron frame work. Here this last mentioned style of insulator is unexcelled. The iron is drilled and tapped as shown in the sketch.

To secure light under such a generator, run iron conduit and at the proper height place a flange upon which is secured a piece of well filled wood. To this a weather-proof socket with center connections is secured, as shown in Fig. 4. If the construction of the generator is such that one can gain access to its interior, this socket may be used by means of an extension lamp and cord for such inspection.

To dead end a wire, use a plan similar to that shown in Fig. 5. The strain is to the left on the insulators, and one or more can be used as desired.

Where two or more parallel wires are dead ended, some similar

method can be employed. The form of the iron will of course depend upon the local construction.

Another method of dead ending a line is to run a wire through a glass or porcelain insulator, securing it to a wall or other firm support; then tie the line wire around the insulator in its groove. Pull up tight, and twist the free end of the wire over the line wire a number of times, to insure its remaining tight. If the wire is large and requires the aid of pliers or other tools to make the twist be careful not to impair its insulation and leave the wire almost bare in spots, as is frequently done.

The same can be said as to making ties to insulators. One end of the wire is passed around the insulator over the wire, and the other end passed in the opposite direction, in such a way that if the insulator were removed and the wires twisted together, they would follow the direction of the strands of a cable. Frequently in making the tie the insulation is utterly ruined, not only making a bad job, but failing to comply with underwriters' rules and requirements.

Fig. 6 shows the way to run the wires for an electric light mast containing one or more lights. The column rests upon a large sandstone. A channel is cut in the stone below the surface, and the pipe laid in it, with the end under the column projecting upward. The pipe is afterward covered with cement. The wires are drawn into the conduit, and the iron pipe for the lights put in place and bolted down.

Fig. 7 shows the method of running and fastening duplex wire for subway lighting either on the ceiling or along a brick wall according to local conditions. The wall is plugged at certain intervals for fastening the wire to porcelain insulators. These insulators are composed of two parts, with an opening in each part to receive the

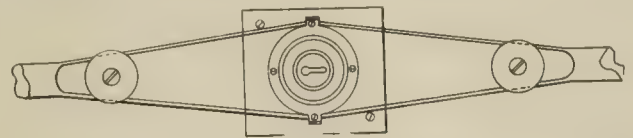


FIG. 7.

wire. When the screw for the porcelain insulator is set up to place the wire is tightly clamped. At the lamp the wall is plugged again and a small piece of wood fastened to it by screws. To this is secured a keyless receptacle with outside connections. The duplex wire is carefully separated at each lamp socket as here shown, and is also fastened at each side of the block to porcelain insulators.

Rules for the Government of Employes.

DISCUSSION OF A. S. R. A. COMMITTEE REPORT AT THE SARATOGA CONVENTION.
For Report see "Daily Street Railway Review" (Sept. 5, 1903, Page 703).

Mr. Connette: Mr. Chairman, the report of the Rules Committee has been printed and distributed among the members of this Association, and the members have had the report in their possession long enough to know what it contains without my undertaking to read any portion of it. The committee of course, in undertaking to compile a standard code of rules, met with more difficulties than any of you would imagine. For instance, when we undertook to make a rule that was applicable to the small roads as well as to the very large roads, in a good many cases we encountered serious difficulty. We have, therefore, only presented to you a code of rules general in their nature, applicable only to conductors and motormen, because they are the employes principally to whom the rules apply. A rule that will apply to a motorman and conductor running upon a small road can also be applied to one similarly employed upon a large road. The rules pertaining to interurban service, I am free to say, were practically confiscated from the rules of the American Railway Association, which is composed of the steam railroads, and the rules which are in effect upon steam railroads are the result of years of experience and study—we believe of over twenty-five, perhaps forty years' experience, and the committee did not think it could compile a set of rules which would be an improvement on the rules which were adopted and are now in effect upon the various steam railroads of the country, especially so far as the movement of trains is concerned, and the use of signal.

I am now going to diverge just a little from the report. I brought

this question up before the committee, but it was deemed to be perhaps not within its scope to embrace a suggestion of the plan which I am about to make, and that is upon long interurban lines, single track lines, that it is better practice, or it would be better practice when it was adopted, that instead of running more cars, separate cars, or changing the headway as the business fluctuates, it would be better to maintain a uniform schedule of headway and use the multiple control system and increase the length of the train as the business may require it, instead of changing the headway or instead of running cars in sections. In my opinion this method of operation would be more satisfactory from several standpoints—first, less liability of accident, which is a great factor in the operation of cars: Secondly, it would reduce the expense of operation so far as the platform expense goes. Third, it would take care of the traveling public, I believe, in a more satisfactory manner, because if the schedule is 30 minutes headway on an interurban line, and that schedule is uniformly maintained, no matter what the business may be, whether you carry 1,000 or tens of thousands of people daily, instead of changing it to meet fluctuating conditions, maintain it rigidly so that the public will know that a car will be at a given point at a given time and ample cars will be provided and if one is insufficient put on two, three or four, and make the same time as you would with one, on the multiple control system, the same as the system by which the trains on the New York elevated road are operated. I put this out as an opinion of my own. I

believe the interurban roads will come to it, and run trains as steam roads run trains, not only one car, and if a little more demand for service is made to run out another car and run it as a second section; but the cars will be run in trains. I believe the running of separate cars to meet increased demands will be done away with ultimately and that we will adhere to the time table instead of changing the headway and mixing up the motormen and conductors and multiplying the duties of the train dispatcher and getting him confused and causing accidents, at least increasing the hazard of them, the danger would be reduced to a minimum and I believe the service in every respect would be the more appreciated by the public.

Mr. Mailloux: I desire to make a suggestion that every individual member present who has the authority to do so should make a careful study of these rules and endeavor to apply them if possible and report the results to the committee. In that way every member of the Association becomes a co-operative factor in the development and perfecting of a system of rules and regulations, signals, etc.; by sending opinions, criticisms, suggestions of changes, etc., to the committee during the next ten months, the committee would be able at the next annual meeting to give us valuable information tending to the further development and perfection of the system of signals, etc.

I want to take issue with Mr. Connette in regard to what he said in regard to the single headway system. I think that depends entirely on the form of load curve with which he has to deal. It would be influenced by the line and the service the line is expected to give. In an ordinary interurban line, where the stations are relatively far apart and the load curve, so to speak, fairly even, that method might well apply; but I submit in cases where your interurban line approximates at all conditions resembling rapid transit, such a method will be absolutely impossible. Take a case like the New York & Portchester Railroad—if you plot the number of passengers carried per hour during the 24 hours, you will find enormous peaks which represent the times at which people go to New York and the times they are coming back. Evidently the service must be adequate for the maximum demands made upon it. That service, with a 4-track road, requires five minutes headway with as long trains as we can possibly operate on the local track and ten minutes headway on express trains with as long trains as we can operate. We cannot maintain such a headway as that during the entire day. There are times when it is necessary to reduce the number of trains, as well as the number of cars.

Mr. Connette: I refer to a single track road.

Mr. Mailloux: It may be on a single track road it would be valuable, but it depends on the load curve. When the curve is flat and does not have enormous peaks, the method suggested is most satisfactory and preferable; but where the curve shows peaks it would not be.

Mr. L. E. Myers: I understand that the committee is to be continued for another year, according to the appointment made yesterday, and is to go on with its work. I assume that these rules are to be adopted by the Association. I have been waiting for seven months to get these standard rules in order to apply them to property we took over some time ago. I want to start off with a firm foundation, and I told our superintendent we would wait until the Association met, when these rules were to be presented, and that as they were to be adopted by the various roads in the country we would also adopt them. I want to apply these rules to the property at Pekin. I want to get an expression as to how many members will apply these rules, so as to make them effective, and I want to ask Mr. Connette a few questions.

Mr. Connette: The Committee on Rules were, as I understood it, expected to compile what in their judgment was a proper code of standard rules as far as they could go and submit their report to the members of the Association for their consideration. There is no use in this Association continuing a committee on rules unless when the committee has given a report that is satisfactory to the Association it is adopted and becomes the standard of the members of the Association. Of course, there is nothing binding or compulsory on the members of the Association to adopt the code of rules that might be presented by this committee and approved by the Association, but there is no use in the Association considering

the question of a standard code of rules unless the members are willing to adopt the rules, when the Association finds that the committee has presented a code of rules that is satisfactory. I will say in this connection that the New York State Association has had a committee on standard rules for nearly three years, of which I have the honor to be chairman, and this report is practically, to a large extent, the result of the work of that committee, supplemented by the committee of this Association. The New York State Board of Railroad Commissioners I think met with the committee at two or three of its meetings, and finally approved the report of the committee, but requested that the committee pursue the matter of rules applying to interurban roads a little further. In fact, the committee has presented very few rules applicable to interurban service and the Board of Railroad Commissioners asked that we might continue the committee to further consider the rules applicable to interurban roads which is now being done by the New York State Association. This report is before the convention. It is for you to do as you please with it. I do not think we have the time to consider even a half dozen of these rules, if we take them rule by rule, even two or three of the principal topics in connection with these rules, concerning which there may be a difference of opinion. I would suggest, if it meets with the views of the Association, that if you do not want to take action on this report at this meeting, each member of this Association carefully consider the rules and write his suggestions or recommendations, and transmit them to the committee, either direct or through the secretary of the Association.

Mr. Beggs: I desire to say a word in commendation of the work of this committee, and I say it as freely and as cheerfully as I severely criticised the report presented to us twelve months ago, which did not seem to have been compiled for street railway management at all, but was apparently compiled for limited trains on trunk lines. I may say that for two years we have had no books of rules to give our 1,000 or 1,200 trainmen, waiting as a matter of courtesy to this Association until it should have had presented to and approved by it a code of rules that we could feel might be fairly adopted by all the roads connected with the Association, if not all the roads of the country. That code I now have in my hand and I would like to have it receive the sanction of this Association; but whether it does or not, with a few trifling modifications in these rules, they will be printed for our company within the next thirty days. I have read every section in the report very carefully. We operate nearly 200 miles of interurban line in connection with our metropolitan system, and therefore the rules which these gentlemen have so carefully embodied in the latter part of this report are valuable indeed and give evidence of having been given thought to by some gentleman who has experience in the operation of interurban lines. I think there is very little to be desired, from my point of view at least, in these rules, for many of them I have been responsible for putting into effect and maintaining in the operation of interurban lines for several years past. I want to suggest changes in three paragraphs. In paragraph 5 I should provide that smoking tobacco while on duty in any part of the company's buildings, except in the conductors' and motormen's room, be prohibited, and would likewise prohibit the trainmen from smoking when riding on the company's equipment when in uniform and not on duty. I would enlarge Rule 14, just to broaden it slightly.

The rule says: "Do not remove trolley from wire at end of run, or elsewhere at night, until passengers have alighted from the car." I would add to that rule, "nor until those waiting to enter the car have entered it and are seated." Rule 24 raises an important question. I seriously consider the advisability of assuming the street railways generally are going to continue to stop on the far side of the streets, as it is called. There are some municipalities which are now enacting ordinances requiring the street cars to stop on the near side of the street, and I am in favor of that.

The committee in the first paragraph in the report directs special attention to Rules 61 and 62. I believe it would be advantageous to leave the matters referred to in those rules to the decision of the local companies, because we must give our conductors and motormen authority to put off the cars passengers who refuse to pay their fare; otherwise they will discuss the matter while they ride out the distance they want to go. It is not unusual on street railways to have a man present a large bill to the conductor and the conductor is unable to change it. Under this rule the man would

not be put off. We put him off. We require them to pay their fare, but here you say they must not be ejected from the car, but the facts of the case must be brought to the attention of the first inspector, starter or official of the company, who is met, and the conductor must act according to the instructions received from such inspector, starter or officials. In the heart of the city the conductor would not go very far before coming to a superior officer, but in sparsely settled sections it is different and the conductor would probably reach the heart of the city before he reached an officer whom he could consult, whether the passenger should be put off. I think most of the provision you have made for protecting the passenger and keeping the company from being involved in litigation by unauthorized ejection of the passenger is carefully taken up.

I move that the rules as presented by this committee be adopted as the standard code of rules of the street railway companies in the jurisdiction of this association.

Mr. J. G. White: I will second the motion of Mr. Beggs, and if he will allow it, suggest an amendment—that is, that the set of rules as presented be adopted by the Association and that the members of the association be requested to adopt these rules as their standard rules, with such modifications as may be necessary to meet local conditions; and that the members of the Association be requested to communicate with this committee, which is to be continued during the current year, any amendments which their experience with the rules leads them to think advisable, and the committee report to the next meeting such amendments as they think will be advantageous, to be embodied into the later standard rules.

Mr. Beggs: I cheerfully accept the amendment.

Mr. L. E. Myers: I want to bring to the attention of the association a scheme we have recently adopted. I do not know that it is original with us, but on the backs of our accident reports we have placed all possible forms of construction for special work, cross-overs, single and double track, turn-outs, etc., and we require the employees to illustrate on the back of the accident report just where an accident happened, whether to a person or vehicle, the position of the car when the collision occurred. I think such a provision in connection with these rules in regard to reports would be a very valuable thing. The trainmen's reports are often confused. I make this suggestion to work in with the form of reports of accidents recommended in the book of rules. I will report that I have been waiting for these rules for seven months and I hope to get them in use on our road as promptly as Mr. Beggs.

Mr. John Grant: I understand the idea is that where a company requires a modification in the rules to meet the conditions in its city, it makes it under the rule; for example, in Rule 8, relating to railroad crossings, we are required by ordinance to stop at our own crossing. So if we adopt these rules we would have to embody an amendment to the rule and that would be in the nature of an amendment to Rule 8, the present Rule 8 to remain as the standard. The rule, however, will still be Rule 8, and any amendments to it would be Rule 8, section a, b, c, etc.

Mr. Connette: Referring to Rule 8, I will say that that rule gave the committee perhaps more trouble than any rule in the book. In fact they gave this subject more time and attention than any other rule in the book, particularly so because the State Railroad Commissioners of the State of New York have a pretty close supervision over the railroads in the state, and they were particularly insistent on this rule.

There was some further discussion regarding the minor changes already suggested in the rules, after which the motion of Mr. Beggs, as amended by Mr. White, was adopted.

Street Railways of Leipzig.

An interesting description of the street railways of Leipzig has been furnished to the State Department by Consul D. H. Warner, jr., from which the following details are taken. The first street car lines in this city were open to traffic in 1872 and continued in operation with horse propulsion until 1895. In the latter year the Leipzig city council granted franchises to two companies to build electric street railways, both of which franchises were practically identical. The concessions extend for 40 years at the end of which time the lines and rolling stock revert to the city with the exception of the grounds, buildings and machinery and those motor cars which shall

have been built within the last preceding five years. The city, however, has the right to buy such grounds, buildings and machinery at the price at which they are assessed and in addition, to take over the lines after the expiration of 20 years by payment of certain prearranged values. After the first three full years the lines are in operation they must pay the city for the use of the streets 2 per cent of the gross receipts which amount will be increased one per cent every five years until it reaches 5 per cent. The companies pay for paving and repairing the streets where new tracks are laid in one case and where the running of the cars is responsible for the wear and tear in the other.

The Grosse Leipziger Strassenbahn Gesellschaft, locally known as the "Blue Line," has a capital stock of \$2,380,000 and a bonded indebtedness of the same amount bearing 4 per cent interest. The company has paid regular dividends since it began operation which have varied from 8 to 5½ per cent. The Leipziger Elektrische Strassenbahn Gesellschaft, known as the "Red Line," is capitalized at \$1,487,500 and has issued 4 per cent bonds to the amount of \$925,000. It has declared dividends annually since its organization varying from 4 to 6 per cent.

The overhead trolley system is used, the span wires being fastened chiefly to the fronts of the houses, a few iron posts being used where there are no houses. The total mileage of both companies including sidings, etc., is 131.17 miles, of which 77.2 miles belong to the "Blue Line" and 53.97 miles to the "Red Line." The former has 275 motor cars, 112 closed and 30 open trailers, or a total of 417 cars. The latter company has 130 motor cars, 20 closed and 30 open trailers, or 180 cars in all. The cars of the blue line are equipped with Westinghouse air brakes in addition to the hand brakes and all the cars are lighted by electricity. It is noticeable that none of the cars are heated even in the coldest days in winter. In winter the car floors are covered with straw and strips of cheap cotton plush cloth are hung before the windows to keep some of the cold air off the passengers' backs.

Automatic signal boxes were introduced by the smaller company last year; these are placed at intersections of the lines to warn motormen of the approach of cars. They have been found very satisfactory as flagmen are no longer needed at the crossings nor have the conductors to run forward to see if the way is clear.

Cars are run from five o'clock in the morning until midnight upon headways varying from 4 to 15 minutes. The cars are limited to a speed of 9 miles an hour in the business section or 7.2 miles with trailers. In the suburbs the speed is 15 miles, or 12 miles with trailers. Cars are not stopped at every street crossing but at specified points about 250 yards apart which are marked by iron sign posts. When a trailer is attached to a car another conductor is required to take charge of it; trailers and motor cars are not connected by a passageway, and passengers are forbidden to go from one to the other without paying an additional fare. There are 20 seats in each car and standing room for about 15 on the platforms. The aisles must be kept clear and when these places are filled no more stops are made to take on passengers. The fare for a single trip is equal to 2.38 cents which entitles the passenger to one free transfer. Passengers carrying large baskets, bundles, etc., must pay full fare for such. A habit which has almost become a local custom is that of feeding conductors. This is practiced by almost every one. Commutation tickets are also issued by companies and postmen, telegraph and messenger boys are carried by contract for which the government pays a yearly sum. All city employees when in uniform are entitled to ride free upon the front platform but not more than two at a time and a large number of the city officials, about 560 at the present time, are given annual passes. Special school tickets are also issued to school children under 15 years of age.

The pay of a conductor is \$20 per month for the first year's service and the same amount is paid motormen for the first six weeks. After their apprenticeship they are paid from \$21.42 to \$28.52 per month, according to the length of their service. The working day is from 10 to 12 hours. A system of sick, accident and life insurance is maintained at the companies' expense for the benefit of those employees whose wages do not exceed \$476 per annum.

On October 1st an electric car mail system will be inaugurated in Chattanooga, Tenn., as an experiment.

Recent Advancements in Electric Railways.*

BY F. C. CALDWELL.

In his opening remarks the author dwelt briefly on the early history of electric railways and traced the gradual growth in the size of cars and equipments down to those of the present time. The question of braking was next discussed and the author considered the air brake to be the most reliable solution of the problem yet found for electric railways. It is natural, however, that electrical engineers should have early set their hearts upon the adaptation of the electric current to the carrying out of this important function. It now appears that the solution of this question is to come by causing the motors to act as generators and then with the current so generated operating the brakes upon the wheels. The author gave a brief explanation of the magnetic track and wheel brake which operated upon this system and which seems to be giving satisfactory service.

In regard to the question of acceleration the author quoted the report of Mr. B. J. Arnold on his tests made in connection with the New York Central R. R., the results of which showed that trains drawn by electric locomotives came up to speed from 15 to 60 per cent more rapidly than those drawn by steam locomotives. The author classifies electric railway service as city, suburban, interurban, rural, freight, electrification of suburban steam roads and long distance high speed service. The alternating current distribution at high potential in the large cities was described as well as the complete alternating current systems devised by Mr. B. G. Lamme and Mr. B. J. Arnold.

The question of competition between electric and steam railways is a most interesting one. That the electric railway can more successfully handle the business of carrying passengers over short distances seems to admit of little question and it is claimed that the short-haul business of steam railways has already been much affected, but it is stated that this condition of affairs is rather satisfactory than otherwise to those roads whose business is mostly heavy through travel. The question arises, however, how far electricity may eventually supersede steam even for this work. So far the speeds which have been used upon electric railways have not been great enough to attract many passengers for long distances, though there should certainly be a demand for sleeping cars running over distances which can be covered during the night.

If the rates charged by electric railways continue as low as they have been in the past, economy will often lead passengers to take these routes, and the large and increasing class who travel for pleasure will often prefer the clean electric cars.

While the interurban cars are a great boon to those who live in the country and will be even more so in the future, the fact remains that since the present heavy construction and high speeds can only be made to pay where the line joins two or more centers of population, such lines will only be built on roads which lie between towns of considerable size, so that while they make a pretty close net work on the map, there will be large areas and many roads that will never be touched by them. It is not unlikely that when this net work has been well established a new class of roads of much cheaper and lighter construction and built for only moderate speeds, will be installed, which will branch out through the country districts and act as feeders to the more important lines.

This latter class of rural roads should result in a great increase in the freight traffic of the electric roads. This business has been already well established, most of the interurban roads now carrying a considerable amount of light freight, milk, and other produce. In some of the larger cities freight houses expressly for the handling of such freight have been established, and even enlarged.

The extent to which the electric railways will offer serious competition to the freight traffic of the steam roads, remains to be determined. On account of the facility with which the electric cars overcome considerable grades, not so much pains have been taken to maintain a level track, as has been done with the steam roads. This fact will militate against the running of heavy freight trains over such roads by electric locomotives, and it is very doubtful whether the freight business can be made to pay for the increased fixed charges, which would result with motor equipments supplied to each freight car.

One of the most interesting and important developments in the superseding of steam by electricity, is found in the electrification of the suburban branches of the steam railways. The great advantage which the electric railway has in this class of work is that the trains being made up of but one or two cars permit of a very frequent service, while the rapid acceleration that electricity makes possible greatly facilitates frequent stops; the electric road also takes its patrons nearer to their destination than is possible with the steam railway. To meet this competition which has already proved very serious, it seems probable that the steam railways will soon adopt electricity to a considerable extent for the operation of their suburban trains. The new South Station in Boston was built with provision for a loop railway on a level below the main tracks, over which loop it was proposed to eventually run the suburban trains electrically.

The last division of our classification, that of long distance and high speed electric traction, is largely a problem of the future. That speeds as high as are now attained on steam railways and even much higher, can easily be accomplished, so far as the electrical equipment is considered, admits of no doubt. So far as speeds now used are concerned, the question is purely a financial one, if however, the alternating current motors mentioned above should prove to be all that is hoped for them, there seems to be no good reason why electric traction for passenger purposes should not be as economical for long distances as the steam. When the question of still higher speeds, running even as high as one hundred miles an hour, is under consideration the difficulties which present themselves are those of constructing a track and a mechanical equipment strong enough to withstand the heavy shocks resulting from such high speed, and also to devising a construction which should make it impossible for the car to leave the track. It is highly probable that these engineering problems could be worked out, but here again comes in the financial question, and it seems very doubtful whether enough high priced passenger traffic could be obtained to pay for the additional cost of such high speed transportation. Inseparably connected with the question of high speeds comes the problem of securing private right of way. Hitherto the use of public highways has been one of the most attractive features to the electric railway promoter. With the advent, however, of such speeds as are in use on the steam railways, must come the private way, and with it additional first cost, interest upon which must be made before the road becomes a paying proposition.

In conclusion, it would seem that there are few developments of the present time which should be watched with so much interest by the general public, as the working out of these problems which have been outlined.

Rights of Way in San Francisco.

The United Railroads of San Francisco has adopted the following rule, effective June 17th, respecting rights of way of cars:

Cars must hereafter come to a full stop on the near side of the street covered by the intersecting car line, and a careful survey of the street must be taken. The motorman must not proceed without two bells from the conductor, to be rung after the situation is inspected. Then the car will cross the street at a reduced rate of speed, stopping on the far side at a signal, but not necessarily signaled by a passenger.

In regard to rights of way, when two cars arrive together at the same intersecting point on a level street, the one to arrive first is given the right of way. At points where a level street crosses a hill, however, the car on the incline will be given the precedence, regardless of the time of its arrival, while at points where two car lines both on hills cross each other the car on the steep grade will be given the right of way. Where two car lines meet at a junction, one of them coming around a curve, and proceed to cross the same intersecting lines, the car on the curve is given the right of way.

The Public Service Corporation of New Jersey has secured the line of the South Orange & Maplewood Traction Co., running through private right of way between West Orange and South Orange. The road was originally built by the late Henry A. Page and at his death its control passed into the hands of his son, Edward D. Page, president and manager. The road traverses a thickly populated district and has been in operation since 1894.

*Abstract of a lecture delivered before the Engineers' Club, Columbus, O. Mr. Caldwell is the head of the Electrical Department, Ohio State University.

Street Railway Legislation for 1903.

Indiana.

LIMIT OF CHARGES ON EXCESS BAGGAGE.

Chapter CXXVI of the Indiana Acts of 1903 provides that it shall be unlawful for any railroad in the state over five miles in length, using steam or electricity as a motive power, to charge, between any points in the state, more than twelve per cent of the amount of a first class fare between such points per one hundred pounds for excess of baggage over one hundred and fifty pounds; provided, that the total minimum charge for such excess, when the same does not exceed two hundred pounds, shall not be less than twenty-five cents. The penalty for a violation of this act is a fine of from \$25 to \$100, except when it is clearly shown that the overcharge was caused by clerical error.

AUTHORITY REQUIRED FOR CONSTRUCTION OF ROAD UPON STATE PROPERTY.

Chapter CXIX of the Indiana Acts of 1903 provides that no railroad, street railroad or electric railroad shall be located or constructed upon, across or through any grounds owned, held, used or occupied by the state of Indiana for any penal, correctional, reformatory, charitable, educational, or other state institution, except upon a written contract between the company constructing the same and a commission composed of the governor, auditor of state and attorney general, acting for the state, which contract shall fully state the terms and conditions upon which such railway shall be built and operated within and upon the grounds of the state.

AUTHORITY FOR CERTAIN TOWNS TO AID ELECTRIC RAILWAYS.

Chapter CLXXIII of the Indiana Acts of 1903 provides that the board of trustees of any incorporated town in the state having a population of 2,200 to 2,300, by the last preceding United States census, shall have the power to donate from the general funds of said town a sum not exceeding \$10,000 to any electric railway company which may contemplate building its line of railway through the town, upon such terms and conditions as the board may order, after having submitted the question of such donation to a vote of the qualified voters of the town, and a majority of the votes cast being for the donation, which may be in money, or in interest-bearing bonds of the town.

PUT ON AN EQUALITY WITH OTHER RAILROADS

Chapter CXXXIV of the Indiana Acts of 1903 provides that wherever the word "railroad" occurs in either section of the act entitled "An act to authorize aid to the construction of railroads by counties and townships taking stock in, and making donations to, railroad companies," approved May 12, 1869, and in various other enumerated acts, it shall be extended to and held to include every kind of street railroad, suburban street railroad, or interurban street railroad, whether its lines of railroad are to be maintained either at the surface, or above or below the surface of the earth, and by whatever power its vehicles are to be and are transported.

MUST PROVIDE DRINKING WATER AND CLOSETS.

Chapter CXLI of the Indiana Acts of 1903 provides that all electric railway companies, traction companies, interurban companies and all companies operating and propelling cars on railway tracks by means of electricity for a distance and continuous run of over eighteen miles shall provide and maintain a suitable water closet, and a tank containing water in each regular motor passenger car for the convenience of the traveling public; provided, that this act shall not apply to any interurban line until it has been in operation for a period of six months; and provided, further, that where such interurban company or companies run and operate passenger cars, in

whole or in part, on and along public highways or streets of towns and cities, the use of such closets shall be subject to such rules and regulations as the board of health, board of trustees and common councils of such towns and cities may prescribe. Any such company failing to comply with the provisions of the above section shall be guilty of a misdemeanor and be fined in any sum not more than three hundred dollars and not less than twenty-five dollars for each offense.

EXTENSION OF POWERS.

Chapter XXXVI of the Indiana Acts of 1903 amends chapter CCVII of Acts of 1901, entitled, "An act concerning street railroad companies, granting additional rights and powers," etc. The amended act includes within its terms "any street railroad company * * * desiring to construct or acquire, or having heretofore constructed or acquired any street railroad, interurban street railroad or suburban street railroad, introducing the words here italicized. It also provides, among other things, that, if at any time after the location or construction, in whole or in part, of such street railroad, interurban street railroad or suburban street railroad, it shall appear to a majority of the directors of such company that the line of such railroad is unnecessarily dangerous, inconvenient or expensive to operate by reason of grades, curves or other physical conditions affecting the construction, maintenance or operation of such road, or that for any other reason the location of such railroad should be changed, it may make alterations in its line and route, and for that purpose may enter upon, take and hold the real estate necessary therefor in the manner and by the special proceedings prescribed in this act.

AUTHORITY TO ISSUE STOCK TO BE PREFERRED IN DIVISION OF ASSETS AS WELL AS IN DIVIDENDS.

Chapter CXCIX of the Indiana Acts of 1903 provides that any street railway or interurban street railway company hereafter organized under the laws of the state of Indiana, is authorized and empowered to fix in its articles of association, and issue an amount of preferred stock, not exceeding one-half of the company's total capital stock, and provide in said articles of association that the preferred stock shall be preferred in the division of assets, over the common stock, in addition to being preferred in dividends, as now provided by law.

Any street railway or interurban street railway company heretofore organized under the laws of the state of Indiana is authorized and empowered to issue preferred stock, not exceeding one-half of the company's total capital stock, which shall be preferred over the common stock in the division of assets, in addition to being preferred in the dividends, as now provided by law, if all of the stockholders of the company shall vote in favor of authorizing the issue of such preferred stock at a stockholders' meeting called for that purpose, of which the stockholders shall have at least ten days' notice.

REQUIRING DISINFECTION OF CARS AND OBSERVANCE OF QUARANTINE ORDERS.

Chapter LXXXIII of the Indiana Acts of 1903 provides, among other things, that all trolley, steam or electric cars or other public conveyances which are known to contain the infection of any disease, or any such cars or public conveyances which may reasonably be supposed to contain such infection, shall, upon order of the state health officer or any health officer in whose jurisdiction the infected car or other public conveyance may be found, be disinfected according to the rules of the state board of health, and the cost of disinfection shall be paid by the company, person or persons owning said cars or other public conveyances; provided, that any and all inspections and fumigations of such cars be at such times and places as not to interfere with the general traffic of the road. If at any time any city, town or region is under quarantine, all trolley, electric

and steam railroad companies passing through any such quarantined city, town or region, shall obey the quarantine orders of the state board of health, which are issued for the purpose of preventing the spread of infection. Each violation of such order shall be a separate offense, for which a fine of one hundred dollars shall be assessed.

FENCING AND FARM CROSSINGS REQUIRED.

Chapter CCXXVII of the Indiana Acts of 1903 provides that any corporation, lessee or assignee or receiver or other person or corporation, owning, controlling or operating, or that may hereafter construct, build, run, control or operate any interurban railroad, traction line, or suburban railway within the state of Indiana, using electricity for a motive power, either by overhead trolley system, storage battery or third rail system, or otherwise, shall within one year from the taking effect of this act, as to those already constructed, and as to those hereafter constructed within one year from the date of the completion of any part of such line and putting the same in operation, erect, build, construct and thereafter maintain fences on both sides throughout the entire length of such road completed within the state of Indiana, sufficient and suitable to turn and prevent cattle, horses, mules, sheep, hogs or other stock from getting on such road, except at crossings of public roads and highways and within such portions of cities and incorporated towns and villages as are or may hereafter be laid out and platted into lots and blocks, and shall also in like manner and within the time hereinbefore prescribed construct, where the same has not already been done, and thereafter maintain at all public roads and highway crossings now existing or hereafter established barriers and cattle guards suitable and sufficient to prevent cattle, horses, sheep, hogs and other stock from escaping to or getting on such road. But it shall not be required to fence such railroad track through unimproved and unenclosed lands, and when any such railway is built in any public highway the provisions of this act shall not apply thereto. Nor shall anything in this act affect or change any existing contract with reference to the building or maintenance of any fence along any such railway. And nothing in this act shall in any manner affect or change the liability of railroad corporations, or of the assignees, lessees or receivers of such corporations for stock killed or injured upon their railroad.

Owners of tracts of land separated by the right of way of any such railroad company, or owner of a tract or tracts of land separated by the right of way of such railway company from a public highway or road lying and situated immediately contiguous to and adjoining said right of way, may require such railway company or person controlling and operating the same to construct and maintain wagon and driveways over and across such right of way leading from one of such tracts to another on the opposite side of such right of way, or leading from such tract or tracts of land on one side to the highway on the other side of the right of way, at a point most convenient to such owner. When such railroad is fenced on one or both sides at the point where such way is constructed, such abutting land owner shall erect and maintain substantial gates in the line of such fence or fences across such way, and keep the same securely fastened and closed when not in use by himself or his employees.

AUTHORITY TO SELL, LEASE OR TRANSFER PROPERTY AND MODE OF DOING SAME.

Chapter CLXXXVI of the Indiana Acts of 1903 provides that any street railroad company now or hereafter incorporated under the laws of the state of Indiana, owning or operating or possessing a franchise to own and operate a street railroad therein, may sell, lease or otherwise transfer its property, franchises and assets of every description and wheresoever situated, or any portion of the same, to any other company authorized to acquire the same by purchase, lease or otherwise for money, stock or bonds or other obligations; provided, however, that such sale, lease or transfer shall be authorized by the vote of a majority in value of all the shares of said company given at a meeting of the shareholders called for the purpose. At such meeting a resolution specifying the terms and conditions of such sale or transfer shall be submitted to the shareholders for their approval or disapproval, and upon the vote of a majority in value of said shareholders, the board of directors of

the said company shall cause the contract authorized by such resolution to be duly executed and delivered to such purchaser, lessee or transferee by the proper officers of the company. Such meeting of said company shall be called in pursuance of a resolution of its board of directors instructing the proper officers of the company to call the same, and, after twenty days' notice, which shall be given by written or printed notice mailed to every shareholder at his last known postoffice address.

If a sale be made, approved by the vote of a majority in value of all the shares of the company as aforesaid, any shareholder or shareholders of such company not voting in favor of such sale and who may be dissatisfied with the terms thereof, may apply by petition to the circuit court of any county in which such railroad is located or operated within thirty days after such shareholders' meeting, praying said court to appoint three disinterested persons to estimate and appraise the value of the property so sold, over and above any liens or incumbrances thereon and claims or indebtedness for the payment of which the same may be liable, and having so appraised the said property and franchises to estimate and ascertain the value thereof, and the value of said shares having been so appraised by the said commissioners, by a concurrence of a majority thereof, shall be reported to said court, and when confirmed by the said court shall be final and conclusive on all parties. The value of the shares thus ascertained shall be paid to the said petitioning shareholder or shareholders by the street railroad company purchasing the property and franchises and other assets sold as aforesaid upon surrender to the purchasing company of the shares so appraised. In case said petitioning shareholders shall not present their shares to the purchasing company for surrender within sixty days from the date of said award, or in case of minority or other legal disability, said purchasing company shall make payment of the amount of said award to the clerk of the court, and upon such payment to the clerk of the court the property and franchises purchased shall be released from the lien of said award. The cost of said proceeding shall be paid by the purchasing company.

All rights of creditors and liabilities for damages and all liens or incumbrances upon the property or franchise sold or transferred pursuant hereto shall continue unimpaired, and may be enforced as against such property and franchises as if said sale or transfer had not been made.

AUTHORITY TO CROSS RAILROADS AND REQUIREMENTS THEREFOR.

Chapter LIX of the Indiana Acts of 1903 provides that any street railroad organized under the laws of the state desiring to construct, maintain and operate its street railroad, interurban street railroad or suburban street railroad across the tracks and right of way of any railroad company shall have the right so to do at grade, and if the two companies shall fail to agree as to the amount of compensation therefor or the point or points of crossing, the street railroad company desiring to cross may acquire the right to construct, maintain and operate its street railroad, interurban or suburban street railroad, or any of its main, side or spur tracks, across the tracks, right of way and railroad of the company to be crossed, at the grade of the principal main track at the point of crossing of the company to be crossed, in the manner prescribed in respect to the taking of lands. At every crossing of the main track of a railroad company constructed under the special proceedings herein provided for, the company desiring to cross shall, within six months after it commences to use such crossing, at its own expense, construct, and, likewise at its own expense, maintain and operate a system of full interlocking works, with a derailing apparatus in the tracks of each company, of such design and character as will be best calculated to prevent collisions at such crossing, and will meet with the approval of the auditor of state.

If any street railroad company desires to construct, maintain and operate its street railroad, interurban or suburban street railroad across the tracks, right of way and railroad of any railroad company, not at grade, but by means of an over or under crossing, it shall have the right to do so at the point or points chosen by the company desiring to cross, and if the two companies shall fail to agree as to the amount of compensation therefor, the street railroad company desiring to cross may acquire the right to do so by pursuing the method provided in respect to taking of lands. Any and all plans and specifications calling for an overhead crossing shall pro-

vide a clearance of not less than twenty-one feet six inches above the top of the rails of the main track of the company to be crossed, and any and all plans and specifications calling for an under crossing shall provide for carrying the tracks of the company to be crossed on arches of stone, concrete or vitrified brick, or on steel bridges resting on permanent masonry.

Any crossing of the tracks of a street railroad, interurban or suburban street railroad and a railroad which has been heretofore or shall be hereafter constructed at grade, outside the corporate limits of any town or city, may, by agreement of the two companies concerned, be changed so that the tracks of one of such companies shall cross the tracks of the other below or above the grade of the tracks of such other. If such companies shall fail or be unable to

agree as to such change, either the railroad company or the street railroad company may institute and prosecute a proceeding against the other therefor. But the court shall not order the construction of a heavier grade than a two per cent grade on such street railroad, interurban or suburban street railroad without the consent of the street railroad company; neither shall a grade of any steam railroad track be required that shall exceed the maximum or ruling grade governing the operation of engines on that division or part of the railroad on which the change is to be made, without the consent of the railroad company, nor shall the track or tracks of any of the companies concerned be required to be placed below high water mark at the point where such change is made.

A Comparison of the "Standard Classification of Accounts and Form of Report"

Proposed by the Municipal Tramways Association of Great Britain and the American Standard.

BY C. N. DUFFY, COMPTROLLER, INTERURBAN STREET RAILWAY CO., NEW YORK, N. Y.

[The following is based upon the remarks by Mr. Duffy before the Street Railway Accountants' Association at its session of Sept. 4, 1903, but is not to be considered as a verbatim report.—Ed.]

(In his introduction Mr. Duffy explained that in November, 1902, he had made an analysis of the report of the Glasgow Corporation Tramways for the fiscal year ending May 31, 1902, and with a desire to learn more concerning a number of questions involved, entered into correspondence with Mr. James Dalrymple, the chief accountant for the Glasgow Tramways. As a result of this correspondence Mr. Duffy was asked to criticise the standard classification of accounts and form of report, which Mr. Dalrymple contemplated presenting before the Municipal Tramways Association of Great Britain. In the course of his correspondence Mr. Duffy presented arguments for adopting the classification of accounts adopted by the Street Railway Accountants' Association of America, and thus make that classification applicable to any street railway property on the face of the globe. Mr. Dalrymple was in sympathy with this idea, but pointed out that by reason of differences in conditions between European and American practice, and more especially with those tramways owned municipally, as is the Glasgow Corporation Tramways, the particular difficulty was that there are officers of the municipality who have it in their province to determine how the accounts shall be kept. Mr. Duffy was appointed to represent the Street Railway Accountants' Association at the Glasgow conference, in response to an invitation of Mr. John Young, president, and Mr. J. M. McElroy, secretary, of the Association of Tramway Managers. Mr. Duffy had gone so far as to engage his steamer passage, when the franchise negotiations in Chicago required a change of plans and prevented his going.)

Mr. Dalrymple in presenting the suggested standard form of accounts stated that he confined himself to the form of the Annual Financial Statement, including Revenue and Expenditure Account, Capital Account and Balance Sheet, with an appendix giving the classification of construction, equipment and operating expense accounts, while purchasing, receiving and dispatching of stores and the recording of time and material were left for a future report. Mr. Dalrymple also stated that he had endeavored to adhere as closely as possible to the standard forms adopted by street railways and steam railroads in America and had consulted the classifications of working expenses presented before the International Tramways Union at a meeting in London, July, 1902.

Instead of the American "Income Account" Mr. Dalrymple proposes a "Revenue Account." In the form submitted the receipt or liability side is on the right hand and the expense or asset side is on the left. I have seen balance sheets just the reverse and the practice in England is about equally divided, as I understand. At the head of this account are given the total number of kilowatt-hours for the period covered by the account on one side and on the other side the total car miles. This account is used for a year. The Cr. side at the right of the page is ruled with columns for the amount in pounds, shillings and pence, and for the average per car-

mile in pence. At the left of the page are corresponding columns for entering the amount and the average per car-mile for the corresponding items in the preceding year, to render them readily available for the purpose of comparison. On the Dr. side on the right hand of the page are the columns for pounds, shillings and pence and for the average per car-mile (and under power expense an additional column for the average per kilowatt-hour). On the left hand side of the page are corresponding columns for entry of figures for the preceding year.

As opposed to the American standard "Gross Earnings as per Schedule A" (see Standard Form of Report for Electric Railways Adopted by the Street Railway Accountants' Association in 1902; "Daily Street Railway Review", Oct. 10, 1902, page 688; "Street Railway Review", Vol. xii, page 688). Mr. Dalrymple's report has only two items "Traffic Revenue" and "Sundry Revenue" with the sub-head "Advertising" under the item "Sundry Revenue." The explanation is that practically all the revenue the tramways have is from traffic and advertisements on the tickets. No advertisements are carried in the cars.

On the Dr. side in place of the three general heads "Maintenance", "Transportation" and "General" with the sub-headings under each which we use, Mr. Dalrymple has six headings. "Power Expenses" is the first of these; this is a part of "Transportation" with us. Next he has "Traffic Expenses". The sub-divisions which he makes here under "Power Expenses" and "Traffic Expenses" are practically the same as our "Transportation" with a little difference in the titles. He follows with "General Expenses." Then as opposed to our "Maintenance" he uses the word "Repairs."

I wish at this point to express my appreciation of the debt which I think our association owes to Mr. W. G. Ross, of Montreal, for his suggestion of the concise, logical and appropriate names for our three general divisions "Maintenance", "Transportation" and "General", and I regret that our British brethren could not have adopted these same heads, because it would have made it very much easier for all of us to compare European and American accounts. The choice of these general headings is one that gave our committee a great deal of concern and has been, I feel, very well taken care of.

Now, passing to the arrangement, Mr. Dalrymple has under "Power Expenses"—which would correspond to our "Operation of Power Plant,"—the same number of accounts, with this difference, account No. 15, "Hired Power", is omitted. His account No. 1, "Salary and Wages", is the same as our No. 10; "Fuel" the same as our No. 11; "Water" same as our No. 12; "Oil and Waste" the same as our No. 13. "Miscellaneous Supplies" the same as our No. 14.

In his next sub-division, "Traffic Expenses", he has ten accounts. "Superintendence" corresponds to our No. 16; "Wages of Motormen and Conductors" corresponds to our No. 17 and No. 18 carried separately; "Wages of other Traffic Employees" corresponds to our No. 19, "Miscellaneous Car Service Employees"; "Cleaning and Oiling Cars", "Lighting Cars", "Cleaning, Salting and Sanding Track", "Fuel, Power, Light and Water for Depots", "Ticket Check",

"Uniforms", and "Miscellaneous" would correspond to our Nos. 29, 31, 32 and 33. He has omitted our No. 24, "Removal of Snow and Ice."

In "General Expenses" he has "Salaries General Officers and Staff", which correspond to our No. 25. "Auditor's Fee", appears to be considered so important that it has a separate account, although I take it that the transactions in connection with this account must be very limited. "Store Expenses," which we call "Stores", corresponds to our No. 29. "Rent of Office" will correspond to our No. 36, "Rent of Land and Buildings". That is followed by "Local Taxes" and "Property and Income Tax".

DR. SIDE OF ACCOUNT.

POWER EXPENSES—

1. Salaries and Wages.
2. Fuel.
3. Water.
4. Oil and Waste.
5. Miscellaneous Supplies.

TRAFFIC EXPENSES—

6. Superintendence.
7. Wages of Motormen and Conductors.
8. Wages of other Traffic Employees.
9. Cleaning and Oiling Cars.
10. Lighting Cars.
11. Cleaning, Salting, and Sanding Track.
12. Fuel, Power, Light, and Water for Depots.
13. Ticket Check.
14. Uniforms.
15. Miscellaneous.

GENERAL EXPENSES—

16. Salaries of General Officers and Staff.
17. Auditor's Fee.
18. Store Expenses.
19. Rent of Offices, etc.
20. Local Taxes.
21. Property and Income Tax.
22. Printing and Stationery.
23. Fuel, Light, and Water for Offices.
24. Legal Expenses.
25. Accident Insurance (third party).
26. Employers' Liability Insurance.
27. Fire and Boiler Insurance.
28. Miscellaneous.

REPAIRS—

29. Track and Roadway.
30. Electrical Equipment of Line.
31. Buildings and Fixtures.
32. Steam Plant.
33. Electrical Plant.
34. Workshop Tools and Sundry Plant.
35. Cars.
36. Electrical Equipment of Cars.
37. Miscellaneous Equipment.

PERMANENT WAY RENEWAL—

38. Permanent Way Renewal Fund at £450 per mile of Single Track per annum.

DEPRECIATION—

39. Electrical Equipment of Line.
40. Buildings and Fixtures.
41. Power Plant and Sub-Station Plant.
42. Workshop Tools and Sundry Plant.
43. Cars.
44. Electrical Equipment of Cars.
45. Miscellaneous Equipment.
46. Furniture.
- Total Amount of Working Expenses.
- Balance, carried to Net Revenue Account.

CR. SIDE OF ACCOUNT.

TRAFFIC REVENUE.

SUNDRY REVENUE—

Advertising.

It will be seen that Mr. Dalrymple includes taxes in his general expenses. That was one of the questions we discussed. You know

it is a very old question with us, and a very much discussed question. On calling Mr. Dalrymple's attention to this he said he thought that in theory we were correct, that taxes should be a deduction from income, but that so far as the accounts of the Glasgow Corporation Tramways were concerned, or this classification, in the practice and under the conditions there prevailing it should be an expense, and properly belonged in "General Expenses".

The next account, "Printing and Stationery", is our No. 27; "Fuel, Light and Water for Offices", will correspond to our No. 28; "Legal Expenses" corresponds to our No. 35. They take care of their damages there by insuring the roads, so they use two accounts, "Accident Insurance, third party", and "Employer's Liability Insurance", which would correspond to our Nos. 33 and 34. It seems to me that the breadth and scope of our accounts 33 and 34 and the definition of what constitutes the charges to those accounts, where we have provided for the company who is fortunate enough to insure his road against accidents, is preferable to this.

Then he has "Fire and Boiler Insurance," which corresponds to our No. 32; "Miscellaneous," under "General Expense," which would correspond to our No. 32.

In "REPAIRS", which corresponds to our "MAINTENANCE", he has practically the same arrangement that we have. "Track and Roadway," means the same as our No. 1. "Electric Equipment of Line," is our No. 2; "Buildings and Fixtures," our No. 3; "Steam Plant," our No. 4; "Electrical Plant," our No. 5; "Workshop, Tools and Sundry Plant," our No. 9; "Cars," our No. 6; "Electric Equipment of Cars," our No. 7; "Miscellaneous Equipment," our No. 8.

Mr. Dalrymple has 37 accounts where we have 39, and the arrangement of them under the headings is practically our arrangement. The arrangement of the headings is different. He starts with "Power Expenses" and "Traffic Expenses", meaning "Transportation" where we have "Maintenance." The second one is "General Expenses," where we have "Transportation." The third is "Repairs" where we have "General Expense;" but the number of accounts, their titles, their arrangement, and their grouping, and the detailed instructions as to what constitute their charges, are, I may say, identical with the American classification, and this classification is such that I think it is not only possible but entirely practical, surely not a very difficult or complicated proposition, to compare any street railway in this country with any street railway in that country, as far as the accounts are concerned. Of course, you must take into consideration the difference in conditions.

Mr. Dalrymple's next heading is "Permanent Way Renewal." This is providing a reserve for depreciation or extraordinary expenditures.

The next heading is "Depreciation," which embraces each one of the following construction and equipment accounts: "Electrical Equipment of Line," "Buildings and Fixtures," "Power Plant and Sub-station Plant," "Workshop, Tools and Sundry Plant," "Cars," "Electrical Equipment of Cars," "Miscellaneous Equipment and Furniture." There is a permanent way renewal fund or charge, and the depreciation charge is a part of expenses, so that he has six sub-headings where we have three. The arrangement is that the total amount of the working expenses is added up, the difference between the two sides of the "Revenue Account" taken and the balance carried to "Net Revenue Account."

There are a number of points that have occurred to me which I will mention. One of them is this,—Is our maintenance properly made up with respect to maintenance of equipment? As to equipment I think we rather borrowed or followed the usage applicable to the steam railroad classification, where it means rolling stock. A steam road has locomotives to operate the cars; it has no stationary or central power plant, and the word "Equipment" at first thought to the average man means the "cars". I would like to have all of you think of this point and if you have any suggestions to make, to communicate with the secretary and let the Classification Committee have the benefit of your thought. It seems to me that, just as we have divided "Transportation," we ought to divide our maintenance: "Way and Structures," "Power Plant," "Cars," "Miscellaneous Equipment," "Repair Shops, Tools and Machinery," and I think we ought to enlarge our "Operation." I think we should have "Operation of Miscellaneous Equipment," the snow plows, salt cars, water cars and sprinkling cars, etc., and to have "Operation of Repair Shops," all of which now goes into account No. 9. That has been very forcibly impressed upon my mind because this year we have, in Chicago, operated what is probably the

most complete and extensive repair shops that ever were built. We have a power plant there, that, ten years ago, would have been considered large enough to run an ordinary city railway and to my mind there is just as much reason why the operation of the repair shops and the operation of the miscellaneous equipment, defined as I have explained, should be kept separate, as there is that the operation of power plant should be kept separate from its maintenance and the operation of the cars from the maintenance of the cars.

Passing on to Mr. Dalrymple's accounts, now comes the "Net Revenue Account." On the credit side he brings over the "Revenue Account" balance. Against that is charged interest on capital at three per cent, sinking fund,—that is to retire bonds, etc., and then brings down a balance which is termed "Net Surplus Carried to Appropriation Account."

In the "Appropriation Account," the net surplus carried down is added to the net surplus of the year before. Then a certain sum is carried to the general reserve fund and the balance remains in this fund.

The "Capital Expenditure Account" simply shows the amount of capital used in the current year and the distribution of it, which is not material for discussion.

The "Capital Account" shows the total capital that went into the construction and equipment of the road. Columns are provided at the left of each page for the entry of corresponding figures for the preceding year.

Then we come to the balance sheet. In this accrued liabilities, like taxes, insurance and interest, etc., are included in "Sundry Creditors."

In his "Sundry Information" (reproduced herewith) he has quite an exhaustive exhibit. There are some things in here which were inserted at my suggestion, "car-miles per day per car," "speed per hour of cars," "car-hours per day per car". Another thing which I think very important if it is ascertainable, is the "average rides per capita per annum." In Mr. Steuart's address he particularly dwelt on that, and put it as 200. I am glad to know that those are the figures, but they are very much higher than I thought they would be. Of course, that is the average for cities of a certain population. Financiers and street railway men want to know, as one of the first things, "What is your population?" and "What do you get out of it?" Mr. Dalrymple calls this "Average journeys per head of population per annum."

SUNDRY INFORMATION.

| | | | |
|--|-----------|---------|--------|
| Total Borrowing Powers. | | | |
| Borrowing Powers exercised. | | | |
| Unexhausted Borrowing Powers. | | | |
| Gross Capital Expenditure. | | | |
| Capital Expenditure, as reduced by Depreciation. | | | |
| Mileage of Track:— | | | |
| | SINGLE. | DOUBLE. | TOTAL. |
| Owned. | | | |
| Leased. | | | |
| Totals. | | | |
| Population served by Tramways. | | | |
| Traffic Revenue. | | | |
| Total Revenue. | | | |
| Working Expenses (excluding Depreciation). | | | |
| Working Expenses (including Depreciation). | | | |
| Interest on Capital. | | | |
| Sinking Fund. | | | |
| Net Balance. | | | |
| Disposal of Net Balance | | | |
| Car Miles. | | | |
| Passengers carried. | | | |
| Average number of Cars in use for | hour day. | | |
| Percentage of Working Expenses (excluding Depreciation) to Receipts. | | | |
| Percentage of Working Expense (including Depreciation) to Receipts. | | | |
| Average Traffic Revenue per car mile. | | | |
| Average Traffic Revenue per mile of single track. | | | |
| Average total Revenue per car mile. | | | |
| Average Car Miles per day per car. | | | |
| Average Speed per hour. | | | |
| Average Car Hours per day. | | | |
| Average Working Expenses per car mile (excluding Depreciation). | | | |

Average Working Expenses per car mile (including Depreciation).
Scale of Fares:—

| | | | | | | | |
|--|-----|---------|-----|---------|-----|---------|-----|
| 1/2d. | 1d. | 1 1/2d. | 2d. | 2 1/2d. | 3d. | 3 1/2d. | Av. |
| Average distance (miles). | | | | | | | |
| Average Fare paid per passenger. | | | | | | | |
| Average Number of Passengers per mile. | | | | | | | |
| Average Journeys per head of population per annum. | | | | | | | |
| Number of Cars in stock. | | | | | | | |
| Total Amount of Sinking Fund. | | | | | | | |
| Amount of Sinking Fund applied in reduction of debt. | | | | | | | |
| Amount Renewal Fund. | | | | | | | |
| Amount Reserve Fund. | | | | | | | |

As opposed to our classification of construction and equipment accounts, Mr. Dalrymple has a classification of capital accounts, and he has nearly the same arrangement that we have except that the accounts are not arranged in the same way. He has about the same number and I think the same constituent charges. For instance, he has A, "Permanent Way, Track and Roadway," corresponding to our D; B, "Electric Equipment of Line," to our E; C, "Ground," to our F; D, "Buildings and Fixtures," to our G; E, "Power Station and Sub-station Plant," to our I; F, "Workshop, Tools and Sundry Plant," to our J; G, "Cars," to our K; H, "Electrical Equipment of Cars," to our L; I, "Miscellaneous Equipment," to our M; J, "Office Furniture," to our O; K, "Parliamentary Expenses," to our A. Then he has L, "Preliminary Expenses," which we would include in A. Our account H is omitted and accounts N and B are omitted, as is also account C. That simply means that he has condensed or grouped these items into a smaller number of accounts.

Litigation Over Crawfordsville (Ind.) Roads.

In the "Review" for July we gave a brief account of the situation at Crawfordsville, Ind., where two interurban electric roads, the Consolidated Traction Co. and the Indianapolis and Northwestern Traction Co., were attempting to occupy the streets of the city. Both companies had been enjoined from proceeding with track construction in the city, and on July 6th the Consolidated company removed the litigation to the United States Circuit Court, sitting at Indianapolis.

Judge Baker, of the federal court, on September 9th ruled that his court had jurisdiction of the cause and issued a citation for George Townsend, president of the Indianapolis & Northwestern; Clift Wise, contractor, and William Johnston and W. N. Harding, attorneys, to show cause why they should not be punished for contempt for laying tracks in Crawfordsville in violation of the injunction issued by the state court.

September 11th the hearing on the contempt proceedings was set for September 24th. Judge Baker has refused to remand the case to the state court, and also to quash the contempt proceedings. The delay in the hearing was granted to accommodate counsel.

The injunctions against further work in Crawfordsville are continued in force.

Free Legal Advice for Employees.

Sept. 14, 1903, C. S. Sergeant, vice-president of the Boston Elevated Railway Co., issued the following General Order No. 414, which is self-explanatory:

"Hon. Russell A. Sears, Manager of the Legal Department, authorizes the publication of the following notice:

"Beginning Monday, September 14, 1903, any employe of this company will be furnished legal advice concerning his personal affairs by the Legal Department, free of charge. Any employe desiring to avail himself of the above may call at the offices of the Legal Department at 101 Milk Street, Room 300, and, upon showing himself to be an employe, will be assisted in his affairs, as far as legal advice is concerned, by the attorneys of the company.

"This undertaking is largely experimental, and should it be deemed expedient to enlarge, qualify or discontinue the same, due notice will be given."

The New York & North Shore Railway Co., of Long Island City, N. Y., has received permission from the Supreme Court to change its name to the Long Island Electric Railway Co., the change to become effective October 1st.

Personal.

MR. J. W. TAYLOR has been appointed principal assistant engineer of the Pacific Electric Railway Co.

MR. BENJAMIN J. WEEKS has resigned as general superintendent of the Puget Sound Electric Railway Co. and accepted the position of manager of the Spokane Traction Co.

MR. F. M. FOWLER has been appointed claim adjuster for the Pacific Electric Railway Co., vice Mr. W. H. Faust, resigned. His headquarters will be at 555 South Main St., Los Angeles.

MR. A. H. WOODWARD, president of the International Register Co., left Chicago September 15th and will spend a month making an automobile tour in the White mountains and Adirondack region.

MR. M. D. STROUT, for 12 years superintendent of the engineering laboratory of Purdue University, has resigned that position to enjoy in his declining years a well merited release from routine duties.

MR. T. N. KERR, of Columbus, O., promoter of the Delaware & Magnetic Springs Railway Co., has resigned as secretary and general manager and it is understood

that he has sold his entire interest in this road, which is nearing completion. Mr. Kerr has been in the electric railway business for the past three years. He first planned the system now being built in Delaware and Union Counties, and through him the owners of the road purchased two hotels in Magnetic Springs, as well as the park containing 11 acres in which is situated the spring for which the town is named. Mr. Kerr has disposed of his interest in these hotels, which he successfully managed during the past season, and will



T. N. KERR.

again take up his residence in Columbus, where he has been in business a number of years. Mr. Kerr, who is a young man, is an Ohioan by birth. He is well known in local railway circles and has been very successful in securing rights of way. He will undoubtedly enter the railway field again in the near future.

MR. H. C. REAGAN, of Osborn, O., has resigned as superintendent of motive power of the Appleyard lines in Ohio, where he had charge of the high tension system and both the main power plants and sub-stations.

MR. H. A. FRAZER has resigned as master mechanic of the Montgomery Street Railway Co., of Montgomery, Ala., to accept a similar position with the New Hampshire Traction Co., with headquarters at Salem, N. H.

MR. W. H. CONRY, for 20 years identified with the Santa Fe shops at Topeka, and recently in charge of the tool room at that point, has been appointed superintendent of the engineering laboratory at Purdue University.

MR. W. RICHARDSON, who was for nearly ten years superintendent of the elevated railroad of Kansas City, Kan., and Kansas City, Mo., has resigned that position to take charge of the rebuilding of the lines in Topeka, Kan.

MR. E. F. GOULD, who was recently appointed electrical engineer of the Aurora, Elgin & Chicago Railway Co., was formerly with the General Electric Co., where he was in charge of important work in the railway engineering department.

MESSRS. STONE & WEBSTER, of Boston, announce the removal of their offices to the 9th, 10th and 11th floors of the newly constructed India Building, State St., corner of Merchants' Row, the new address being No. 84 State St., Boston, Mass.

MR. M. E. WILLIAMS has been appointed superintendent of the Indian Territory Traction Co., with headquarters at South McAlester, I. T. He was formerly traveling freight and passenger agent of the Missouri, Kansas & Texas Railway System.

MR. H. P. BRUCE, general manager of the Demerara Electric Co., of Georgetown, British Guiana, who has been spending his vacation in this country, sailed for home September 17th. Mr. Bruce has been manager of the Demerara Electric Co. for about three years and under his supervision the property has developed

rapidly and is now on an excellent basis. Several new extensions have been built and the road has been the means of greatly developing the surrounding territory.

MR. H. L. SMITH has been appointed superintendent of the Columbus, Delaware & Marion Electric Railroad Co. and assumed his new duties September 11th. Mr. Smith was formerly connected with the Central Market Street Railway Co., of Columbus.

MR. E. S. DIMMOCK, formerly general manager of the Bay Cities Consolidated Railway Co., has been appointed manager of the Cape Breton Electric Co., Ltd., and the Glace Bay & Sydney Railway Co., with headquarters at Sydney, Nova Scotia. These companies are Stone & Webster syndicate properties.

THE LANSING CITY ELECTRIC RAILWAY CO., of Lansing, Mich., has been purchased by interests controlling the Lansing, St. John & St. Louis Railway Co., and the two roads will later be consolidated and incorporated under a new name. It is stated that Mr. James R. Elliott is to become the general manager of the company.

MR. W. D. KURZ has been appointed general foreman and electrician of the Marinette division of the Menominee and Marinette Light & Traction Co. Mr. Kurz was the first superintendent of the first central station in the world to sell electric current for lighting, namely the old Edison plant at Appleton, Wis., which was started in 1882.

THE ROYAL COMMISSION on London street traffic appointed a sub-committee last July to visit this country for the purpose of studying American street railway systems, and the members of the committee, with one exception, sailed from Liverpool for New York on September 18th. The committeemen sailing are Lord Ribblesdale, George Bibb, general manager of the Northeastern Ry.; Sir David Barbour and Sir J. Dickson Poynder.

THE CHICAGO MIDLAND TRANSIT CO., recently organized, has acquired the interests of the Chicago General Ry. represented by J. H. Witbeck and C. L. Bonney and is consolidating the other conflicting interests. The Midland company has control of the General Railway bonds and stocks and has affiliated with it the official organization as well as the receiver for the Chicago General Ry. The Midland Transit Co. intends to operate the system of the Chicago General Ry.

MR. T. F. MANVILLE, president of the H. W. Johns-Manville Co., returned August 20th from a two months' trip abroad during which he visited London, Paris, Berlin and other places on the continent. Mr. Manville was largely interested in some very important tests of the efficiency of pipe coverings, which were conducted by the English government, and he feels confident of closing some very important contracts as a result. Mr. Manville was accompanied by his family.

THE PACIFIC ELECTRIC RAILWAY CO. has reorganized its mechanical department in consequence of the resignation of Mr. C. E. Donnetin, the former superintendent, and hereafter Mr. A. H. Lindemuth, master car builder, will report to Mr. William Jennings, the new superintendent, as will Mr. Richard Nelson, who was recently appointed mechanical foreman of the mechanical and labor departments, and Mr. Joseph Strang, who has been appointed general foreman of the machine shop.

MR. S. L. NELSON, who on July 7th was elected president of the Galesburg Electric Motor & Power Co., will continue to serve as vice-president and general manager of the Fort Wayne & Southwestern Traction Co., for which company he is also receiver. Mr. Nelson is also general manager of the Wichita Railroad & Light Co., which position he has held for years, and he has been for a long time closely identified with other properties known as the McKinley syndicate properties. His headquarters will continue to be Ft. Wayne, Ind.

MR. V. W. BERGENTHAL on September 1st resigned as assistant manager of the Chicago office of the Stanley Electric & Manufacturing Co. to take charge of the sales department of the American Automatic Switch & Signal Co., of Chicago, of which company he has also been elected vice-president, vice Mr. E. T. Glennon, resigned. Mr. Bergenthal, who was associated with the Stanley company five years, in the capacities of engineer, salesman and assistant manager, has many friends among the trade who will be pleased to learn of his new appointment.

MR. C. E. DONNETIN recently resigned as superintendent of the mechanical department of the Pacific Electric Railway Co., which position he held a little more than a year and a half. He was pre-

viously for 27 years master car repairer for the Southern Pacific Co. Mr. Donnetin is a director in and vice-president of the Dollar Savings Bank, of Los Angeles, and president of the Southern California Savings Association, besides having an interest in the company which is exploiting a new pneumatic trolley base, and he will hereafter devote his attention to these and other private interests.

DR. BYRON BRIGGS BRACKETT, A. B., A. M., has been appointed to the chair of physics and electrical engineering at the Thomas S. Clarkson Memorial School of Technology. Dr. Brackett is a graduate of the Syracuse University and received the degree of Ph. D. from the Johns Hopkins University. He is an associate member of the American Institute of Electrical Engineers and a member of the American Association for the Advancement of Science. His teaching experience has been in the Dickinson Seminary, Williamsport, Pa., Adelphi Academy, Brooklyn, N. Y., Eastern High School, Washington, D. C., Electrical Engineering Laboratory, Johns Hopkins University, Union College, Schenectady, N. Y., and Rutgers College, New Brunswick, N. J.

MR. A. H. POMEROY has resigned as president of the Cleveland & Southwestern Traction Co. and has been succeeded by his son, Mr. F. T. Pomeroy, the general manager and treasurer, who has resigned the latter office to become president, but retains his position as general manager. The elder Pomeroy's health has been poor since he sustained a stroke of apoplexy a year ago, and, besides, he has private interests that demand his attention. The vacant treasurership has been filled by the election of Mr. F. L. Fuller, a broker, who has been interested in the road from the beginning. The office of assistant treasurer has been created and Mr. J. O. Wilson, general passenger agent, has been elected to fill it, at the same time continuing to hold his old position.

MR. THOMAS R. GABEL, who on July 1st was appointed general traffic manager of the Los Angeles Pacific Railroad Co., was born in Fredericton, N. B. He entered railway service April 30, 1877, as clerk in the general freight department of the Central Vermont Ry., at St. Albans, Vt., and in 1880 became chief clerk of the department. In October, 1882, he was appointed chief clerk to the general manager of the Mexican Central Railway Co., with headquarters in Mexico. From September, 1885, to November, 1886, Mr. Gabel was chief clerk to the general manager of the Atlantic & Pacific R. R., and then became acting general superintendent of the same road. In February, 1887, he was appointed general material agent for the Colorado Midland Ry., and resigned in August, 1888, to again become chief clerk to the general manager of the Atlantic & Pacific R. R. From Sept. 1, 1891, to Jan. 1, 1895, he was general superintendent of the road. From 1895 to 1901 he was engaged principally in mining, and in the latter year he entered the service of the Los Angeles Pacific Railroad Co.

Accidents.

On August 21st an electric car filled with picnickers ran away on a steep grade in Fremont, a suburb of Seattle, and, leaving the track at a curve at the bottom of the hill, crashed into a yard. Fourteen passengers were injured, one fatally, and the car was wrecked.

A rear-end collision between two Colorado Springs & Interurban Railway Co. cars occurred August 23d on the Cheyenne Canon line. Two women passengers were seriously injured. One of the motormen was thought to have been negligent as the cars were running on a very close headway.

The first street railway collision to occur in Newport, R. I., took place August 25th. It was a rear-end collision due to wet rails. Both conductor and passenger were lightly injured, one passenger's arm was hurt and one car was badly damaged.

An eastbound Albany car and a work train going west collided on the Albany division of the Schenectady Railway Co. September 5th. The conductor of the Albany car was severely injured by flying glass and an unknown man was seriously injured. There was a heavy fog and neither motorman could see the approaching car.

There was a head-on collision on the Orange County Traction Co.'s line at Newburgh, N. Y., September 5th, which resulted in serious injury to five persons, one of them a motorman, whose thigh and arm were broken. The cars were a regular and an extra, and a misunderstanding of orders caused the collision.

On September 6th a trolley car on the Wilkesbarre (Pa.), Dallas & Harvey Lake Railway Co.'s line was wrecked in a mountain

gorge five miles from Wilkesbarre and plunged down a 30-ft. embankment, killing one passenger and injuring 11 others. The wreck was caused by a stone believed to have been maliciously placed.

A misplaced signal was said to be responsible for a collision of two trolley cars at Fort Washington, Pa., September 6th, in which 14 persons were injured, two of them not being expected to survive. The track at a sharp curve.

Four persons were killed and 19 seriously, and some of them probably fatally, injured in a head-on collision September 6th on the Hudson, Pelham and Salem division of the New Hampshire Traction Co.'s system. The accident occurred near Pelham, N. H., and misunderstanding of a starter's orders was given as the cause.

Eight persons were injured in a head-on collision on the Easton and Bethlehem branch of the Lehigh Valley Traction Co., September 7th. The cars met on a curve on a steep grade.

A car on the Lake Shore Electric Railway Co.'s system ran into an open switch near Sheffield, O., September 3d, and crashed into a gondola car loaded with coal. Five persons, including the conductor and motorman, were injured. It was thought that the conductor would die.

Four persons were injured in a head-on collision on the Milford, Attleboro & Woonsocket Street Railway Co.'s line at Eagle Hill, Wrentham, Mass., September 7th. Both legs of one of the motormen were crushed and he was expected to die, as was one of the passengers.

A freight train on the Chicago & Northwestern Ry. ran into a Manitowoc & Northern Traction Co. car at Manitowoc, Wis., September 14th. Nine persons were injured, five of them seriously, and the car was badly damaged.

Strikes of the Month.

The street railway strike against the Virginia Passenger & Power Co., of Richmond, Va., which was mentioned in the "Review" for June, July and August, was officially declared off August 24th, after lasting two months and seven days, the strike having begun June 17th. It is estimated that the strike cost the company \$125,000 and that the men lost \$50,000 in wages. One man was shot and killed by soldiers during the trouble and one motorman was fatally stabbed by another, while a number of persons were more or less injured.

The most important feature of the victory from the standpoint of the company is the total disruption of the union in Richmond. The strikers lost everything. More than a hundred of them returned to work some time ago, but 400 are without work and deeply in debt. The company also lengthened the hours of labor to 12 daily, with a uniform wage of \$2 per day.

The unsettled conditions that have prevailed among the employees of the Seattle Electric Co. for a long time resulted in a strike being called on September 9th. The men did not respond as spontaneously as had been anticipated, however, and fewer than 100 went out. The men were divided as to the merits of the strike, so the International Union of Street Railway Employees recommended that the strike be declared off, which was done on September 15th. Forty-five of the men who struck were dropped from the company's payrolls. The disaffection grew out of the strike last March, which was mentioned in the "Review" for April, and which the union did not consider satisfactorily settled.

The men employed on overhead construction work for the Indianapolis & Northwestern Traction Co., between Frankfort and Indianapolis, struck September 4th for more pay. They were receiving \$2.75 per day. On September 9th the company decided to recognize the union and pay union wages and the men went back to work.

The strike of the conductors and motormen of the Kanawha Valley Traction Co., of Charleston, W. Va., which was mentioned in the "Review" for July, was ended August 21st by the signing of a compromise agreement by which a new wage scale went into effect September 1st, the company agreeing to reinstate a portion of the strikers at once and others as vacancies occur.

The Omaha Street Railway Co. expects to build its 13th St. line south to Missouri Ave. in South Omaha this year, that being the only extension contemplated before frost sets in.

Power Plant of the Nashville Railway & Light Co.

The Nashville Railway & Light Co. which is a consolidation of the Cumberland Electric Light & Power Co. and the Nashville Ry. is now completing a large and modern power plant which was begun about a year ago under the direction of Percy Warner and E. C. Lewis, at that time receivers for the Nashville Ry. and managers of the Cumberland Electric Light & Power Co. The engineering features of this plant are under the supervision of Ford, Bacon & Davis. The cost of the complete plant including the building and site will be over \$500,000 and owing to the completeness of its detail and the size of its units the new plant will be equal to any in the South.

The power house is situated on North Front St. adjoining the new municipal plant of the City of Nashville and stands upon the bank of the Cumberland River. It is a fire proof structure 300 ft. long by 110 ft. wide and is built of brick and steel with a gravel roof and with floors of tiling and cement. The only wood used in the building is in the window frames. The girders carrying the floor are built of reinforced concrete and no steam piping or wires are run above the floor, all being in the basement.

The boiler plant comprises six batteries of Babcock & Wilcox boilers each of 700 h. p. capacity. As yet only one battery has been installed, the remaining five batteries which are practically new now being in operation at the old plant. These will be gradually moved to the new power house. The main generator unit for the railway load is a 1,600-kw. direct connected General Electric generator operated by a 2,500-h. p. Green-Wheelock cross-compound condensing engine. The electric light load will be handled by a 1,250-kw. General Electric generator direct connected to a 1,600-h. p. Green-Wheelock cross-compound condensing engine. These engines were built by the American & British Manufacturing Co., of Providence, R. I., and all of the electrical machinery for the plant was furnished by the General Electric Co.

The engine room is spanned by a traveling crane built by the Reading Crane & Hoist Works, of Reading, Pa. It has a span of 60 ft. and a carrying capacity of 30 tons. It traverses the entire length of the building. The pumps and condensing apparatus are of the Blake and Worthington types. The boiler furnaces were built by the Hawley Down Draft Furnace Co. and are located in the rear of the building on a foundation of solid stone 15 ft. below the level of Front St. In the rear of the building is a condensing well 20 ft. in diameter and 60 ft. deep, which serves as a reservoir for water from the river, to which it is connected by a tunnel 6 ft. square and 60 ft. long. This tunnel runs from the bottom of the well to the low water mark of the Cumberland River. The large condensing pumps are located in rooms around the bottom of this well which radiate from the central shaft. This shaft and the rooms were cut out of solid rock and no artificial walls were required. There are two condensers one having 7,000 sq. ft. of cooling surface and the other 5,700 sq. ft.

The boilers are situated on the side of the power house facing the river and run the entire length of the building. The arrangements for receiving the coal supply are especially convenient as the tracks are mounted on steel trusses and run through the rooms so that coal cars can be run in and dumped just where the fuel is needed. Retaining walls over 50 ft. high were built up from the river bank to secure the foundation for the boiler room. Just outside of this room are two large coal pockets for storing coal which have a capacity of about 4,000 tons. The chimney is built outside the main building and is 200 ft. high, 25 ft. square at the base and is 12 ft. in internal diameter.

The switchboard is of the General Electric Co. standard type and is built of black marble. All of the principal switches are of the oil break type which overcomes all possibility of arcing. The oiling of the machinery is done automatically. A tank is located high up on the wall of the engine room from which the oil is piped to all the bearings. From these the waste oil is led to a tank in the cellar where it is filtered after which it is pumped up to the supply tank and thus used continuously.

While the two generators cannot be used interchangeably reversible rotary converters are installed by means of which either direct or alternating current can be obtained from either unit. This will prove a great convenience in case of any extraordinary demand on the railway lines or in case either machine should be disabled. These

machines are arranged so that if desired only a part of the current from either unit will be converted and the remainder used in the way for which it was originally designed.

Comparison of the new power house with the old plant is interesting owing to the great changes in engineering practice which are exhibited. In the new plant two generators take the place of 16 now in use at the old plant, and the two machines have almost double the capacity of the 16 old ones. In designing the new plant ample provisions for increase in the future have been made. The new equipment will more than take care of the present needs of the company but the building is of sufficient size to double the present capacity if necessary. The location of the machines and the piping has been arranged so that new machines can be added as needed without making any changes in the present equipment. It is probable that some of the best electrical machinery in the old plant may be temporarily installed in the new plant to be used in cases of emergency. When the new power house is fully completed and the relaying of the street railway tracks in Nashville is finished, that city will have a thoroughly modern electric railway and lighting system.

Los Angeles Notes.

The Los Angeles Traction Co. was recently acquired by the Huntington-Hellman syndicate, the formal transfer taking place July 13th; the price paid is reported to have been \$1,750,000. The company operates three city lines, and an interurban line—the California Pacific—to San Pedro. The Los Angeles Pacific Railroad Co. and the Los Angeles & Redondo Railway Co. are now the only systems not owned by the Huntington interests. The Los Angeles Traction Co. is to undergo a thorough overhauling under direction of S. B. McLanagan, the superintendent. The rolling stock will be renovated and renewed, the cars painted and repaired, and portions of single-track road will be double tracked. The schedules will be changed, so that night men will have an equal chance with the day men, and motormen will be permitted to sit while on duty within certain limits.

The Los Angeles Railway Co. has begun work upon a new car house which will be the largest in this region. It will be 263 x 400 ft., with 20 tracks, and will cost about \$75,000. It will be similar to the Pacific Electric Railway Co.'s car house in Los Angeles, and is located some distance south of the city, in anticipation of the city's growth.

The steel construction work on the Pacific Electric Railway Co.'s new terminal station is nearing completion and the heavy girders are being erected. The girder over the entrance is the largest west of the Rocky Mountains; it weighs 41 tons. The Llewellyn Iron Works, of Los Angeles, was awarded the contract.

The Los Angeles-Pacific Railroad Co. is building a new power house southwest of the city. It will contain four Stirling boilers, a McIntosh & Seymour horizontal cross compound engine and a Stanley alternator of about 800 kw. capacity. A new sub-station is being built nearer the city, it being a step-down transformer station of about 300 h. p. capacity.

New Cars for Union Traction Co.

The receivers for the Union Traction Co., of Chicago, have let contracts for 100 new cars at a cost of \$493,500. These cars, which will be built by the St. Louis Car Co., will be 40 ft. long and will contain reversible back cross seats and large windows. They will be equipped with air brakes and General Electric motors. The company has applied to the city for permits to substitute the overhead trolley system for the cable in certain streets on the north and west sides of the city which it seems improbable that the municipal authorities will grant. The receivers, however, are apparently relying on the decision of Judge Grosscup in which he held that for the purposes of the receivership the 99-year act carried the broadest rights claimed under it.

An order has been issued establishing mail service by the Milwaukee Electric Railway & Light Co., between Milwaukee and Hale's Corners, beginning September 21st. Two mails each way will be carried on week days and one on Sundays and holidays. It is the first electric road mail route in the county.

Financial.

Recently the Johet, Plainfield & Aurora Ry. voted a \$400,000 bond issue.

The Pueblo & Suburban Traction & Lighting Co.'s gross earnings for July, 1903, were \$44,222.

The earnings of the Boston & Worcester Street Railway Co. for July were \$29,000; for August, \$29,055. The road began operation in July.

The gross receipts of the Metropolitan West Side Elevated Railway Co., of Chicago, for the first six months of its fiscal year, to September 1st, were \$1,006,981, an increase of \$56,022.

The Massachusetts Railroad Commissioners recently authorized the Boston & Worcester Street Railway Co. to issue \$1,000,000 4½ per cent 20-year bonds and 2,500 additional shares of stock at par.

The earnings of the St. Louis Transit Co. for August were \$659,484, compared with \$579,524 for August, 1902, a gain of \$79,960. The August earnings show a gain of \$26,880 over those for July.

It is announced that the Hoosac Valley Street Railway Co., of North Adams, Mass., recently increased its capital from \$200,000 to \$400,000 and that all of the new stock has been taken.

The net income of the Syracuse Rapid Transit Co. for the year ending June 30, 1903, amounted to upwards of \$100,000, and the gross earnings showed even a greater increase, on account of the operating expenses having increased considerably over the year before.

The Pottsville (Pa.) Union Traction Co.'s statement for August shows that the receipts for the month were \$22,344, compared with \$17,156 for August of last year. The total receipts for this year up to August 31st are \$129,161, as compared with \$110,358 last year.

The receivers of the Lehigh Valley Traction Co. and the Philadelphia & Lehigh Valley Traction Co. have paid all the fixed charges maturing September 1st, amounting to \$70,000. The gross receipts for August were \$113,182, an increase over August, 1902, of \$9,093.

The earnings of the Northern Ohio Traction Co. for August were \$83,118, against \$71,655 for August, 1902, a gain of \$11,463. The gain in lighting earnings and miscellaneous was approximately \$2,000. The average daily passenger earnings for the month were \$2,681, against \$2,311 for last year, a daily gain of \$369.

The gross earnings of the Binghamton (N. Y.) Railway Co. for the year ending June 30, 1903, were \$226,702, as against \$207,900 for 1902. The operating expenses were \$126,600; net earnings, \$100,101; operating ratio, .558. For the quarter ending June 30th the gross earnings were \$61,321, an increase of \$9,042; operating expenses, \$31,267, an increase of \$1,663; net earnings, \$30,054, an increase of \$7,379.

Following are the gross earnings of the Springfield & Xenia Traction Co. for the 13 months beginning with May, 1902, and ending May, 1903. This company was recently acquired by the Bushnell syndicate, of Springfield. The earnings: 1902—May, \$49; June, \$714; July, \$1,650; August, \$2,889; September, \$3,501; October, \$3,624; November, \$3,794; December, \$3,107. 1903—January, \$2,909; February, \$2,783; March, \$3,457; April, \$3,720; May, \$5,363.

The Mineola, Hempstead & Freeport Traction Co., now the New York & Long Island Traction Co., on September 3d filed a mortgage for \$1,000,000 in favor of the Savings & Trust Co. of Cleveland, O., the loan having been secured for the purpose of completing its lines in and around Mineola, Freeport, Rockville Center, Queens and Babylon, L. I., including an extension to the New York City line.

The gross passenger earnings of the Aurora, Elgin & Chicago Railway Co. for August were \$53,704. Following are the earnings

by weeks from the week ending June 7th to the week ending Aug. 6, 1903: June 7, \$8,516; June 14, \$9,411; June 21, \$9,297; June 28, \$9,590; July 5, \$14,831; July 12, \$11,285; July 19, \$11,700; July 26, \$11,385; August 2, \$12,205; August 9, \$12,144. For the week ending August 30th, a stormy week, the earnings were \$10,073.

The Capital Traction Co., of Washington, D. C., has decided to remove its stock transfer office from New York to Washington about November 1st. It is one of the rules of the New York Stock Exchange that a company that wishes to have its stock listed must maintain its transfer office in New York. It is stated that the trades in the Capital Traction Co. stock on the New York exchange have not been important, however.

It was announced August 22d that a syndicate headed by William C. Whitney and Thomas F. Ryan, of New York, and P. A. B. Widener and Thomas Dolan, of Philadelphia, had taken over the entire holdings of Kuhn, Loeb & Co. in the Metropolitan Securities Co., which through a third company holds a lease of the Metropolitan Street Railway Co. lines in New York City. It is stated that the syndicate originally owned the stock and sold it to Kuhn, Loeb & Co. with a guarantee that the Metropolitan earnings would show 7 per cent upon the stock. This, it is claimed, they have not done, so Kuhn, Loeb & Co. offered the stock back under the guarantee.

CONSOLIDATION AT ALTON, ILL.

We are advised by Joseph F. Porter, president, that on July 30th the Alton Railway, Gas & Electric Co. and the Alton & East Alton Railway & Power Co. were consolidated under the name of Alton Light & Traction Co., with a capital of \$1,000,000. Under the plan of consolidation \$500,000 of preferred and \$150,000 of common stock have been issued.

NORTHERN TEXAS TRACTION CO.

The statement of the Northern Texas Traction Co. for the month of July, 1903, shows the gross earnings to have been \$42,548; operating expenses, \$20,543; net earnings, \$22,005; fixed charges, \$9,018; net profit, \$12,986. For the eight months ending August 31st the gross earnings were \$293,347; net earnings, \$131,062; surplus, \$64,369. The August earnings were \$43,859 gross, \$19,357 net and \$11,024 surplus.

TOLEDO RAILWAYS & LIGHT CO.

The gross earnings of the Toledo Railways & Light Co. for the first six months of the present year were \$772,178, an increase of \$100,894; operating expenses, \$401,205, an increase of \$48,824; net earnings, \$370,972, an increase of \$52,070; fixed charges, \$242,070, an increase of \$15,037; surplus, \$128,901, an increase of \$37,032. The operating ratio for June was .5073; for the six months, .5196.

UNITED TRACTION CO., ALBANY.

The annual report of the United Traction Co., of Albany, N. Y., shows the following statistics: Gross earnings from operations, \$1,606,089; operating expenses, \$1,076,847; net earnings, \$529,242; fixed charges, \$299,138; five per cent dividend distributing, \$249,997; deficit for the year, \$1,677; surplus for next preceding year, \$67,320; total surplus, \$65,642. Number of passengers carried, including transfers, 31,680,601; number of transfers, 2,703,339. The operation of the Cohoes City railway shows a deficit for the year of \$36,149, or a total deficit of \$40,928.

SYRACUSE, LAKESIDE & BALDWINVILLE RY.

Since Mr. W. B. Rockwell became manager of the Syracuse, Lakeside & Baldwinsville Ry., on July 1, 1902, the road has made a remarkably good showing, largely on account of reduced operating expenses. The annual report shows the net receipts for the fiscal year ending June 30, 1903, to have been \$34,217, as compared with \$13,141 for the previous year, a gain of more than 160 per cent. The gross receipts were \$87,950, as against \$87,835, and the operating expenses \$53,733, compared with \$74,714. In 1902 there was a deficit of \$14,935; this year there was a surplus of \$6,726. The fixed charges and taxes were about \$28,000 for each year. The showing is the more remarkable when it is considered that the gross receipts were nearly the same, wages were increased approximately 10 per cent and fares were materially reduced to regular patrons.

Where formerly four cars were employed to take care of through traffic, three are now used, and the service has not suffered. For the lake resort business three double deck cars, with nine men to run them, used to be employed, while now two cars and four men perform the same service. The employes have been carefully drilled and accidents, and resulting damage claims, are fewer.

LOUISVILLE & SOUTHERN INDIANA.

The New Albany (Ind.) Street Railway Co. has executed a lease to the Louisville & Southern Indiana Traction Co., transferring to the latter all its property. The lease is for 25 years at an annual rental of \$500. The lessee assumes all debts, contracts and obligations of the street railway company, including an issue of \$250,000 5 per cent bonds, and also agrees to pay preferred stockholders the dividends as they mature. The \$250,000 bond issue is guaranteed by the United Gas & Electric Co., which agrees to deliver to the traction company 2,000 shares of common stock, par value \$200,000, and to furnish electrical power for 25 years. A deed has also been filed for record transferring all the property of the Southern Indiana Interurban Co., the consideration being \$2,000,000, the transfer being necessary because of the traction company's change of name.

The stockholders of the Louisville & Southern Indiana Traction Co. have voted to issue \$1,000,000 of 5 per cent bonds, the money to be used in building new lines and equipping the bridges for entrance into Louisville. The company has a 20-year lease for the use of the Big Four bridge and is negotiating for the use of the Kentucky and Indiana bridge.

LOUISVILLE TRACTION CO.

The Louisville Traction Co., which was recently incorporated to take over the Louisville Railway Co., has an authorized capital of \$2,500,000 of 5 per cent cumulative preferred stock and \$12,000,000 of common stock. According to the plan of reorganization the traction company will give for the preferred stock of the Louisville Railway Co. an equal amount of the preferred stock of the Louisville Traction Co., and also give in its common stock 20 per cent of the amount of such preferred stock. For each share of the common stock of the Louisville Railway Co., with the additional payment of \$55, the traction company will issue three shares of its common stock. The new stock will be delivered Apr. 1, 1904. The common stock deposited will draw interest at the rate of 5 per cent per annum from July 1, 1903, to Apr. 1, 1904, payable quarterly; cash payments at the rate of 5 per cent per annum from the time the payments are made to Apr. 1, 1904, and preferred stock at the rate of 5 per cent from Apr. 1, 1903, to Apr. 1, 1904, payable semi-annually. The Fidelity Trust & Safety Vault Co., and the Columbia Finance & Trust Co., both of Louisville, are depositaries.

Up to September 10th 54,000 of the 60,000 shares had been deposited, 6,000 shares only being then out. The company has already paid off \$600,000 of its borrowed money.

ITHACA STREET RAILWAY CO.

Following is the statement of the Ithaca (N. Y.) Street Railway Co. for the quarter ending June 30th:

| | 1902. | 1903. | Increase. |
|------------------------------|----------|----------|-----------|
| Earnings from operation..... | \$21,238 | \$23,011 | \$ 1,773 |
| Miscellaneous earnings | 4,823 | 6,625 | 1,802 |
| Total earnings | 26,061 | 29,636 | 3,575 |
| Operating expenses | 26,621 | 15,137 | **11,484 |
| Net earnings | * 559 | 14,499 | 15,058 |
| Fixed charges | 5,720 | 5,217 | ** 503 |
| Net income | * 6,279 | 9,281 | 15,560 |

*Deficit. **Decrease.

CINCINNATI, NEWPORT & COVINGTON.

The statement of the Cincinnati, Newport & Covington Light & Traction Co. for July is as follows:

| | 1902. | 1903. | Increase. |
|------------------------------|----------|-----------|-----------|
| Earnings from operation..... | \$91,976 | \$109,006 | \$17,030 |
| Operating expenses | 36,435 | 42,858 | 6,423 |
| Miscellaneous expenses | 13,978 | 16,839 | 2,861 |
| Total expenses | 50,414 | 59,697 | 9,283 |
| Net earnings | 41,562 | 49,308 | 7,746 |
| Fixed charges | 21,670 | 20,929 | *741 |

| | | | |
|-----------------------|--------|--------|--------|
| Net income | 19,892 | 28,379 | 8,487 |
| Operating ratio | .5481 | .5470 | *.0005 |

*Decrease.

For the six months ending June 30, 1903, the gross earnings were \$573,384, as against \$519,241 in 1902; operating expenses, \$238,750 in 1903 and \$215,189 in 1902; net earnings, \$234,419 in 1903 and \$222,256 in 1902; operating ratio, .5911 in 1903 and .5719 in 1902.

INTERNATIONAL TRACTION CO.

Following is the comparative statement of income account of the International Traction Co., Buffalo, for July:

| | 1902. | 1903. | Increase. |
|--|-----------|-----------|-----------|
| Earnings from operation..... | \$328,627 | \$390,413 | \$ 61,785 |
| Operating expenses | 162,179 | 169,490 | 28,311 |
| Net earnings | 166,448 | 199,923 | 33,474 |
| Fixed charges, including interest, taxes, rental, etc..... | 127,393 | 134,990 | 7,596 |
| Net income | 39,055 | 64,933 | 25,877 |
| Operating ratio | .503 | .497 | *.006 |

*Decrease.

BROOKLYN HEIGHTS R. R. CO.

The Brooklyn Heights Railroad Co. reports for the quarter ending June 30, 1903, and for the year ended the same date as follows:

For the quarter ended June 30—

| | 1903. | Increase. |
|-------------------------|-------------|-----------|
| Gross earnings | \$3,358,250 | \$303,686 |
| Total net earnings..... | 1,412,508 | 129,364 |
| Surplus | 312,899 | 102,873 |

Fiscal year—

| | | |
|--------------------------|--------------|-----------|
| Gross earnings | \$12,357,041 | \$831,839 |
| Total net earnings | 5,925,491 | 885,894 |
| Surplus | 735,584 | *804,740 |

*Deficit last year \$129,156.

CHICAGO & MILWAUKEE.

The Chicago & Milwaukee Electric Railway Co.'s comparative statement of earnings for August is as follows:

| | 1902. | 1903. | Increase. |
|--------------------------|----------|----------|-----------|
| Gross earnings | \$25,529 | \$30,465 | \$ 4,936 |
| Operating expenses | 7,221 | 8,746 | 1,525 |
| Net earnings | 18,308 | 21,719 | 3,411 |

From January 1st—

| | | | |
|--------------------------|-----------|-----------|----------|
| Gross earnings | \$128,058 | \$153,715 | \$25,657 |
| Operating expenses | 52,858 | 57,116 | 4,258 |
| Net earnings | 75,200 | 96,599 | 21,399 |

MONTREAL STREET RAILWAY CO.

Following is the comparative statement of earnings and expenses of the Montreal Street Railway Co. for the month of July:

| | 1902. | 1903. | Increase. |
|------------------------------|-----------|-----------|-----------|
| Earnings from operation..... | \$194,194 | \$212,337 | \$ 18,142 |
| Miscellaneous earnings | 4,461 | 3,800 | * 562 |
| Total earnings | 198,636 | 216,236 | 17,580 |
| Operating expenses | 93,966 | 116,157 | 22,190 |
| Net earnings | 104,680 | 100,079 | * 4,601 |
| Fixed charges | 19,920 | 24,696 | 4,766 |
| Net income | 84,759 | 75,383 | * 9,376 |
| Operating ratio | .4839 | .5470 | .0631 |

*Decrease.

The net earnings for 10 months ended July 31, 1903, decreased \$24,608, and the net income for the same period showed a deficit of \$49,743, although the gross earnings increased \$144,341.

PHILADELPHIA CO. AND AFFILIATED CORPORATIONS.

Comparative statement for July of Philadelphia Co., Equitable Gas Co., Consolidated Gas Co. of the City of Pittsburg, the Allegheny County Light Co., and Pittsburg Railways Co.:

| | 1902. | 1903. | Increase. |
|-------------------------------|-------------|-------------|-----------|
| Earnings from operation | \$1,111,338 | \$1,222,579 | \$111,241 |
| Miscellaneous earnings | 30,670 | 21,808 | * 8,862 |
| Operating expenses | 708,300 | 785,529 | 77,229 |
| Net earnings | 433,708 | 458,858 | 25,150 |
| Fixed charges | 307,537 | 319,137 | 11,600 |

| | | | |
|-------------------------------------|---------|---------|--------|
| Net income | 102,234 | 115,784 | 13,550 |
| Available for Philadelphia Co. | 102,234 | 115,627 | 13,393 |

*Decrease.

For the six months ending June 30, 1903, the gross earnings were \$7,728,567, an increase of \$878,102; net earnings, \$3,442,942, an increase of \$270,002.

LAKE SHORE ELECTRIC.

The earnings of the Lake Shore Electric Railway Co. for the first 23 days of August, 1903, were \$57,560, against \$33,313 for the corresponding period of last year, a gain of \$24,246. The average daily earnings for the 23 days were \$2,502, against \$1,448 for the same period in 1902, an average daily gain of \$1,054. For the first six months of this year the gross earnings were \$259,903, an increase of \$60,470 over the first six months of 1902; operating expenses, \$184,376, an increase of \$51,425; fixed charges, \$75,526, an increase of \$9,044; operating ratio, .7094, an increase of .0328.

Following is a table showing the earnings of the road for the first seven months of the present year as compared with the same period of 1902:

| | 1902. | 1903. |
|----------------|----------|----------|
| January | \$20,740 | \$34,749 |
| February | 24,000 | 32,030 |
| March | 32,347 | 42,300 |
| April | 31,502 | 42,501 |
| May | 38,219 | 51,448 |
| June | 42,030 | 56,822 |
| July | 40,121 | 67,186 |

MANCHESTER CORPORATION TRAMWAYS.

The annual report of the Manchester (Eng.) Corporation Tramways for the year ended Mar. 31, 1903, has been received. The report of the Tramways Committee, which was submitted by Mr. D. Boyle, chairman, shows that during the year three new routes were opened, comprising 57 miles 531 yards measured as single track, making a total of 77 miles 1,611 yards open for traffic. The gross earnings for the year were £317,960; operating expenses, £193,989; net earnings, £123,970, to which is added bank and other interest amounting to £2,595, leaving £126,566 available to be applied to fixed charges and other obligations. The net earnings for the preceding year aggregated £63,456, which included £13,548 transferred from surplus account. The total operating expenses per car mile amounted to 6.95d., as compared with 8.10d. the preceding year.

The total cost for power for the year was £53,126; traffic expenses, £100,311, of which wages of drivers, guards and traffic staff amounted to £62,811; management expenses, £20,783; maintenance, £19,767. The balance sheet shows the total liabilities as £1,251,275; total outlay and assets, £1,309,625, the outlay during the year amounting to £597,541.

During the year 66,849,457 passengers were carried, the total receipts from this source being £306,249.

NEW ORLEANS RAILWAYS CO.

The semi-annual statement of the New Orleans Railways Co., dated June 30, 1903, has just been issued. In it the president, Mr. E. C. Foster, states that the result of operation for the six months shows as follows:

Income: Dividends, interest and undivided surplus, on account of securities of constituent companies owned by the Railways company, \$424,229.

Charges: Taxes, \$3,705; general expenses, \$9,595; interest on bonds, \$400,702; total, \$414,003.

Surplus for six months ending June 30, 1903, \$10,225.

Special attention is called to the following facts:

New Orleans & Pontchartrain Railroad: That while over \$240,000 has been expended on the New Orleans & Pontchartrain Railroad, the railroad is still in process of construction, so that the Railways company has received no appreciable income or benefit from the moneys expended.

Betterments and Improvements: Since the organization of the railways company there has been expended approximately \$1,500,000 in betterments and improvements to the various properties, from which the expected benefits are only now commencing to be realized. In the electric light and power department one unit of 1,050 kw. capacity was installed complete, ready for regular operation on or about

July 6, 1903, and a second unit of 1,000 kw. capacity is expected to be brought into operation by the end of this month, thus increasing the capacity of this plant from 3,200 to 5,250 kw., an increase of 64 per cent. In the new power house a new unit of 1,500 kw. was put into operation on or about February 8, 1903. A second unit of 2,250 kw. capacity is expected to be installed, ready for operation about December 1, 1903, and a third new unit of 2,250 kw. now under order is expected to be installed ready for operation in time for use during the Mardi Gras season of 1904, making a total of 6,000 kw. of new and most modern electric equipment installed in the new power house. Upon the completion of these new units, operated with the present boiler plant, it is expected that there will be an annual net saving cost of operation of over \$20,000, due to economies to be obtained by shutting down several of the various plants now being operated under adverse conditions as to location and apparatus. With the installation of a proposed new boiler plant, the estimated annual saving will amount to approximately \$60,000.

The company, in order to take care of the increased demand for gas, the price of which had been reduced, has expended about \$300,000 for improvements.

During past six months the company was called upon to meet large unexpected charges, which include an increase in taxes amounting to \$40,506; increase in wages of motormen and conductors, \$37,944; increase in cost of fuel, \$45,588, and reduction in price for municipal lighting, \$26,472, a total of \$150,512.

B. R. T. ANNUAL REPORT.

The annual report of the Brooklyn Rapid Transit Co. was made public September 12th. Following is the summary of operation for the year:

Gross Earnings—Passenger, \$13,086,840; freight, mail and express, \$75,658; advertising, \$117,823; total earnings from operations, \$13,280,321.

Operating Expenses—Maintenance of way and structure, \$495,188; maintenance of equipment, \$812,600; operation of power plant (a), \$1,680,751; operation of cars—trainmen's wages, \$2,542,214; operation of cars—other expenses, \$908,310; damages and legal expenses, \$956,730; general expenses, \$535,286; total operating expenses, \$7,931,079; net earnings from operation, \$5,349,242.

Income from Other Sources—Rent of land and buildings, \$81,877; rent of tracks and structure, \$99,054; miscellaneous, \$96,562; total income, \$5,626,735.

Deductions—Taxes, \$757,789; interest and rentals, net, \$3,904,068; total deductions, \$4,661,857; net income, \$964,878; special appropriations, \$168,095; surplus for the year, \$796,783; sundry accounts from previous years charged off, \$40,386; balance to credit of surplus, \$756,397.

The gross earnings, which were the greatest in the history of the company, show an increase of \$769,699, while the gain in net earnings over 1902 was \$1,022,517. The net returns would have been greater had it not been for unusual expenditures under the heading "operation of power plant," these including \$109,337 paid for hired power and \$283,979 increase in the cost of coal due to the coal strike. The passenger earnings are divided as follows: Surface, \$9,284,157, an increase of \$234,928; elevated and bridge, \$3,802,683, an increase of \$530,647.

Of the operating expenses the total amount of trainmen's wages is \$2,542,214, a decrease as compared with the preceding year of \$63,116. The damage and legal expenses this year are \$956,730, a decrease of \$138,015. There was also a decrease in the maintenance of equipment account of \$348,399, and a total decrease of operating expenses of \$252,818.

There was an increase in taxes of \$14,972, and of interest and rentals of \$171,435. The income from rent of land and buildings, rent of track and structure and miscellaneous showed an increase of \$25,447, and a total increase in the total income of \$1,047,964. The increase in the net income is \$861,557, against which is charged an increase in special appropriations of \$83,667.

The mileage of the system is 251 miles, of which 242 is double track. In addition there are 35 miles of sidings and turnouts. During the year there was added to car equipment 120 open elevated cars, 16 open surface cars, 34 combination surface cars, 10 freight gondola cars and 2 snowplows.

In his report the president, Mr. Edward W. Winter, says that the new central power station is progressing toward completion and is expected to be fully in operation with its equipment of eight

4,000-h. p. engines in the spring of 1904. There were installed and are in operation in the eastern power station one new 4,000-h. p. engine with 2,700-kw. generator and at various sub-stations six 1,000-kw. rotary converters and 18 static transformers. Sub-stations at Essex and Halsey Sts. were completed and put in operation, and the Sands St. sub-station well advanced. Besides a large amount of special track work there was added to surface tracks 9,076 ft. of new construction; four car storage yards were constructed; inclines from three elevated stations were constructed; the work of equipping the elevated lines for operation by electricity was nearly completed; a clubhouse for employes was built, the Brighton Beach Hotel was renovated at a cost of \$18,000, and there were several other substantial improvements made.

New York State Street Railway Association.

The twenty-first annual meeting of the Street Railway Association of the State of New York will be held in Syracuse on Tuesday and Wednesday, October 6 and 7, 1903. The headquarters of the Convention will be at Yates Hotel, Syracuse.

President Rogers informs us that an unusually interesting meeting is anticipated and assured. The date of the convention this year is a month later than usual, owing to the date at which the American Street Railway Association held its meeting, but it is believed that this change in the date will in no way detract from the interest and attendance at the State meeting. Numerous papers upon important electric railway subjects will be presented and topics of general interest and profit to electric railway men will be thoroughly discussed. In addition to the interesting and profitable features of the meeting, a splendid program of entertainment, including the annual dinner on Tuesday evening, October 6th, has been arranged by the local committee. As heretofore, supply men are cordially invited to participate in the pleasures and benefits of the meeting and all supply houses are requested to send one or more representatives. Arrangements have been made for exhibits and ample space for the display of supplies, small models, etc., in close proximity to the place of meeting will be provided without charge to those who desire to avail themselves of the privilege.

It will be the aim of those in charge of the association to make the twenty-first annual meeting a largely attended, interesting and profitable event. Those who anticipate attending and especially those who will require space for exhibits are requested to communicate in advance with Mr. G. T. Rogers, president, Street Railway Association of the State of New York, Binghamton, N. Y.

Papers on the following subjects have been allotted:

"Steam Railroad Crossings or Right Angle Crossings of Electric Railways."

"Repair Shop Methods."

"Hydraulics in Connection with Street Railway Operation."

"Track Construction and Maintenance."

"Accounting and Way-Billing on Trolley Express Lines."

"Dispatcher's Duties and Electric Signals."

"Methods of Discovering Fraudulent Claims for Injury."

"Physical Examination Accident Cases."

"Physical Examinations as Aid for Trial Counsel."

In addition to these papers upon technical subjects which always form the principal part of the program an allotment of sub-topics has been made upon the following subjects:

"Interurban Service," divided into three heads:

1. Standard Equipment.

2. Car Dispatching.

3. Standard Methods of Fare Collection and Ticket Taking.

"Extra Freight and Baggage Service on Interurban Lines," divided under three heads:

1. Traffic Arrangements with Steam Roads and Boats.

2. Traffic Arrangements with Other Interurban Lines.

3. Development of Freight and Express Service.

"The Advantages and Disadvantages of Oil Tail Lights for Interurban Cars."

"Street Car Controllers—Their Proper and Improper Operation."

Plans have been completed for a new brick car barn for the Toledo Railways & Light Co., on Starr Ave., Toledo. It will be 80 ft. wide and either 200 or 400 ft. long, with six tracks. It will cost not less than \$15,000.

Reorganization of the Western Electrical Supply Co.

Owing to the steady growth of the business of the Western Electrical Supply Co., of St. Louis, Mo., during the past ten years, the company has found it advisable to increase its cash capital and to divide the business into two parts. The part of the business relating to railway supplies and the building of electric light plants and electric railroads will be retained by the old company which will hereafter restrict itself to these departments, in which it now has orders on hand which amount to nearly \$1,000,000.

That portion of the business relating to electrical supplies, with the stock and good will, has been sold to the Wesco Supply Co., which has been organized recently with ample capital. The new company will be under the personal management of Mr. R. V. Scudder, who is also the vice-president of the corporation. Mr. Scudder started in the electrical business in 1886 with the Western Light Co., of St. Louis, Mo., where he remained for several years. In 1891 he organized the Western Electrical Supply Co. with which he was identified until two years ago when he severed his connection with it and moved to New York where he has been engaged in other lines of business.

The president of the Western Electrical Supply Co., Mr. H. K. Gilman, has occupied that position for the past ten years and the very rapid growth and prosperity of the company has been largely due to his careful management. Mr. Gilman will retain an interest in the Wesco Supply Co. and will serve as one of its directors. Mr. H. S. Doyle, who has been for some time manager of the railway and mining department of the Western Electrical Supply Co., has been appointed as general manager of that company. Mr. Doyle is a graduate of the college of engineering of the Missouri State University. He was for some time superintendent of the Sedalia Electric Ry. and later held the position as electrical engineer of the Missouri, Kansas & Texas R. R. For some years he was with the constructing engineering department of the General Electric Co. and personally superintended the erection of some very large power plants. Both companies will be officered by old employes of the Western Electrical Supply Co. and will undoubtedly continue the record of success already achieved.

Greeting to Employees.

Chattanooga, Tenn., Sept. 9, 1903.

To the Employees of the Chattanooga Electric Railway Co.:

The 4th of July and Labor Day, Sept. 7th, have come and gone. These events stir our people up to an exciting interest as evidenced by the great crowds using our cars on those days en route to the park and other points seeking relaxation and pleasure.

Never before in the history of this company or this city have such large numbers ridden upon the street cars, and seldom if ever have such large masses of people been carried from point to point so successfully, so expeditiously and so safely as was done on these two occasions by the careful and zealous work of our employes. It is safe to say that many accidents entailing death and injury were avoided, and if the number of people so saved was known and realized by the general public it would be something startling. The management therefore takes this method of expressing their warmest thanks and commendation to our officers and especially to our motormen, conductors and other employes for the noble and satisfactory work done upon these two occasions. The management is proud of such men and the public we know are bound to have for you a latent regard and appreciation. The position held by the conscientious motormen and conductors in charge of electric cars and who incidentally have in their keeping the comfort and safety of thousands, is one of honor and trust. It is even more than that in an abstract sense, for the public expect and receive at your hands many attentions that affect their interest and happiness.

You will observe that the management accords you full credit for all this, and that it is eager in looking to your elevation and general interest. CHATTANOOGA ELECTRIC RAILWAY CO.,

By J. H. Warner, President.

The foundation is laid for a brick and stone power house for the Omaha & Council Bluffs Street Railway at Omaha, Neb. It will be one story, 140 x 170 ft., and 30 ft. in height.

More Convertible Cars for Virginia.

The J. G. Brill Co. recently shipped seven of its patented convertible cars to the Roanoke Railway & Electric Co. of Roanoke, Va. This is the third order for convertible cars from the Lynchburg syndicate which is evidence of the satisfaction that this type of cars is giving. Roanoke is a city of 25,000 population and is situated in the southwestern part of the state of Virginia. It is an important shipping center for a large district and the street railway company operates lines between Roanoke, Salem and Vinton. The company also owns a fine park which is a very popular resort during the summer months. The cars of this order are to be used in the city of Roanoke and will run a short distance into the suburbs.

The construction of these cars includes an unusual style of side sill. This sill which is $3\frac{3}{4}$ by 7 in. in size, is plated on the side with $\frac{5}{8}$ x 7 in. steel to which is securely bolted a $\frac{1}{2}$ x 3 x 4 in. angle iron the full length of the sill. On the outwardly extending flange of this angle iron is placed a smaller sill through which the tie rods are bolted. The end sills are $4\frac{3}{4}$ x 7 in.

The platform knees are reinforced by angle irons and the ends of the platforms are protected by angle iron bumpers of the Brill patented type. The corner posts are $3\frac{3}{4}$ in. thick solidly connected with panels to the first post, the center of which is 15 in. from the corner. From center to center of side posts is 2 ft. 7 in. and the thickness of the side posts is $3\frac{3}{8}$ in.; the sweep of the post is 5 in. Other principal dimensions are as follows: from rail to platform



CONVERTIBLE CAR FOR ROANOKE, VA. - J. G. BRILL CO.

step, $15\frac{1}{4}$ in.; from step to platform, 12 in.; from platform to car floor, $7\frac{1}{4}$ in.; from rail to top of running board, $18\frac{1}{2}$ in.; from running board to car floor, 16 in.; length of cars over end panels, 25 ft. 9 in.; length over crown pieces, 34 ft. 9 in.; length from end panels over crown pieces 4 ft. 6 in.; width over sills, 6 ft. 10 in.; width over posts at belt, 7 ft. 9 in.

The interiors of the cars are finished in quartered oak with decorated ceilings of the same. The seats are of spring cane with reversible backs and are $32\frac{1}{2}$ in. long, leaving the width of the aisle $18\frac{3}{4}$ in. and giving a seating capacity for 36. Tool boxes are placed under the corner seats. Round corner seat end panels of the Brill type are used which allow the curtains to be drawn to the floor, and these panels, together with the seats, add to the stiffening of the side posts. The panels and sashes are stored in roof pockets when not in use. The platforms are equipped with portable vestibules which are particularly suitable for this type of car in southern states and folding gates of the Brill type are provided at the platform entrances. Ash guard rails are provided which move behind the grab handles and which are held in place under the water board by gravity catches when not in use. Other specialties with which these cars are equipped include "Dumpit" sand boxes, "Dedenda" gongs, radial draw bars and ratchet brake handles. The cars are mounted on Brill "Eureka" maximum traction trucks having 33-in. driving wheels and 28-in. pony wheels, and a 4-ft. wheel base. Each truck is equipped with a 38-h. p. motor and the weight of the car without motors is 20,700 lb.

The Worcester & Southbridge Street Railway Co., which recently went into receiver's hands, is to be reorganized.

Arnold Magnetic Couplings.

A new form of magnetic couplings has been put upon the market by the Arnold Magnetic Clutch Co., of Milwaukee, Wis., consisting of two cast steel rings which are carried on steel plate webs bolted to hubs on the shafts to be coupled. One of these rings, called the field ring, has an annular slot in which the energizing coil is placed. The other ring acts as the armature or keeper and is separated from the field ring when the coupling is not energized by a gap of from 1-16 to 3-16 of an inch, according to the size of the coupling. Owing to the spring of the steel plate webs the field and armature rings come together when the field coil circuit is closed, and the magnetism induced by this circuit holds the surfaces of the two rings together with a heavy pressure. To release the coupling the circuit of the field coil is opened and the spring of the plates separates the surfaces of the rings.

Where a very quick release is desired a simple automatic device is provided to momentarily reverse the current in the coil which destroys the residual magnetism of the field ring and releases the keeper at once. The magnetizing current is very small, amounting in the large sizes to a small fraction of one per cent of the power transmitted. Collector rings are mounted on the field hub and a brush holder stand is attached to the floor or ceiling and is adjusted so that the brushes bear centrally. This type of coupling occupies about the same space on the shaft that is required by an ordinary flanged coupling. The hubs are pressed on the shaft and may be faced true

after mounting, if desired, although this is not essential. Once mounted there are no further adjustments to be made. The faces of the two rings are accurately finished so as to make good contact, and one of the important features of this device is that if the shafts get somewhat out of alignment it will not interfere with the operation of the clutch as the spring of the steel plate webs will take care of this.

This type of coupling is not adapted to starting a load from rest and bringing it up to the speed of the driving shaft, but is designed for use where both shafts are stationary or running at approximately the same speed. For example, in power station work a generator or section of line shaft may be shifted from one engine to another and this can be done at the switchboard regardless of the location of the generator shaft. Small switches for opening the clutch circuit can be placed at various points within instant reach of workmen in order to effect a quick release to prevent accidents, and the clutch can be so wired as to open the circuit in case of the breaking of the belt. It can also be regulated so as to slip when the load exceeds a certain limit, thus guarding against excessive overloads.

A petition has been filed in the superior court at Concord, N. H., the object of which is the dissolution of the Concord Street Ry. corporation and the assuming of the rights and property by the Concord & Montreal R. R., which avers that it has purchased the entire preferred stock and more than three-fourths of the common stock of the street railway company. This petition is the first move under the statute passed by the last Legislature permitting the Concord & Montreal R. R. to acquire property.

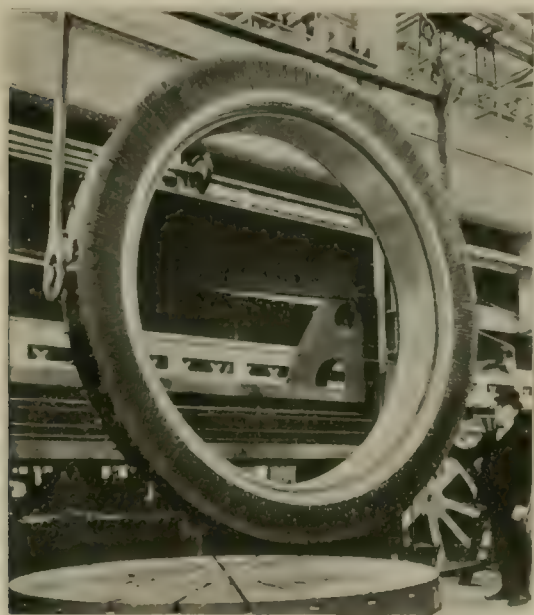
New Publications.

WATER PURIFICATION FOR CITIES BY SULPHATE OF IRON. Published by the American Steel & Wire Co., maker of the sulphate of iron coagulant used in the process described. The book, which contains 50 pages, 5 x 7 3/4 in., embodies interesting reports of Mr. Ernest E. Irons, the well-known bacteriologist, and Mr. James E. Campbell, a chemical engineer of repute. The data were obtained at the Quincy Water Works, at Quincy, Miss., and deal with the purification of the Mississippi River water to render it suitable for domestic and commercial uses. The American Steel & Wire Co. invites correspondence, its principal offices being at Chicago, New York, Worcester, Denver and San Francisco.

SPECIFICATIONS FOR PORTLAND AND NATURAL CEMENTS, Adopted 1903. Published by the American Railway Engineering and Maintenance of Way Association. Pamphlet form, 8 pages, 6 x 9 in. The pamphlet also contains the specifications for concrete submitted by the Committee on Masonry, but not acted upon by the convention for lack of time. Price, single copies postpaid, 10 cents. Address the secretary, 1562 Monadnock Block, Chicago.

A Large Commutator.

The accompanying illustration shows an assembled commutator which is to form part of a 1,800-kw. d. c. generator field under construction in the shops of the British Westinghouse Co., of Manchester, Eng. This generator is being built for the City of London Electric Lighting Co. and will be run in conjunction with units of a



COMMUTATOR FOR 1,800-KW. GENERATOR.

similar size which are now in operation at the Bankside station. The external diameter of the commutator is 10 ft. and it contains 900 segments of hard drawn copper around the circumference. The generator is designed for a normal output of 1,800 kw. at 500 volts and will be capable of carrying a continuous overload of 20 per cent.

This commutator illustrates the size of the work being turned out from the Westinghouse works now that the organization has become settled into definite operation. The development of this enterprise will be watched with special interest from the fact that some of the largest schemes under consideration for power distribution and railway operation are now in the hands of this company.

On September 7th the Danville, Urbana & Champaign Railway Co.'s system was opened between Danville and Champaign, Ill., a distance of 33 miles. The line is a link in the McKinley system and it is expected that by the time the World's Fair opens a through line will be in operation from Danville via Champaign, Decatur and Springfield to St. Louis.

Westinghouse Sales Department.

The New York office of the sales organization of the Westinghouse Electric & Manufacturing Co., consisting of the New York Sales Department, Department "I," the Export Department, and the General Agent's office, have been removed to the new Hanover Bank Building, corner of Nassau and Pine Sts. The new offices occupy the entire 17th floor of this building, where the arrangements and facilities will be of the best, both for the representatives of the company, and the public with whom they do business. The mail address of the several departments of the Sales Organization in New York will be No. 11 Pine St. The telephone number, 6131 Cortlandt, remains unchanged.

The Executive, Financial and Stock Transfer offices will remain on the fourth floor of the Equitable Building.

The present organization of the Westinghouse Electric & Manufacturing Co. has been quartered in the Equitable Building since 1889, but the rapid and material increase of business has made a removal necessary.

Union Traction Co. to Mine Coal.

Pursuant to the plans reported in the "Review" for August, the Indiana United Traction Coal Co., of which the Indiana Union Traction Co. is the principal member, has arranged to take over 4,500 acres of coal lands in Sullivan County, Ind. The price to be paid ranges from \$25 to \$35 an acre, the farmers being allowed to retain the "top" for farming purposes. Certain rights for shafts, railroad tracks, etc., are included in the contract.

Conductors Indicted for Transfer Thefts.

Three conductors employed by the Chicago City Railway Co. and a newsboy were indicted by the grand jury at Chicago September 17th for the theft and sale of transfers. The conductors are charged with the theft, while the newsboy is accused of complicity in the theft and with the sale of the stolen tickets. It is stated that collusion between conductors and newsboys is extensive and that the company has lost thousands of nickels by the traffic in transfers by newsboys. Most of the transfers are secured by the boys from passengers who do not intend to use them and are either begged or taken in payment for newspapers.

Automatic Signals at Syracuse.

An interesting demonstration of what automatic block signals will do occurred at Syracuse, N. Y., during the recent State Fair week. Because of the State Fair, Labor Day and President Roosevelt's visit happening at the same time, an immense number of people had to be carried to the Fair Grounds. To do this it was necessary to divert the street and suburban cars to this purpose, and in order to reach the grounds all the cars were obliged to pass over a stretch of single track, going and coming. This piece of single track crosses the New York Central tracks on a trestle and has a sharp curve and incline at each end, making it a very dangerous piece of road to operate on such occasions. Previous to this year it required the services of four flagmen to regulate the cars and guide them safely across. Shortly before State Fair week the management decided to install a set of automatic block signals to protect this part of the road. On Monday, September 7th, the signals were given their first test, and although it was a very severe one they performed their work so satisfactorily that within an hour after the beginning of the trial the manager sent the four flagmen back to the car barns, as their services were no longer required. The cars were controlled entirely by the signals, and although they were operating on two-minute headway and carried over 180,000 people in five days, they were able to do so without an accident or a mistake of any kind. The four chances of an error in flagging were eliminated and the cars were enabled to cross without being obliged to slow up, and thus maintain schedules throughout.

These signals were furnished by The American Automatic Switch & Signal Co., of Chicago.

The Atlantic City (N. J.) & Suburban Traction Co.'s power house and seven new cars were wrecked by a tornado September 16th.

New Cars for Oakland, Cal.

The St. Louis Car Co. has just finished an order for 10 cars for the San Francisco, Oakland & San Jose Ry., one of which is shown in the accompanying illustrations. As will be seen the cars are unusually large and have handsomely finished interiors. Some of the principal dimensions of these cars are as follows: length over all, 54 ft. 7½ in.; length over body, 44 ft. 11¼ in.; length from body over bumper, 4 ft. 10 in.; length from corner post to inside of crown piece, 2 ft. 6 in. The clear opening of windows is 2 ft. 3½ in., the



NEW CAR FOR OAKLAND, CAL.—ST. LOUIS CAR CO.

width over posts, 8 ft. 10¼ in., and the width inside of car sills, 8 ft. 8½ in. The height of the car from the rail to the bottom of the side sill is 38½ in. and the width over all is 9 ft. The car contains 32 cross seats of the St. Louis Car Co.'s reversible type and it is mounted on the company's No. 32-B trucks, the length between truck centers being 32 ft. 7½ in. These trucks are of the M. C. B. type and have a wheel base of 6 ft. 6 in. They are built for standard gage tracks and each truck is equipped with a G. E.-66 motor.

The vestibules of these cars are provided with folding doors in addition to which there are wire gates which slide in front of the



INTERIOR OF OAKLAND CAR

platform steps preventing any access to them when the gates are closed. The interiors of these cars are illuminated with arc lights and the cars are also provided with arc headlights, both of which are peculiarities of the St. Louis Car Co.

Work on the new general repair and car shops of the Indiana Union Traction Co. is about to begin. The shops will cover more than six acres of ground and will cost about \$300,000. They will be situated directly north and east of the main power house at Anderson.

Two New Southern Interurban Roads.

Knox, George & Co., of New Orleans, consulting, constructing and operating engineers, have recently been awarded two important contracts, one for building and equipping an interurban electric road out of Birmingham, Ala., and one for building and equipping the Jennings & Northern R. R. in Louisiana.

The Birmingham road will be 40 miles long, part of it double track. It is to be built for the Birmingham & Steel Cities Railway & Power Co., capital \$1,000,000. The line will run from Birmingham

to Ensley, Pratt City, Bessemer, and surrounding towns and factory districts. The territory to be traversed has a population of 113,000. It is the intention to carry baggage, express and freight, as well as passengers.

The power house will be equipped with boilers of 2,500 h. p. capacity, and the engines and electrical apparatus will be of the most improved types. Automatic stokers, coal-conveyors and ash-handling machinery are contemplated. The line construction and rolling stock will be up-to-date in every particular. Sixty cars, both interurban and standard city types, will be required. Surveys for the road have been begun and the plans are under way. In addition to this being the largest contract of the kind ever awarded to a New Orleans company, it will be the longest interurban line in the South. The builders will operate the road for a time after its completion.

The Jennings & Northern R. R. will be nearly 40 miles in length. It will run from a point on Lake Charles in Calcasieu Parish to a northern connection with the Texas & Pacific Ry. Work on the main line has not begun, but the grading for a spur line from Jennings to the Jennings oil fields is practically completed and it is expected to have the branch in operation by January 1st. The builders will also operate the road.

Knox, George & Co. have offices in Chicago and New Orleans. George W. Knox is president of the company, James Z. George, vice-president and general manager, and A. H. George, secretary.

Wm. Wharton, Jr. & Co's. Catalog.

The new catalog (No. 10) of rails and special track work just issued by William Wharton, Jr., & Co., Inc., of Philadelphia, and which was distributed at the street railway convention, is one of the finest productions of the kind that has come to hand. It contains 180 pages, 9 x 11 in., handsomely printed on colored paper and bound in crimson cloth boards. It is profusely illustrated, and page and alphabetical indexes make it easy to locate the desired subject. Particular attention is called to the introduction of Manganese steel in track work, for which the company has the sole right in the United States. The views contained in this catalog show, among others, some of the most important special track layouts in the world. There are also numerous diagrams and tables, and, in fact, everything of interest in connection with work of this character.

The Georgia Railway & Electric Co. on September 11th put in operation a suburban express car for the transportation of express and freight to the suburbs of Atlanta.

A Souvenir for the Asking.

The Massachusetts Chemical Co., 170 Summer St., Boston, distributed as a souvenir at the recent street railway convention rubber mats for use under cuspidors, the mats being a product of the company's Walpole rubber works. The demand did not cease with the convention, for the company has since received many letters asking if it has any of these useful souvenirs left. The company states that it will be pleased to send a souvenir to any applicant who will forward the name of the railway company with which he is connected and the position he holds.

Improvements on the Union Loop, Chicago.

The Union (Loop) Elevated Railroad Co., of Chicago, is now engaged in extending the platforms at its stations, an improvement which will increase the capacity of the loop about 35 per cent and provide for all increase of traffic that can be handled through the several interlocking junctions. A plan now under consideration by the management to be carried out in the course of a few years when the capacity of the present interlocking junctions is reached, provides for the elevations of portions of the outer track of the loop to eliminate the grade crossings with the lines using the inner loop. The plan is to begin at Madison St. and Wabash Ave. and gradually elevate the outer track until at Van Buren and Wabash it is high enough to permit the South Side trains to pass under it. The elevated track will continue in Van Buren St. clearing the Metropolitan junction in Fifth Ave., and return to the present elevation at Quincy St. and Fifth Ave. A similar elevation of the incoming tracks at the northwest corner of the loop would enable incoming trains to clear outgoing Northwestern trains, the superstructure in Lake St. coming to the present elevation at State St.

When the outer loop is thus elevated moving stairways will be installed in the State, Dearborn and La Salle St. stations.

Half Fares.

The Indianapolis & Eastern Railway Co. celebrated the opening of its line to New Castle, Ind., September 11th, by inviting the leading business men of New Castle to ride over the line in the first car leaving that city. The party was entertained at dinner at Greenfield, also.

The Dunkirk & Fredonia Railroad Co., of Fredonia, N. Y., transported without accident over 25,000 passengers from Dunkirk and Fredonia to Central Park on the recent State Fair days and Labor Day, which is considered a fine record for an electric railway unaccustomed to heavy traffic.

The Indiana Union Traction Co. recently built at its shops at Anderson, Ind., an express and freight car which gives such satisfaction that six more of the same pattern will be made at once. The company has purchased land in Alexandria for a new freight station, 15 x 90 ft., which is in course of erection.

The Youngstown & Southern Railway Co. has purchased 1,100 acres of land, including coal and surface rights, situated in the West Point (O.) coal field. The price was about \$50,000. The company proposes to make coal mining an important part of its business. It also owns about 1,200 acres at North Lima, O.

The Lake Shore Electric Railway Co. plans to extend the service of the Electric Package Co. over the entire line and abolish general freight service from Norwalk to Toledo, at least until it can secure a freight depot and extensive terminals that will simplify the freight business. In the meantime it will confine its attention to package freight at express rates.

The Sterling (Ill.), Dixon & Eastern Electric Ry. has purchased nine motor cars, four for city use and five for interurban traffic. The interurban cars will be 50 ft. long, 9 ft. wide, and weigh about 8 tons each. The seating capacity will be 60 persons. One of the interurban cars will be used for baggage, and also to deliver milk to the Dixon milk factory. Nine trailer cars have been purchased, also.

How the Trolley Raises Rural Tastes.

BY JOHN PARSON, PRESIDENT CALUMET ELECTRIC STREET RAILWAY CO. IN THE CHICAGO TRIBUNE.

Within the last four or five years the extension of interurban electric railways has worked a notable change in the character of rural communities. Throughout the state of Ohio, all over northern and eastern Indiana, and through several of the counties adjoining our own perfect networks of electric railway systems have been built within an incredibly short time. Before these roads were constructed people living in the country made only occasional visits to the city, while even to the inhabitants of the towns and villages along steam railroad lines the trip was attended with so much inconvenience it was rarely made.

The railways stopped, perhaps a train a day each way at the smaller stations, but in most of these cases the trains were scheduled at such hours that it was impossible to transact any business in the city and return the same day. Now any one living within fifty to eighty miles of Cincinnati, Columbus, Cleveland, Detroit, Indianapolis, or Chicago may leisurely journey to his metropolis, spend several hours in marketing or in transacting other business, and reach his home the same day.

Not only have these helps to transportation made local travel more convenient and more saving of time, but they have changed materially the character of small towns and cities. More than this, they have affected the tastes and the manners and customs of the people. This effect is not unlike the influence of the post roads in the best days of the Roman empire when the city and the provinces were linked so closely together by excellent systems of roads that urban civilization permeated the entire empire.

It is always true that one opportunity breeds a desire for more opportunities. The rural citizen who can now visit Chicago once a week with less inconvenience than four trips a year gave him before the electric roads were built has come to accommodate himself to the ways and the tastes of the city. He reads the city papers daily. He has found interests there, and must keep pace with them. More magazines and books find their way to his parlor table. He has unconsciously absorbed much of the life of the city, and many of its tastes have become his own.

Travelers in the rural districts of Arkansas or the mountains of North Carolina and southern Kentucky have noticed that while the children have almost uniformly bright, pretty faces, the men and women seem altogether dispirited and lacking in intelligence. These people never touch the life of the cities. Seldom do they go beyond the confines of their own stony plantations, for roads are too poor for travel even on horseback. The women almost never visit even the smaller towns, and the ideas that prevail are the ideas of fifty years ago. Here the effect of the separation of the city from the country is seen at its maximum. To the extent that the life of the centers of activity can be shared with the less populated districts, the civilization of the entire country will be enhanced.

This ease of communication with the city has brought keen competition to the country store. It can no longer satisfy its patrons with cast off styles. It must be up to date. Its show windows are tastefully arranged, and a better grade of goods is carried.

Of little less importance is the opportunity for recreation, with its beneficial effect upon the health and happiness of hard working people. Particularly is this true of the busy housewives, whose little journeys are no longer of such rare occurrence as to be epochs. The actual toil of the average farmer's wife is not half so hard to bear as its monotony.

This development is not due to one movement alone, and the beneficial effect of the extension of postal rural delivery routes and the building of telephone lines in the farming districts must be admitted. But above and beyond this, the traction lines reaching out from our large cities have probably been of more value in the development of our smaller towns and villages than any other agencies now at work.

It is stated that under an agreement between the Cincinnati, Dayton & Toledo Traction Co. and the Miami & Erie Canal Transportation Co., the former's cars will run to the heart of Cincinnati over the latter's tracks, provided the necessary legislation is secured. It is understood that the traction company guarantees the interest on the bonds of the canal company.

STREET RAILWAY REVIEW

Vol. XIII

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No. 10

The Utica & Mohawk Valley Railway.

Complete Description of One of the Most Important Electric Railway Systems in New York State—History of the Consolidated Companies—Track Construction—Arrangements for Power—Sub-station Buildings and Electrical Equipment—Transmission Lines—Direct Current Line—Car Houses and Shops—Rolling Stock—Bridges—Express Service—Official Organization.

There are two ways by which money is sometimes made from investments in electric railway enterprises. One is by the legitimate operation of the rolling stock; the other by the illegitimate manipulation of capital stock. It is unfortunately true that in the early days of the art the latter method was occasionally resorted to, or—and it produced the same results—it was commonly reported that such was the case. It was said that electric roads were "built to sell," and the character of construction, service given and other details of operation received secondary and oftentimes scant consideration. This reputation, for a time, kept electric railway securities

spicuous example of the high status that has been attained in this direction by the combining of sound financial methods with the highest possible standards in construction and management.

The Utica & Mohawk Valley Railway Co. furnishes electric railway transportation facilities for nearly half the Mohawk Valley. Its main line comprises a double track road for practically its entire length, stretching from Rome at the head of the Mohawk Valley to Little Falls, a distance, as the crow flies, of about 37 miles, and with its branch lines, the system serves a territory said to be the most thickly populated area to the square mile outside of cities in



CONCRETE PORTION OF HERKIMER BRIDGE 10 CONCRETE ARCHES WITH SPANS FROM 62 FT. TO 66 1/2 FT.

as a class in more or less ill-repute with responsible bankers and brokers and with the investing public generally. It can be stated to-day, however, with emphasis, that the "build to sell" idea is not in favor with promoters and capitalists and efforts are now directed towards securing soundness and permanence in construction, and intelligent and conservative management in operation rather than toward finding unsuspecting and unsophisticated purchasers upon whom to unload "doctored" securities of decrepit properties. It is gratifying to record that the electric transportation industry stands upon an entirely different basis from that of ten years ago, and to-day electric railway securities, as a class, are as highly regarded as are the high-grade steam railroad or industrial stocks.

All this is introductory to a description of the Utica & Mohawk Valley Ry., because this property affords a most striking and con-

New York State. At practically the central point of the system is the city of Utica with 62,000 population, for which the Utica & Mohawk Valley Railway Co. in addition to its interurban connections furnishes all the electric railway transportation facilities within the city limits and to the surrounding suburbs. From Utica east, the cities and towns reached by the main line with their population (census of 1900) are as follows: Harbor, 200; Frankfort, 2,664; Ilion, 5,138; Mohawk, 2,028; Herkimer, 6,748, and Little Falls, 10,381. From Utica west, the towns on the main line are: Whitesboro, 6,235; Oriskany, 811, and the city of Rome, 18,000. From Utica there are four lines running to the southwest, one line to New Hartford, one to Capron, one to Clinton and one to Forest Hill Cemetery. The population of New Hartford is 5,230; of Clinton (including the town of Kirkland) 3,500; of Capron 200. There

is also one line to the southwest, serving the town of New York Mills, with a population of 1,800. The total population served by the system in its entirety approximates 125,000.

In the city of Utica the local service is cared for by what are termed respectively the Eagle, Elm, South, Blandiana, Lincoln and Phillip St. lines, which accommodate all parts of Utica proper.

The system of schedules adopted is interesting as showing the service necessary to properly accommodate the business in the territory covered by the company's property. On the main line a regular half hour service is given between the two terminals, Rome and

HISTORY OF ORGANIZATION OF THE VARIOUS COMPANIES FORMING THE UTICA & MOHAWK VALLEY RAILWAY CO.

Utica & Mohawk Valley Railway Co. This company was formed on Nov. 27, 1901, as a consolidation of the following companies (I and II):

I. Utica Belt Line Street Railroad Co. This company was chartered June 18, 1886. On Dec. 1, 1886, the company leased the street surface railroad lines owned and operated by the Utica, Clinton & Binghamton Railroad Co. in the city of Utica and the villages of Yorkville, New Hartford and Whitesboro. The property was in the hands of a receiver from Feb. 1, 1892, until Aug. 12, 1894. On the latter date the receiver was discharged and the road passed into the hands of the stockholders. On Nov. 27, 1901, this company was merged with the Utica & Mohawk Railroad Co., forming the Utica & Mohawk Valley Railway Co.

II. Utica & Mohawk Railroad Co.—This company was chartered Jan. 8, 1874, as a successor to the Utica & Mohawk Street Railroad Co. (chartered originally in June, 1869). On Nov. 27, 1901, the Utica & Mohawk Railroad Co. was merged with the Utica Belt Line Street Railroad Co., forming the Utica & Mohawk Valley Railway Co.

On Nov. 29, 1901, the following companies were merged with the Utica & Mohawk Valley Railway Co.:

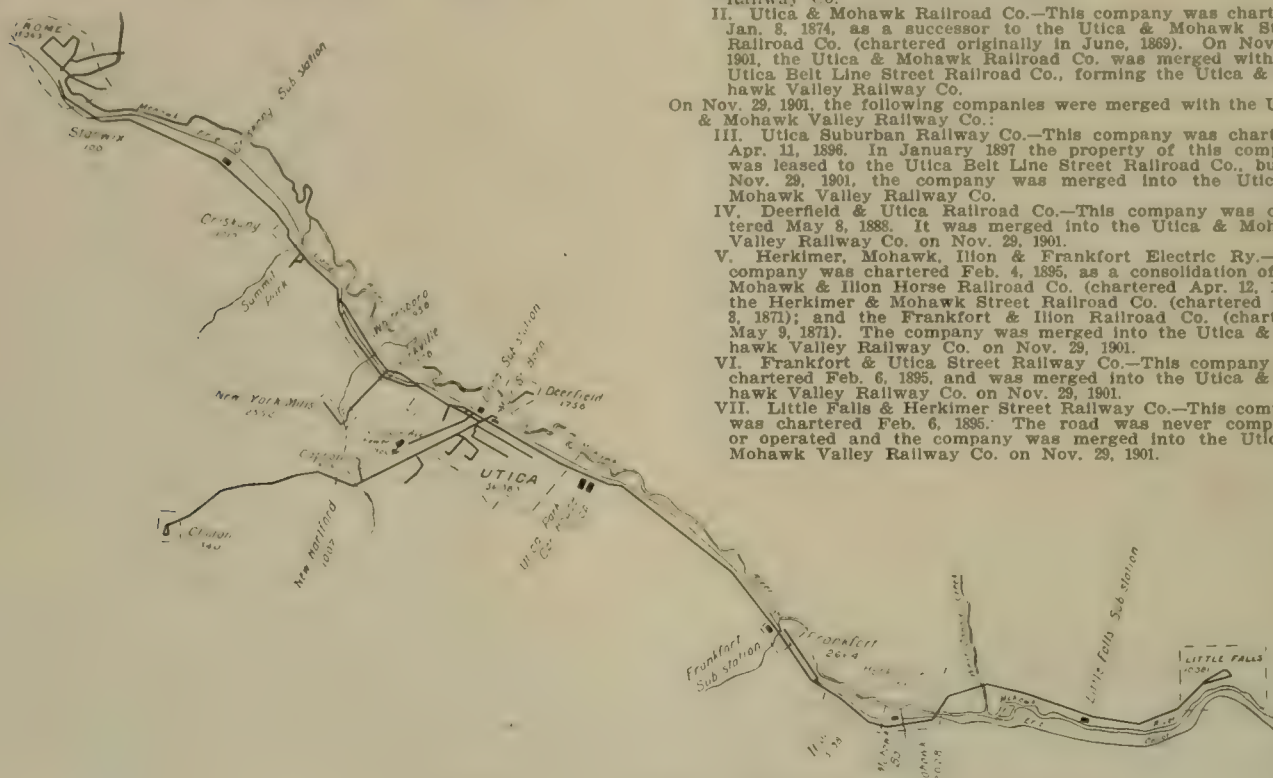
III. Utica Suburban Railway Co.—This company was chartered Apr. 11, 1896. In January 1897 the property of this company was leased to the Utica Belt Line Street Railroad Co., but on Nov. 29, 1901, the company was merged into the Utica & Mohawk Valley Railway Co.

IV. Deerfield & Utica Railroad Co.—This company was chartered May 8, 1888. It was merged into the Utica & Mohawk Valley Railway Co. on Nov. 29, 1901.

V. Herkimer, Mohawk, Ilion & Frankfort Electric Ry.—This company was chartered Feb. 4, 1895, as a consolidation of the Mohawk & Ilion Horse Railroad Co. (chartered Apr. 12, 1870); the Herkimer & Mohawk Street Railroad Co. (chartered Mar. 8, 1871); and the Frankfort & Ilion Railroad Co. (chartered May 9, 1871). The company was merged into the Utica & Mohawk Valley Railway Co. on Nov. 29, 1901.

VI. Frankfort & Utica Street Railway Co.—This company was chartered Feb. 6, 1895, and was merged into the Utica & Mohawk Valley Railway Co. on Nov. 29, 1901.

VII. Little Falls & Herkimer Street Railway Co.—This company was chartered Feb. 6, 1895. The road was never completed or operated and the company was merged into the Utica & Mohawk Valley Railway Co. on Nov. 29, 1901.



MAP OF THE UTICA & MOHAWK VALLEY RY. SYSTEM.

Little Falls. A half hour service is furnished between Herkimer and Frankfort, passing through Herkimer, Ilion and Frankfort, and in conjunction with the main line cars giving a 15-minute service between all these points. A half hour service is provided between Utica Park, located just east of the outskirts of the city of Utica,

tracks forming the main line, one called the North or old line—this being a single track road; the other known as the South or new line, being double track on private right of way. The Clinton line gives half hour service between Clinton and the New York Central Depot in Utica; the Capron line gives a 40-minute service to Capron;



VIEW OF MOHAWK VALLEY AS SEEN FROM THE UTICA & MOHAWK VALLEY RY.

to New York Mills, alternating with the Rome and Little Falls cars. A 15-minute service is provided between Utica Park and Whitesboro, this, in conjunction with the other schedules, giving a 7½-minute service through Utica.

Just west of Utica and through Whitesboro there are two sets of

the New Hartford line a 20-minute service to New Hartford; and the cars are sandwiched in such a way as to give a 10-minute service from Utica to New Hartford.

On the city lines a 10-minute straight-away schedule is maintained with sufficient extras to take care of the morning and even-

ing travel. During afternoons there is given a special 15-minute service from the center of Utica to Summit Park to care for the park travel. The business from Rome to Summit Park is all handled by extras, depending on the travel and attractions at the park.

The local system within the city of Rome is owned by the same interests as control the Utica & Mohawk Valley Ry. The local Rome system comprises 7 miles of track and operates four cars, giving a 15-minute service to all parts of the city. The local lines in Rome are operated by power furnished by the Utica & Mohawk Valley Railway Co.

The rates of fare on the suburban and interurban lines average 1.42 cents per mile, with a minimum charge of 5 cents within the limits of each municipality served, except that six tickets for 25 cents are sold in the cities of Utica and Rome, villages of Herkimer, Mohawk, Ilion and Frankfort. Single and round trip tickets are sold to suburban and interurban points.

furnished by the Cleveland Frog & Crossing Co. Porter de-rails made by the same company are placed at all crossings. The ballast is gravel and crushed stone.

A noteworthy feature in connection with the track construction is the very careful attention that has been given to securing proper drainage. The roadbed for its entire length is double ditched with cross drains at frequent intervals. To the end that track surface and alignment would be preserved against disturbance in times of excessive rain, streams were frequently diverted from their natural courses to other locations, and when necessary to cross a spring or stream or to build through low or marshy land, concrete culverts were put in of ample proportions to prevent any excessive accumulation of water along the line of track. Streams that could not be cared for by 24-in. culverts were crossed on small bridges made entirely of concrete or with concrete abutments and steel spans. Most of these concrete bridges have heavy concrete protecting wing walls.



VIEWS ON UTICA & MOHAWK VALLEY RY., SHOWING TRACK AND OVERHEAD CONSTRUCTION.

Track.

Including interurban, suburban and city tracks, the Utica & Mohawk Valley Railway Co. owns and operates an aggregate of 114 miles measured as single line. For the most part, the interurban lines are laid on private right of way 100 ft. wide, which is fenced on both sides for practically the entire length with American Steel & Wire Co.'s wire fencing and with iron gates at all farm crossings. The rail selected is an 80-lb. A. S. C. E. T. section laid on oak, chestnut and Georgia pine ties, measuring 6 x 8 in. x 8 ft. The rails are connected by "Continuous" rail joints and are bonded with 10 and 12-in. bonds of 250,000 c. m. capacity, supplied partly by the American Steel & Wire Co. and partly by the Ohio Brass Co. There is no cross bonding, as it is the intention eventually to use one rail of each track as one side of the circuit for a block signal system. All special work is 80-lb. T rail of "hard center" construction with double spring frogs and trailing switches. T-rail special work was

Cattle passes are all constructed of concrete cement work.

The general form of concrete culvert and method of construction are interesting. The form adopted as standard comprises a length of vitrified pipe of double strength 24-in. in diameter, bedded on a foundation of concrete throughout its entire length, and having its ends set in concrete endwalls. In some cases, double barrel culverts were put in, having two 24-in. pipes instead of the one.

In building these culverts the pipe was laid on a concrete foundation having a thickness of from 6 to 9 in. Where the soil was boggy with little supporting power, 18 to 24 in. of sand and gravel rammed in layers was put in under the concrete. The concrete was carried half way up the sides of the pipe throughout the entire length and dirt filling was put in to bring the surface to grade. In the end walls the concrete was carried down approximately 2 ft. below the bottom of the pipe. In some cases a greater depth was required in order to get below the frost line. The materials com-

prising the culverts are all masonry concrete, good gravel, and portland cement, mixed in the proportions of one part packed cement, three parts loose sand and seven parts clean gravel.

To care for the surface drainage, wooden box cross culverts 12 in. wide x 12 in. deep were put in across the entire width of the road bed at frequent intervals wherever necessary. These give good drainage into the side ditches. Care was also taken to provide for draining the water in the side ditches away from the location of the

cials. The special work in city streets is all of 9-in. 95-lb. girder rail of "hard center" construction furnished by the Lorain Steel Co. and Wm. Wharton, Jr., & Co.

Power.

The company's steam plant, which was taken over at the time of consolidation and which was put to its final use some time since in feeding direct current into the city system only, has given place to a



CONCRETE CATTLE PASSES—UTICA & MOHAWK VALLEY.

roadbed so that there can be no excessive accumulation of water in the ditches.

All curves are elevated for a running speed of 65 miles per hour.

Where the railway crosses highways at grade, the crossings are thoroughly protected with heavy planking in the manner shown in the illustrations. At each crossing are placed "Climax" cattle guards. As required by the Board of Railroad Commissioners, all highway crossings are protected by crossing signs reading "Railroad Crossing—Stop—Look—Listen." These are metal signs supported on iron posts supplied by the Climax Fence Post Co., of Chicago. The crossings are numbered consecutively throughout the entire length of the road, and the number of the crossing is shown in each case on a conspicuous sign.

For enabling persons who wish to signal the car to stop, signal

purely sub-station system. This system now derives its power from the generating station at Trenton Falls, some 12 miles north of Utica, which is owned by the Utica Gas & Electric Co. Power is purchased of this company delivered at the Utica sub-station high tension switchboard at 20,000 volts, 7,200 alternations per minute, three phase. These sub-stations are located along the line as shown on the accompanying map, and contain the usual complement of machinery for the transforming of high tension alternating current to 600-volt direct current.

Transformer Sub-Stations—Buildings.

The transformer sub-stations of the Utica & Mohawk Valley Railway Co. are four in number, one being in the city of Utica at the Cornelia St. station of the Utica Gas & Electric Co., from which the



SINGLE BARREL CULVERT



DOUBLE BARREL CULVERT.

boxes are placed at all stopping places in the country. The boxes contain a knife switch, operated by means of a rope, which, when pulled by the intending passenger, closes the circuit and lights a lamp in the box, the lamp remaining lighted so long as the rope is held down.

In city streets the track comprises either a 7-in. 80-lb. T rail or a 9-in. 95-lb. girder rail laid on oak and pine ties 6 x 9 in. x 8 ft. In the village of Whitesboro there is 1000 ft. of track, comprising 80-lb. T rail laid with 6-in. of concrete under the track, the concrete forming the foundation for the brick paving required by the village offi-

cially. The railway company purchases power, and the other three being located along the line of the road as shown on the map.

The three outlying stations were built from the same plans and are brick buildings, 39 x 51 ft. with steel roof trusses carrying white pine planking and slate roofing. The floors are of cement, and artificial stone conduits connect the bases of the machines to the main conduit, which carries all the wires to and from the switchboards. Special attention was paid to the high tension wire entrances, which are constructed of 8-in. tile built in the walls. In these tiles are cemented plate glass disks carrying 2-in. holes, through each one of

which passes one of the high tension wires. This arrangement has thus far proved to be a very satisfactory method of entrance and exit. Outside, a small protecting roof was built over the entrances to assist in keeping out the snow and rain. The trimmings over windows and doors, and all sills are of litholite, an artificial stone molded to the shape required.

A door of usual size is at one end of the building, while at the

are to be transferred as rapidly as the 500 kw. units arrive. The switchboard equipment of these three stations consists of an alternating current load panel containing three pairs of transformer switches, three alternating current ammeters, bracketed synchroscope and voltmeter. The use of these switches in connection with the opening of a special quick-break arrangement on the high tension side of any transformer enables that transformer to be cut out,



VIEWES OF TYPICAL HIGHWAY CROSSING.
Showing Planking, "Climax" Cattle Guard, Sign Post and Stop Signal for use of intending passengers

other side a sliding door 10 ft. wide admits of moving machines in or out of the building. These buildings were designed and constructed by the Archbold-Brady Co., of Syracuse, N. Y.

Electrical Equipment of Sub-Stations.

After entering the sub-station building the high tension line passes to the lightning arrester, the high tension switches, static interrupters and thence to the high tension side of the step down transformer. From these the current at 360 volts passes to the alternating current load panel and through the individual rotary converter panels to the machines. The current passes from the direct current side of the rotaries to the machine panels on the d. c. board and thence to the line through feeder panels.

The equipments of the four sub-stations are similar in plan and the three outlying stations are identical, both as to plan and details of installation.

Frankfort sub-station, for example, has three Westinghouse 330-kw. oil-cooled transformers, connected in delta. This station is at present equipped with two 300-kw. three phase, 60 cycle, 600 volt (d. c.) rotary converters, a third converter to be installed later from the Utica sub-station. This latter arrangement holds true of each of the three outlying stations (at Frankfort, Oriskany, and Little Falls), the Utica station having been temporarily equipped with the third rotary from each of these stations. These 300-kw. machines

thus connecting the other two transformers in delta and enabling the rotaries to run with this connection. Each rotary has an individual panel consisting of one three-blade quick-break main switch, three pole starting motor switch and an alternating current ammeter.

The rotaries are brought up to speed by a starting motor and are synchronized by means of lamps or synchroscopes. Facing the front of the switchboard the load panel is on the left and the rotary con-



INTERIOR OF SUB-STATION AT UTICA

verter panels on the right of the switchboard. Additional rotary converter panels may be placed on the extreme right of the board corresponding to the position of the converter in the station. The direct current converter panels are of standard type suitable for the control of railway generators, with the exception of the field rheostat face plate, which is mounted on the back of the alternating cur-

rent panel. The direct current load panel contains the totalizing ammeter, differential voltmeter and the Thomson recording wattmeter.

For these strictly interurban stations the feeder panels are two in number and are equipped with the usual instruments, switches and circuit breakers, each panel carrying the feeders running to the first



TRANSFORMER ROOM AND BUS BAR COMPARTMENT—UTICA SUB-STATION.

section each side of the station. Facing the front of the board the feeder panels are placed on the left with the main rotary converter panels on the extreme right. The load panel occupies the middle of the board. It will be noted that the alternating current and direct current switchboards are entirely separate and that the order of panels on the direct current board is the exact reverse of that usually followed. They were so placed in order to readily facilitate the addition of more rotary converters with the accompanying switchboard panels and feeder panels. This arrangement permits of the additions being made without changing any of the present wiring or interfering with the straight running of the added new work. All of the alternating current ammeters and voltmeters are of the long scale type, while the direct current ammeters on the rotary converter and feeder panels are the round pattern instrument. The local panel instruments are of the illuminated dial dead beat type. All the above apparatus is mounted on blue Vermont marble, and all instruments are dead beat.

Attention is called to the fact that current for the rotary converters is furnished from a single bank of transformers, and the converters therefore operate in multiple on both the alternating and direct current sides. No choke coils are used in the individual converter leads to prevent cross currents. At present there is one 500-kw. machine operating with the three 300-kw. converters in this manner in the main sub-station at Utica.

These stations are protected from lightning and static disturbances by low equivalent lightning arresters, supplemented by static interrupters. The former are placed where the high tension line enters the building, while the latter are adjacent to the 330-kw. transformers, thus being placed between transformer and high tension switch. These latter are the stick type of fused circuit breaker switches.

The main sub-station at Utica has practically the same arrangement of apparatus, except with reference to the direct current switchboard, which is placed in the reverse order from that in the other stations. Blank panels were placed in this board to provide for further extensions or additions.

The transformers are of the oil-cooled type, each having a capac-

ity of 550 kilowatts. They furnish current at present to one 500-kw. and three 300-kw., 60-cycle rotary converters, the last three being duplicates of those placed in the outlying stations. As stated previously these will eventually be supplanted by 500-kw. converters.

The total high tension current delivered from Trenton Falls passes on to the high tension bus bars, placed on top of the transformer room, with accompanying low equivalent lightning arresters, shown in the illustration. From these bus bars are taken taps for the outgoing transmission lines feeding the three stations previously described. These lines are also controlled by two sets of stick type circuit breakers, thus giving the main sub-station complete control of all stations. The entire input is measured by a 20,000-volt, three-phase integrating wattmeter and is also shown by means of an indicating wattmeter mounted on the low tension switchboard. The direct current output is measured by a Thomson recording wattmeter at each station and the readings from these as well as from the alternating current input meter are taken hourly, thus enabling a close check to be kept on efficiency of operation. During September, 1903, the efficiency of the entire system varied from 70 to 84 per cent; this includes all transmission and station losses. All stations are connected by a private telephone line which runs on the d. c. pole line, so that communication may be had at any time with any station.

The entire electric equipment was furnished and installed by the Westinghouse Electric & Manufacturing Co. and represents the latest type of its apparatus in every respect.

Daily record sheets are also kept at all sub-stations. A copy of one of these (that of Utica sub-station) appears here. The readings are taken every fifteen minutes by the station operator and plotted on the log sheet, which is suitably ruled for the purpose. The sheet is arranged to show the total load readings a. c. voltmeter, and d. c. voltmeter readings at the station, and is divided into rectangles representing one hour each on the horizontal scale and 250 amperes and 50 volts respectively on the vertical scale. These rectangles are subdivided horizontally into four fifteen-minute squares and vertically into five squares rep-



INTERIOR OF FRANKFORT SUB-STATION.

resenting 50 amperes each for the load curve and ten volts each for the a. c. and d. c. voltage curves. The hours are printed at the top of the sheet, the curves beginning at 4:00 a. m. The hours representing the afternoon are in full faced type. A curve arranged in this way represents graphically the work done at each station and enables a close check to be kept on that station's operation. Operators do not plot swing readings so that with the dead beat type of instruments used the curves give a very accurate

UTICA

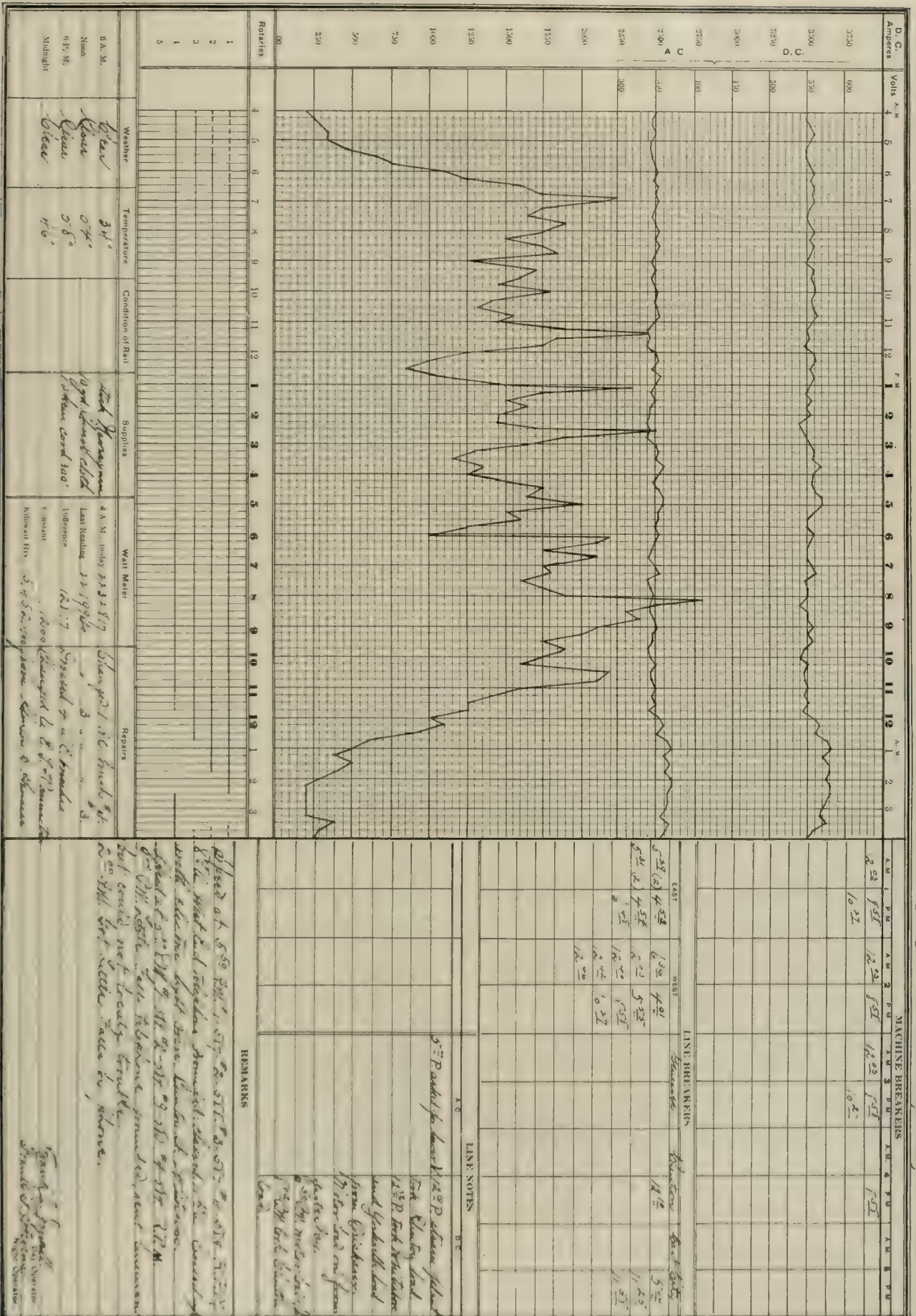
Substation.

UTICA AND MOHAWK VALLEY RAILWAY CO.
DAILY SUBSTATION LOG.

For 24 hours beginning 4 A. M.

Saturday May 23

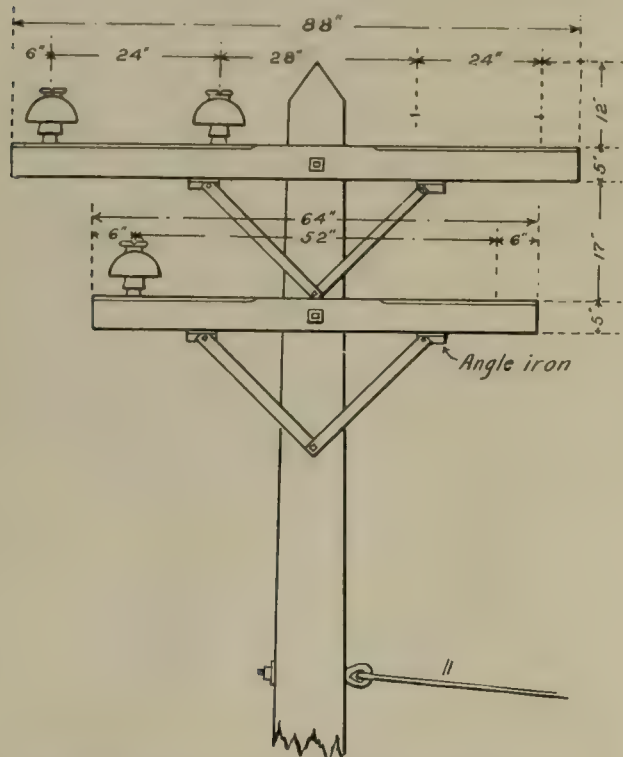
1903



idea of the demand on each station. On the lower section of the plotting surface horizontal lines are drawn by the operator indicating the time during which each machine has been running. Spaces are provided for the customary daily wattmeter readings and circuit breaker records and also line notes and remarks. These sheets are filed for future reference, as are also the hourly wattmeter records.

Transmission Lines.

In the principal sub-station of the railway company at Utica are located in addition to the rotaries described, the switching apparatus to control the high tension lines running to the other sub-stations.



STANDARD CONSTRUCTION FOR TRANSMISSION LINE.

These lines run through the city on poles of the Utica Gas & Electric Co., crossing to a point just north of the New York Central Railroad track, where they pass to the poles of the railway company. One of the lines turns west along the Mohawk Valley flats to a point west of the town of Whitesboro, where it crosses the New York Central Railroad tracks and the Erie Canal, and thence runs west along the trolley right-of-way to the Oriskany sub-station. This sub-station is located about one-half mile west of the famous Oriskany Battle Monument. This latter stretch of line diverts from the trolley right-of-way to pass around the village of Oriskany and then it follows the Berme bank of the Erie Canal. The total length of this west line is approximately ten miles, five miles being along the trolley right-of-way.

The other line follows the transmission line right-of-way of the lighting company 4,300 feet, across the Mohawk flats, when it turns and runs east on the railway company's pole line to a point about one mile east of Utica Park, where it follows the trolley line right-of-way to the Frankfort sub-station, which is just west of the village of Frankfort. This portion of the transmission line carries current for both the Frankfort and the Little Falls sub-stations. Connected to this line in the station are switches to connect on the line which runs to the Little Falls sub-station, following the trolley right-of-way to a point a short distance west of the village of Ilion, where the line turns and runs over the hills south of the villages of Ilion, Mohawk and Herkimer, and then crosses the Mohawk River and Erie Canal and joins the trolley right-of-way at a point near the big concrete-steel bridge over West Canada Creek at Herkimer. From this point the transmission line runs along the trolley right-of-way to the sub-station about three miles west of the city of Little Falls.

Where the transmission lines follow the trolley right-of-way the wires are carried on the field side of the pole not used for carrying the direct current feeders. On the cross-country sections the transmission pole line occupies one side of a right-of-way one rod in

width, purchased for transmission purposes, the poles being placed so that the end of the long cross arm comes on one edge of the right-of-way, as this will allow room on the other side of the right-of-way for a second transmission line if such should be required.

The line voltage being 20,000, precautions were taken to use a construction that would insure the greatest continuity of service possible. The limited time available for repairs (there being only two hours shut down per night) also argued for substantial and permanent construction.

The poles are cedar and chestnut of a minimum length of 35 ft. and with tops 25 in. in circumference. The cedar poles were used along the trolley right-of-way and part of the way where the transmission lines have their own right-of-way. Where the poles on the flats might be in danger of floods, ice, etc., chestnut was used as affording greater strength, and as a good quality of chestnut poles was available, that timber was used for a great part of the other work also. Where special danger from ice was anticipated, two chestnut sticks, not less than 7 ft. in diameter, were set alongside of the poles and bolted to them, the sticks being on the upstream side. These, it is believed, will buffer off any ice or driftwood and be a protection to poles in time of flood. Poles in earth or clay were set at least 7 ft. in depth, in gravel 6 ft., and in rock they were set 4 ft. or more and concreted in. When there was danger that water would wash around the bases of the poles in flood time a 6-in. layer of concrete extending two or three feet around the poles was laid as affording additional protection.

A maximum distance of 140 ft. was fixed as spacing between poles and this was shortened as required to take care of curves, grades, etc. Special attention was paid to guying and bracing the poles. Braces were framed into the poles and all guying was done with $\frac{3}{8}$ -in. double galvanized steel strand. Where the transmission lines were carried on the trolley line poles, all the poles were guyed to $\frac{3}{8}$ -in. guy rods, which were bolted to blocks of wood at least 3 x 6 in. x 2 ft. 6 in. buried 4 ft. in the ground, the guy opposing the strain of the span wire.

Great care was used in grading the line so that there should be no undue strain up or down on insulators or pins. The accompanying illustrations will show the care with which this was done. No attempt was made to use instruments for this work, as it was thought



LINE CONSTRUCTION AT SHARP ANGLES.

that better results would be obtained by relying on the judgment of the line foreman who had special instruction and experience on this part of the work.

The drawing of the pole top will show the arrangement of cross arms, pins, etc., on the poles. The cross arms are of southern pine and were given two coats of lead and oil paint after they were received at Utica. Most of the cross arms were inspected at the mill

to insure the quality necessary for this work. Pins are locust and special care was used in the selection of the wood. The form of cross arm bracing used is also shown in the drawing. Instead of the complicated form of bent angle which is frequently used, to attach the cross arm braces under the cross arm in high tension work, the combination of a galvanized iron angle clip, which can be



VIEW OF CRADLE ON HIGH TENSION LINES.

screwed to the arm and a galvanized cross arm brace bolted to the clip with a small galvanized bolt, was found to be the most simple and effective metal brace arrangement.

The insulators used are the Locke No. 100 one-piece insulator and were tested to 60,000 volts for five minutes. This is an extreme test, but it has proved its value, as none of the insulators has broken down from electrical strains.

with No. 2 solid aluminum. Twisted sleeves were used for splicing, using two and one-half full turns per sleeve.

At highway and railroad crossings, cradles were put under the wires to prevent broken wires from falling on other wires, vehicles or trains below. These cradles are carried on 10-ft. arms on high tension insulators and consist of $\frac{3}{8}$ -in. double galvanized steel strands carrying triangular wood sticks 2-in. on a side, the sticks being laid flat on the wires about 10 ft. apart. Standard cradle construction is shown in the illustrations.

At slight angles or changes in grade double crossarms were used, giving the strength of two insulators, pins, etc., for each wire. At sharp angles in the lines four arms were framed on the poles, as shown in the illustration, to divide the strains due to the wire over four pins and insulators. At right angle turns in the line the wires in each direction were dead ended on four arms, jumpers being used to complete the electrical connection. This construction, while somewhat complicated in appearance, is strong and does not require frequent repair. Right angle turns in the line were few and were avoided as much as possible and curves used in their stead. A telephone line runs on the poles on the cross country sections, which is used by repairmen in communicating with the nearest station. This line is independent of the d. c. telephone system already mentioned.

The lines, in general, presented various problems of considerable difficulty. The construction on the Mohawk flats is on wet lands with much quicksand, and required the most careful work to guard against high water and ice. On the line over the hills above Ilion and Mohawk, following a country which is extremely rough, poles varying from 35 ft. to 75 ft. in length were required to grade the wires properly. These lines were designed and built by the Archbold-Brady Co., Syracuse, N. Y., who had charge of the work as contractor and engineer.

Direct Current Line.

The direct current feeders pass out of the sub-station buildings through 2-in. porcelain tubes. These feeders comprise two 500,000 c. m. copper cables running to the end of each section east or west from the sub-station, together with one 400,000 c. m. copper cable



UTICA & MOHAWK VALLEY RY. PARK

Seven strand aluminum cable was used throughout the line, that from Utica to the Onondaga sub-station and from Frankfort sub-station to Little Falls, all of it being No. 2 aluminum equivalent to No. 4 copper. The line from Utica to Frankfort sub-station is No. 6 aluminum, equivalent to No. 2 copper, allowing carrying capacity for both Frankfort and Little Falls. All ties were made

running approximately one-half the length of each section. These are tapped to two No. 6000 trolleys every 12 poles. The double trolley extends over practically the entire length of the main line, the only exception being where single track is being used temporarily. This will soon, however, be made uniform with the rest of the system, the side lines operated in the cities of Utica and Rome and the

branches in Whitesboro, New York Mills and the north side of the Erie Canal in Frankfort being the only other sections operating with single trolley and turnouts.

Taps from feeder to trolley are made with No. 6 B. & S. insulated copper wire. Columbia anchor cars are placed every 12 poles along the entire line, coming midway between feed taps. The first four feed taps at the sub-station are omitted.

The line is divided into sections, a section insulator being placed at each sub-station and also midway between the stations, thus mak-



THEATER AT PARK.

ing approximately a five-mile section in each case except in the city of Utica, where the arrangement is altered by local conditions.

Span construction is used on all the new work, poles being of cedar 35 ft. long set 7 ft. in the ground, and placed 80 ft. apart on tangents. The standard form of cap and cone hangers is used with 15-in. soldered ears for No. 0000 round trolley.

Lightning arresters have been placed along the line one-half mile apart except where conditions warranted a closer spacing. These arresters are placed invariably at the feed tap. Feeders are of bare copper cable on the private right-of-way and of covered cable in the cities and villages. The feeder system is designed for a minimum voltage of 400, under the most severe conditions of load. This will also permit of temporary handling of the direct current line of one sub-station from its adjacent station in case of high tension trouble.

As a safety precaution wherever the electric railway crosses steam railroad track, the trolley wire is suspended in an inverted trough. The trough is made of copper and being alive, should the trolley wheel leave the wire it will strike the trough and thus supply sufficient current to the motors to carry the car over the crossing. It is practically impossible for a car to become dead on or near a railroad crossing. These overhead troughs were supplied by the C. D. Austin Manufacturing Co., of Amsterdam, N. Y.

Car Houses and Shops.

The car houses of the company are six in number, that at Utica Park being the largest and most recently erected. This car house is built of brick with steel roof trusses, carrying plank and slate roofing as in the case of the sub-station. The building is in the form of two bays each 45 ft. x 500 ft., with three tracks each, and has a capacity for 60 interurban cars. The several other car houses are older and smaller, and have a total storage capacity of 67 cars.

The new shops of the company are located adjacent to the car house at Utica Park and are of the same style of construction. The shop building is 50 ft. x 204 ft., and is subdivided into shops for the various departments. The main shop, 36 ft. x 204 ft., contains two tracks with pits and has a capacity of six of the large type cars. The pits are each equipped with movable hydraulic jacks.

Beginning at the front of the building is the office of the master mechanic and adjoining this is the stock room, with nearly 4,000 sq. ft. of shelf room. The heavier pieces are kept in a building near the main shop and fitted up for that purpose. The machine shop proper is located in the center of this side of the building and is 30 ft. x 14 ft. Opening out of this toward the front of the building and adjoining the stock room is the armature room, and opening out of

the machine shop toward the rear of the building is the blacksmith shop.

Most important in the equipment of the machine shop are a Putnam geared lathe with 24-in. swing; one 42-in. boring mill; one 180-ton wheel press; one planer; a 30-in. drill press and a small geared lathe of 14-in. swing. The armature room contains one re-taping machine, one field winding machine and one machine for taping field coils. The blacksmith shop contains the usual outfit of smithing tools, including a bolt cutting machine.

In the rear of this last shop is the carpenter shop with a capacity of two of the large interurban cars. This shop contains a 34-ft. band saw, one circular saw, one planer and a wood lathe.

The paint shop occupies the rear of the car house proper and has a capacity of six of the large interurban cars. All machinery is operated by electric power furnished from the d. c. system of the railway company by means of a small motor located in the machine shop. Washrooms and closets are located in an extension on the west side of the machine shop and are furnished with city water. This building and car house have their own heating plant, which is located in the former building. Six Dudgeon jacks form a part of the miscellaneous equipment of the shop. Detached buildings are provided for the storage of oil, gasoline and car signal lamps, and also buildings for sand and coal storage.

Rolling Stock.

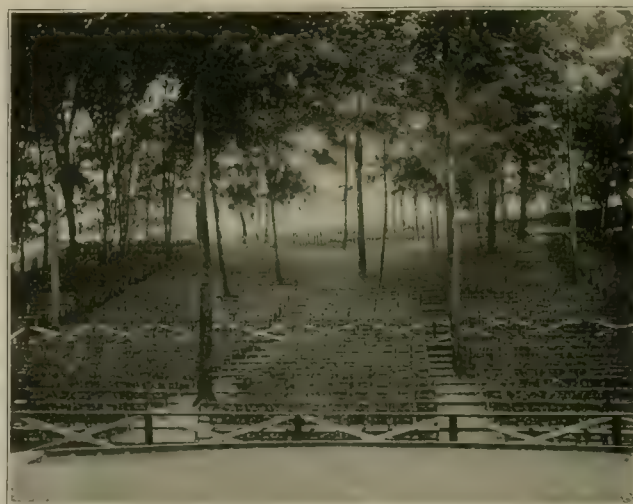
In the selection of rolling stock, logical care has been exercised in order to meet the conditions of service as they exist.

Closed Cars.

The company operates three types of closed cars, as follows: A single truck 18-ft. body for service on purely local lines within the limits of the city of Utica; a 28-ft. double truck, single end car for use in what is called the suburban service running outside of the limits of the city of Utica and to the immediate adjoining towns; a 34-ft. 6-in. double truck car for the strictly interurban service between Rome and Little Falls.

Of the first class for local service, the company owns 34 cars in all. These are equipped with two motors to the car and are the double end type, that is they run either end on. They are mounted on Peckham, du Pont or Taylor single trucks and are equipped with two motors to the car, the motors being either G. E. 800 or Westinghouse No. 49. The bodies were built by Brill and Jackson & Sharp.

Of the 28-ft. double truck cars for suburban service the company owns 32, of which 22 are of Brill semi-convertible type, and ten are



THEATER FROM STAGE.

of the John Stephenson Co. make. These cars are designed to run the same end on for both directions and are mounted upon Brill 27 F double trucks with four Westinghouse No. 68 motors to each car.

Of the long cars for interurban service, the company owns 14. These are of the Brill semi-convertible type, having a smoking compartment separate from the regular passenger compartment. The bodies measure 34 ft. 6 in. and are mounted on Brill 27 A1

double trucks, equipped with four Westinghouse No. 56 60-h. p. motors, geared 24-58. The cars are finished in mahogany. The wheels under the Brill 27 A1 trucks were made by the Railway Steel Spring Co. and are of the "fused" type of steel wheel 34 in.

Snow Equipment.

The snow equipment consists of two double truck Ruggles rotaries mounted on Peckham trucks and equipped with four Westinghouse No. 68 motors. The fans are driven by two Westinghouse



REPAIR SHOPS, CAR HOUSE AND EMPLOYE'S BUILDING—SIGN RACK IN FOREGROUND.

in diameter, having 3-in. tread and 1 $\frac{1}{8}$ -in. flange. The interurban cars are equipped with Westinghouse storage air brakes. For additional safety on the rear platform of each interurban car is a valve which, when opened, will admit air directly to the brake cylinder and apply air brakes without aid from the motorman. This permits the conductor to stop the car in case of extreme emergencies.



PAINT AND REPAIR SHOP.

Open Cars.

For city service the company has twenty-one 10-bench open cars. For suburban service there are thirty 14-bench single end cars of the Cleveland type built by the J. G. Brill Co. and mounted on Brill 27F trucks, equipped with four Westinghouse No. 68 motors. No open cars are used in the interurban service.

The equipment of the passenger cars includes the following: Consolidated electric heaters on the single truck city cars; Peter Smith hot water heaters on all double truck closed cars, the No. 3 heater on the 28-ft. bodies and the No. 2 heater on the 34-ft. 6-in. bodies; seats of the Wheeler make; Providence fenders; New Haven registers; Pantasote curtains; Syracuse changeable headlights and Neal electric headlights on the city cars; oil headlights on the interurban cars; Kalamazoo No. 3 trolley wheels; and Union trolley stands. All cars which pass without the city limits of Utica are equipped with oil tail lights and oil classification lights in accordance with the standard code of signals adopted by the New York State Street Railway Association and the American Street Railway Association.

Illuminated destination signs are carried on both deck and dash. These are wooden signs with open letters having celluloid backs.

Express Cars.

The company has three express cars, two of which are double truck, 28-ft. bodies mounted on Brill 27 A1 trucks equipped with four Westinghouse No. 56 motors; the third car is a single truck, 18-ft. body on Peckham truck equipped with two G. E. 52 motors.

No. 68 motors mounted on the floor of the car. All appliances are controlled by compressed air. The single truck rotary is mounted on a Peckham truck and equipped with G. E. 1,200 motors.

There are two steel double truck sheer plows equipped with four Westinghouse No. 68 motors. These plows were built by Smith & Wallace and are of novel type in that the bucking of the snow is done with the truck.

There are two single truck nose plows equipped with Westinghouse No. 68 motors and two single truck sheer plows equipped with Westinghouse No. 68 motors.

The company owns a single truck all-steel sweeper equipped with Westinghouse No. 68 motors.

All of the snow equipment with the exception of the three Ruggles rotaries was built by Smith & Wallace. The company also has three Lewis & Fowler sweepers which have no motive power of their own. For use in building the recent extensions to Little Falls there were used 36 cars and 3 locomotives of the type used by the Manhattan Elevated in New York City.

Bridges.

On the main interurban line between Rome and Little Falls there are over 25 bridges, having spans in excess of 13 ft. These are for the most part steel structures resting on concrete abutments, and are built and maintained according to the best steam railroad stand-



END VIEW LATTICE GIRDER THROUGH BRIDGE.

ards. Two of the typical bridges on the Little Falls extension are illustrated in the accompanying engravings. One of these shows the 103-ft. through lattice girder span which crosses the dry channel of the Mohawk River. Another engraving shows the 130-ft

through lattice truss span which crosses the Mohawk River just above the 103-ft. span. These bridges are of very heavy design, the 103-ft. span weighing about 98 tons and the 130-ft. span 135 tons. They were designed to carry the heaviest cars which the Utica & Mohawk Valley Railway Co. is now using, and are much heavier than the average electric railway bridge. The steel for the struc-

The bridge structure proper, beginning at the west end, comprises a series of ten concrete cement arches which begin where the earth-fill ends, a point distant about 100 ft. from the west bank of the creek, and which ends at a point about 230 ft. beyond the east bank of the creek. As stated, these arches vary in span from 62 ft. to 66½ ft. The supports for the arches consist of two abut-



COMBINED CONCRETE AND STEEL SPAN BRIDGE AT HERKIMER TOTAL LENGTH 1,212 FT.

tures was furnished and erected by the Snare & Triest Co. of 39 Cortlandt St., New York.

The Herkimer Bridge.

The Herkimer Bridge, by means of which the company's cars cross the West Canada Creek and the tracks of the New York Central, excels in magnitude anything of the kind yet attempted in this country, for, while it is true there are many bridges of concrete steel construction, and some of them with one, two or even three spans greater than any at Herkimer, yet the boldness of the design which provides for a series of ten concrete arches with spans from 62 ft. to 66½ ft., and in addition to this continues the same structure with a 225-ft. steel span, completing the viaduct with three 55-ft. steel spans and making the bridge 1,212 ft. long, puts this

ment-piers with nine intermediate piers. One of the features of the design provides that the intermediate piers shall be of two different sizes, the third, sixth and eighth being larger, so that they may act as abutments in case a portion of the bridge should fail. The second to the eighth inclusive are so constructed at the upstream end as to act as ice breakers. The faces of the piers have a batter of three-quarters of an inch per foot, and are provided with a moulding at the top, having a depth of 2 ft.

The arches have a thickness at the crown of 21 in., this increasing to 4½ ft. at the haunches, and each contains 32 pairs of 1¼-in. steel rods of the Thacher patent, which are placed 3 in. from the extrados and intrados and extend down into the piers. The first seven arches have a clear span of 62 ft. with a rise of 12 ft., the last three, a span of 66½ ft., with a rise of 14 ft. The spandrel



100-FT. THROUGH LATTICE GIRDER SPAN.

work beyond comparison with anything which has yet been done in this line.

A technical description of the engineering details of this bridge, written by Mr. F. C. Phillips, the company's resident engineer, will be found in the "Street Railway Review" for Dec. 20, 1902, beginning at page 893. A brief extract from this article will be repeated here.

walls extend 2 ft. 9 in. above the arches and are surmounted by a coping 18 in. in depth.

The pilasters above the piers project 1 ft. beyond the spandrel walls, and those of the larger piers extend a certain distance above the coping. Steel poles for supporting the trolley wire are placed one in each pilaster.

The arches are covered with two coats of cement grout to ren-

der them water-proof, and this coating is extended part way up on the spandrel walls. The filling over the arches and piers consists of sand and gravel, forming a good roadbed for the electric railway track. Drainage is provided for by 4-in. vitrified pipes located over each pier.

The east abutment pier serves not only as an abutment for the arches, but also to support one end of the 225-ft. steel through truss which spans the tracks of the New York Central, thus making the steel bridge continuous with a series of arches.

That part of the structure following the long steel span, namely, the three 55-ft. girder spans, is on a curve to the right, and the piers are set radially on this curve. The curvature, however, is not abrupt, being a Searles spiral made up of 14 20-ft. chords.

Masonry.

The brand of cement used was "Nazareth," made by the Nazareth Cement Co., at Nazareth, Pa., and sold by the Chas. Warner Co., of Wilmington, Del. The cement was carefully tested at the electric railway company's laboratory on the work.

In the foundations and in the piers the materials were mixed in the proportion of one part cement, three parts of sand and seven parts gravel, the only distinction being that in the foundations less attention was paid to the screening of the sand than in the superstructure of the piers. In the arch rings and spandrel walls a proportion of 1 to 2½ to 5 was used.

On exposed surfaces a facing mortar 1½-in. thick was used. This mortar was first made 1 to 2, but was afterward changed to 1 to 2½. The facing was placed by means of slip boards and was rammed at the same time with the body of the concrete. On the up-stream ends of those piers, which were sharpened to act as ice breakers, a mixture of 1, 2 and 4 varying in thickness from 6 to 8 in. was used in addition to the ordinary facing.

The proportioning of the materials in the concrete was on the basis of packed cement, loose sand and loose gravel, and was de-

termined by tests of materials combined with the judgment of the inspector on the work.

A word with reference to the method of depositing concrete on the arches may be of interest. The arches were built in transverse sec-



PLATE GIRDER BRIDGE CONCRETE ABUTMENTS.

tions, extending the full width of 27 ft. The rods were first placed in position and the section at the crown deposited first. This section varied in width from 10 to 14 ft. The sections at the haunches were then placed and continued up toward the crown.

Work was begun on the earth embankment May 22, 1902, on the abutments of the "Dry Channel Span" June 22d, and on the main

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DIAGRAM SHOWING EXECUTIVE ORGANIZATION, UTICA & MOHAWK VALLEY RAILWAY CO.

structure the latter part of June. Messrs. Beckwith & Quackenbush, of Herkimer and Mohawk, N. Y., were contractors for the masonry, and Messrs. Snare & Triest, of 39 Cortlandt St., New York, erected the steel work.

Express Service.

The company operates with success an express service over all its lines. In speaking of this department at the Saratoga Convention of the American Street Railway Association, Mr. C. Loomis Allen, general manager of the company, epitomized the experience with this department as follows:

In December last we organized an express department on the Utica & Mohawk Valley Railroad. We did not undertake to handle anything in the way of heavy material or such matter as freight. We operate three express cars, which are operated about twelve hours a day. We do not take any material for shipment unless that material be delivered at the destination. By that I mean we have at each village or municipality where we give service, teams for the delivery of the express matter. In each of the cities we maintain teams for the purpose of collecting express matter, on the same system as that adopted by the old line of express companies. The expense, which, of course, must be very large, due to the maintenance of the drivers and agents in each of the municipalities, has been in the neighborhood of about 70 per cent of the gross receipts.

Oldest Indiana Interurban Completed.

The Indianapolis, Columbus & Southern Traction Co.'s extension from Franklin to Columbus, Ind., was opened for traffic September 21st. The line was completed between Indianapolis and Greenwood in December, 1899, and was opened Jan. 15, 1900. In the summer of 1902 the system was extended to Franklin. This was originally the Indianapolis, Greenwood & Franklin Railroad Co., which was incorporated in November, 1894, and which is believed to be the first electric interurban road projected in Indiana. The original projectors were Messrs. Grafton Johnson, J. T. Polk and John A. Polk, of Greenwood. They began construction in 1896 and had practically completed the grading to Greenwood, when money became tight and they were forced to abandon the enterprise. In July, 1899, Messrs. Joseph I. Irwin and William G. Irwin, his son, of Columbus, undertook to complete the road. It was constructed wholly with private capital, the entire stock being owned by members of the Irwin family. The officers of the corporation are: President, Joseph I. Irwin; vice-president and general manager, William G. Irwin; secretary and treasurer, Hugh T. Miller. These with the other two stockholders, Mr. and Mrs. Z. T. Sweeney, comprise the board of directors.

The work of building the road to Columbus was begun in September, 1902. It is a well-built road, very free from grades and curves. The bridges are all of iron and the masonry for bridges and culverts is entirely of concrete. A new power house has been erected at Edinburg and a sub-station at Greenwood. The car barn and shops will be at Columbus. The walls of the car barn, a portion of which is completed, will be of concrete. A number of new high-speed interurban cars have been put in service. Mr. A. B. Hogue, of Greenwood, who has been the Messrs. Irwins' superintendent from the first, has supervised the entire work. Those portions of the road that have been in operation have been well patronized and free from accidents.

Brooklyn Heights Road Adopts Merit System.

Under date of Oct. 1, 1903, D. S. Smith, general superintendent of the Brooklyn Heights Railroad Co., issued the following order:

"Commencing Oct. 15, 1903, all punishment of conductors, guards, switchmen, flagmen, engineers, motormen and firemen in train service by suspension from duty with loss of pay will be abandoned, and thereafter discipline for neglect of duty, violation of rules and bad conduct shall be by reprimand, demerit marks or dismissal from the service.

"On that date, every employe above named starts with a clear record, except that when subsequent records show that past offenses are being repeated, the persons concerned will be dismissed from the service or double the demerit marks entered against them.

"It will be understood that disloyalty, intemperance, insubordina-

tion, immorality, wilful or gross carelessness, incompetence, dishonesty, false statements or concealing facts concerning any matter under investigation will be dischargeable offenses.

"A complete record of each employe will be kept and all discipline imposed will be shown thereon. Credit will be given for excellent conduct, deeds of heroism, or extraordinary service rendered, and these credits will receive due consideration in connection with any charges which may be made against such employe.

"For every three consecutive months of service free from demerit marks or reprimand, five marks will be deducted from any that may have been previously entered against an employe's record. When sixty marks shall have been entered against the record of an employe his services will be dispensed with.

"On January 1st, of each year, the names of employes who have at that time completed a year with a clear record will be posted.

"In the promotion of employes, their previous record will always be considered.

"Record bulletins of an educational nature will be posted periodically, giving a brief account of cases where employes have been disciplined, stating what action was taken in each case but will not ordinarily give the name of the employe nor any information that would identify him.

"Each employe will be notified in writing of any action concerning him, and will have an opportunity to appeal from any decision as to the number of demerit marks, but such appeal must be made to the Division Superintendent within ten days after receipt of notice.

"The objects of this system are:

"First—To continue employes in the service without interruption, loss of wages and consequent suffering to those dependent upon their earnings for support.

"Second—To obtain greater efficiency in the safe and careful operation of the company's service by encouragement to faithful and intelligent performance of duty.

"This system is introduced in the belief that it will be beneficial to employes and that it will meet with their hearty co-operation."

Pittsburg and Charleroi Line Opened.

On September 27th the Pittsburg and Charleroi line of the Pittsburg Railways Co. was formally opened. The route is through a picturesque section and the road touches all of the important steel centers of the Monongahela valley. Construction on the road, which presents the longest continuous track in western Pennsylvania, was begun in 1901. It is 27½ miles long, having its northern terminus at West Liberty, Pa., and its southern terminus at Allenport, 35 miles from the Pittsburg Union station. It extends south in a direct line through Castle Shannon and Finleyville to Monongahela City, Charleroi and other towns along the Monongahela River, and except in the towns through which it passes it runs on private rights of way. There are no grade crossings, the maximum grade is 6 per cent, and with 80-lb. rails on a thoroughly ballasted road it is expected that high speed will be maintained. Between Castle Shannon and Allenport there are 25 steel and stone bridges, one of them being 165 ft. high. On the long stretches between towns a single track has been laid, but grading has been completed for another track whenever it is deemed necessary.

At present the line is divided into three sections for purposes of operation. One extends from Union station to Castle Shannon, another from Castle Shannon to Riverview, and the third from Riverview to Allenport. Current is transmitted over a high-tension line at 15,000 volts, the power house being at Rankin and the sub-stations at Riverview, Library and Charleroi. The cars are each equipped with four 56-h. p. motors. A steel car barn, 220 x 80 ft., is being erected at Charleroi. The new road opens up Washington County, and saves 40 miles in some instances in the journey to Pittsburg.

The Pacific Electric Railway Co., of Los Angeles, is building a new line to Whittier, a distance of 13 miles. The road is graded, poles are set and wires strung, and the rails are being laid. The line to San Pedro is also under construction. Considerable work is also being done on the company's new power house. The foundations have been built for three 2,500-h. p. engines, and 10,000 h. p. in Edge Moor boilers is being installed.

Indiana Railways.

The Indiana Union Traction Co. is now engaged in building a line from Anderson to Elwood, via Florida and Frankton, a distance of 14 miles; from Muncie to Alexandria, a distance of 17 miles, and from Anderson to New Castle via Middletown, a distance of 22 miles. Grading on the Muncie-Alexandria and the Anderson-Elwood lines was practically completed October 1st and it is expected that these divisions will be in operation by January, 1904. The line to Elwood will be eight miles shorter than the present route via Alexandria, while the Muncie-Alexandria route will make the distance between these points 13 miles less than the present route of the Union Traction lines via Anderson, and establish a through line from Muncie to Tipton paralleling the Lake Erie & Western, the lines between Elwood and Tipton, built by the Indianapolis Northern Co., having been in operation for some time.

It is hoped that the lines of the Indianapolis Northern Traction Co. (which by the terms of its merger with the Union Traction Co. of Indiana was to complete the construction work and constitute the construction department for the Indianapolis Northern system as originally contemplated) will be completed by January 1st. This route is from Indianapolis to Kokomo, the county seat of Howard County, via Noblesville, the county seat of Hamilton, and Tipton, the county seat of Tipton. From Kokomo two branches will extend, one to Logansport, the county seat of Cass, and one to Peru, the county seat of Miami. Entrance to Indianapolis is over the line of the Broad Ripple Traction Co., which from 28th St. to Broad Ripple has been acquired by the Indianapolis Northern. The engineering work, which has been in charge of Mr. S. H. Knight, on this line is of exceptionally high quality, and the large number of bridges has made the construction expensive. Much of the bridge and culvert work was done by the National Bridge Co., of Indianapolis.

For the operation of the Indianapolis Northern lines there are to be six sub-stations located at Broad Ripple, Noblesville, Tipton, Kokomo, three miles southeast of Logansport, and three miles south of Peru. Power is generated at the station of the Indiana Union Traction Co. at Anderson. From Anderson to Tipton there are two transmission lines which feed into common bus bars at the Tipton sub-station. From these bus bars one circuit is carried south to Noblesville and Broad Ripple and two circuits are taken north to Kokomo, where they feed into common bus bars. From these bus bars the Kokomo sub-station is supplied and two circuits are carried north, one to Peru and one to Logansport.

The Wabash-Logansport Traction Co., controlled by the same interests as the Indiana Union Traction Co., is operating between Wabash and Logansport, and the Ft. Wayne & Southwestern Traction Co. is operating between Wabash and Ft. Wayne. The Ft. Wayne, Logansport, La Fayette & Lima Traction Co. will build along the Wabash River from Logansport to La Fayette, and thence southwest.

In order to take care of the Indianapolis Northern system the power house of the Union Traction Co. at Anderson has been enlarged and two 1,000-kw. alternating current units installed. A new stack is also under construction. These generators are Westinghouse three-phase machines generating at 375 volts, 3,200 alternations. In the boiler room will be installed four Babcock & Wilcox boilers, two of 400 h. p. and two of 600 h. p. each. The design of the addition to this station is similar to that of the older portion of the station, which was described at length in our issue of April, 1901. A new building has been erected near the power station the first floor of which will receive the fifteen 250-kw. 375-15,000 volt transformers formerly located in the basement of the main station and seven 500-kw. 375-3,000 volt transformers for the Indianapolis Northern system. In the second story of this new building there will be the high tension switchboard. This work has been carried out under the direction of the company's electrical engineer, Mr. A. S. Richey.

The Indianapolis & Eastern Railway Co., which has been operating between Indianapolis and Dublin via Greenfield and in connection with the Richmond Street & Interurban Ry. and Ohio lines gives a through line from Indianapolis to Columbus, on September 15th opened the branch line from Dunreith to New Castle, a distance of 10 miles. The Indianapolis & Eastern Company has in operation 60 miles of track. The main line is from Indianapolis to Greenfield,

17 miles, thence to Dunreith, 18 miles, and thence to Dublin, 12 miles. The cars in Indianapolis are operated over the Indianapolis Traction & Terminal Co.'s tracks for five miles, but this is not counted in the mileage given.

The Indianapolis & Cincinnati Traction Co., which was organized in May last to operate from Indianapolis to Cincinnati via Rushville, Connersville and Hamilton, has completed grading and bridge foundations as far as Rushville, a distance of 40 miles from Indianapolis. The roadway has been graded for a double track line throughout and all bridge foundations and culverts have been constructed with a double track in view. A single track only will be laid at first, however. The whole is on a private right of way which has a minimum width of 66 ft. The distance between the principal towns are: From Indianapolis to Rushville, 40 miles (three miles in Indianapolis will be over the local tracks); to Connersville, 17 miles; to Hamilton, O., 33 miles; to Cincinnati, 25 miles. Total, 115 miles. The officers of the Indianapolis & Cincinnati Traction Co. are: President and general manager, C. L. Henry; secretary, William L. Taylor; treasurer, E. M. Johnson. John W. Moore is chief engineer. The offices of this company are in the Stephenson Building, Indianapolis.

The Consolidated Traction Co. of Indianapolis has practically completed grading between Indianapolis and Crawfordsville, 43.5 miles, is securing a right of way between Crawfordsville and Covington, 29 miles, and is at work on the preliminary survey between Crawfordsville and La Fayette. The headquarters of this company are 403 Indiana Trust Bldg., Indianapolis. Edward Hawkins is president and manager and Guy E. Hawkins secretary.

The Indianapolis & Northwestern Traction Co. formally opened its line between Lebanon and Indianapolis September 30th, and one or more trips were made over the line each day thereafter, although a regular schedule was not established until October 5th. The line from Lebanon to Frankfort is practically completed and work is progressing rapidly between Frankfort and La Fayette, the present terminus of the line. The car equipment is to include 10 passenger coaches and 4 freight cars, all built by the Jewett Car Co., of Newark, O. The cars are mounted on Peckham No. 36-B trucks and equipped with four G. E.-73 motors. The equipment includes the General Electric type M control, Westinghouse air brakes, Peter Smith hot water heaters, Hale & Kilburn push-over seats.

The power house and car house are located at Lebanon. The power house equipment includes four 500-h. p. Stirling boilers with Roney stokers, two 370-volt, 1,250-ampere alternating current generators operating at 107 r. p. m.; two 300-kw. rotary converters and two 125-volt, 440-ampere exciter generators driven by Ideal engines and one motor-driven exciter. There are six 270-kw. transformers for raising the voltage to 26,400 for transmission. The electrical equipment is all General Electric.

The officers and operating force of the company are: President, George Townsend; vice-president, F. L. Saltonstall; secretary, Winthrop Smith; treasurer, Chauncey Eldridge; general manager, C. C. Reynolds; auditor, Howard St. G. Eldridge; superintendent, G. K. Jeffries; chief engineer and electrician, Mr. Alexander.

Prosperous Employees' Association.

The annual report of the Consolidated Traction Company Employees' Relief Association, which includes only the men employed on the consolidated system of the Pittsburg Railways Co., shows that since the inception of the association in 1890, it has paid to members \$85,528.50 in sick benefits and to deceased members' families \$15,487.50 in death benefits, a total of \$101,016. The treasurer's report for the year ending August 31st is as follows: Balance on hand Sept. 1, 1902, \$6,940; dues from members Aug. 16, 1902, to July 15, 1903, \$13,803.50; donations from the Pittsburg Railways Co., \$6,751; returned benefits, \$94.50; interest on deposits, \$277.87; total receipts, \$27,866.93. Disbursements: Sick and death benefits and miscellaneous, \$19,264.15; refunded dues, \$5; balance on hand, \$8,597.78. The association has a total of 1,566 members, a net gain of 71; the first year it had 54 members and the dues were not sufficient to pay the benefits. It was formed by employees of the old Citizens Traction Co.

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DON'T do it in the barber shop—Buzzard's Bay Philosophy.



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We cordially invite correspondence on all subjects of interest to those engaged in any branch of street railway work, and will gratefully appreciate any marked copies of papers or news items our street railway friends may send us, pertaining either to companies or officers.

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If you contemplate the purchase of any supplies or material, we can save you much time and trouble. Drop a line to THE REVIEW, stating what you are in the market for, and you will promptly receive bids and estimates from all the best dealers in that line. We make no charge for publishing such notices in our Bulletin of Advance News, which is sent to all manufacturers.

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FAR OR NEAR CROSSING?

At the Saratoga convention when moving that the American Street Railway Association adopt the "Rules for the Government of Employees" as submitted by the Committee on Rules, Mr. John I. Beggs, of the Milwaukee Electric Railway & Light Co., called attention to several changes that he would make in preparing a copy of the rules for use by his company. One of these changes suggested was to make rule 24 provide for stopping cars on the near side instead of on the far side of an intersecting street, and Mr. Beggs cited with approval the fact that several municipalities were at that time enacting ordinances providing for stops at the near crossing. An argument in favor of the near crossing is presented by a correspondent in this issue of the "Review", who speaks from the standpoint of a conductor, and believes that the "near stop" would be a remedy for the getting-off backward evil.

Mr. Beggs is satisfied that stopping on the near side of the street is best adapted to the conditions obtaining in his city, which is further evidence that there is one principle on which all street railway men can agree, to wit: "That local conditions differ." Whatever the conditions are in Milwaukee, and in smaller places, that make the near stop preferable, or a matter of indifference to the management, we believe that in the larger cities there are serious objections to the proposed change in rule 24.

In 1896 the Chicago city council passed a near stop ordinance with which the street railway companies promptly complied. The ordinance was repealed at the meeting of the council next following the date on which the change became effective, and, if our recollection is correct, was in force for less than two weeks. It was found that the change was not agreeable to passengers, who, leaving at the rear end of the cars, had to walk at least twenty feet farther through the slush and mud with which the streets were usually covered, in order to reach the crossing walk.

The most important objection, however, to the near stop was the increased number of accidents, both injuries to pedestrians and collisions with vehicles which could be attributed to the new rule. It was found that pedestrians and drivers of vehicles assumed that the cars would stop before crossing each street, and as no stop was made unless a passenger wished to alight, this assumption too often resulted in injury to persons or property; so often, in fact, that the ordinance was repealed.

GERMAN HIGH SPEED EXPERIMENTS.

Considerable interest is being taken in the experiments on the Berlin-Zossen military road in the operation of electric cars at very high speeds. The latest reports are that a speed of 125.8 miles has been attained, this being about $\frac{5}{8}$ of a mile higher than the fastest run previously made. The engineers announce that they feel confident of attaining a speed of 140 miles per hour. The engineers are reported as saying that they do not believe 125 miles will be practicable in regular service, but that they are prepared to recommend a speed of 93 miles per hour between Berlin and Hamburg.

It will be remembered that in the experiments conducted early in 1902 on the same road the highest speed attained was about 100 miles per hour, and at this speed the cars became very uncomfortable because of the side motion, and it was found necessary to repair the tracks at the conclusion of each run. Inasmuch as the speed has been greatly increased this year it is to be presumed that the difficulties formerly encountered have been obviated.

NO MUNICIPAL LINE FOR SAN FRANCISCO.

The citizens of San Francisco recently had the opportunity to try an experiment in the municipal ownership and operation of street railways, and we are gratified that the decision was in the negative, although the city had a narrow escape. San Francisco is a city of about 350,000 population with probably 75,000 voters, yet the total vote on the question of issuing bonds for the purchase of the Geary Street, Park & Ocean Railroad was but little in excess of 26,000, the affirmative vote being 14,481 and the negative 10,745. The proposition failed because a majority of two-thirds was required.

It is well known to all who read the returns of municipal elections that by far the greater number of electors as a rule will not vote upon the various questions which are from time to time submitted at general elections, but the fact that the advocates of

municipal ownership are few in number is more than offset by their pernicious activity. While heretofore radical action in the direction of municipal ownership of the so-called public utilities has been prevented because the laws under which the questions were submitted to popular vote have required that the number of affirmative votes be a majority of all the votes cast at the election, and not a majority merely of the votes on the particular proposition. This defense has now been broken down in various of our states, and unless some effectual means is devised for arousing the conservative elements of a community and bringing them to the polls, we predict that it will not be long before some American city is made to serve as a horrible example of how an incompetent municipal government can mismanage a street railway.

THE QUESTION BOX.

Elsewhere in this issue will be found a complete report of the convention of the Pennsylvania Street Railway Association held at Williamsport, Pa., September 23 and 24. An innovation in the proceedings of this convention was the introduction of a question box, which proved of very general interest and elicited considerable discussion. The question box was classified under six different heads, namely: Power House Department, Operation and Maintenance of Equipment, Track and Roadway Department, Bonding Department, Overhead Line Department and Management. Owing to the very large number of questions and answers received, want of space prevents us from giving the question box in full at this time and the remainder will be given in our next issue.

While the idea of a question box is by no means new, it has usually been of secondary importance where it has been adopted, but the prominence which it attained at the Williamsport convention points to possible important developments in this direction for future conventions. It certainly forms a convenient method of tabulating the experiences of different street railway companies, and the wide range from which this experience is gathered would, in many cases, make the information so obtained more valuable than a paper on the same subject expressing only an individual opinion. While many of the answers are very brief and lack considerably in details which might be desirable, this is perhaps largely due to the very large number of questions it contains. At the same time it must be remembered that street railway men as a rule are busy men who have but little time for the preparation of extensive papers, and by means of a question box many answers requiring but little or no time for their preparation would be received which, on the other hand, would not be elicited in the discussion of a paper.

The question box of the Pennsylvania Street Railway Association contains a great deal of practical information, and if this department is continued in the succeeding conventions of this association the question box will ultimately prove a valuable compendium of current practice in the various departments of street railway work.

COURTESY TO PATRONS.

It has come to be generally recognized that courtesy is one of the cheapest things available in the business world, though one is sometimes tempted to add—and one of the scarcest. We fear that too many of the electric interurban railways are, in the treatment of patrons, following a practice that was formerly considered as "standard" by many steam roads and which has been epitomized in a terse remark concerning the public which is usually attributed to the late Commodore Vanderbilt. An instance of useless and outrageous disregard of the rights, not to say sensibilities of passengers, by the employees of an electric railway in western Michigan has been brought to our notice recently. A gentleman had purchased tickets for himself and family and was standing on the sidewalk when the car arrived; being unable to carry his hand bag and at the same time assist his wife and children to board the car, the handbag was necessarily left on the sidewalk. The party being on board the conductor gave the starting signal and refused to hold the car the few seconds that would have enabled the man of the family to get his baggage. The forced the passenger, after accompanying his family to the junction point and transferring them, to return for his bag, causing a loss to him of three hours' time and the fare. To make matter worse complaint to the superintendent

elicited the response, "he guessed the conductor waited as long as he could."

Such treatment of patrons is evidence of poor discipline which in turn means poor management, and if continued is sure to result in a bitter feeling that will manifest itself in opposition to franchise renewals, verdicts for excessive damages, and the many other ways in which corporations are affected by adverse public sentiment.

THE SYRACUSE CONVENTION.

We print in this issue a complete report of the New York State Street Railway Association, which is one of the most successful and businesslike conventions which the association has ever held. Not only was a large number of important papers prepared, but the discussions on several topics showed evidence of careful preparation. One of the features of these conventions for several years past has been the annual address of the president, which summarized the history of the year's progress in all departments of street railway work. The large variety of subjects touched upon, as well as the diversity of subjects treated in the different papers, provided something of interest for every member present, and the excellent discussions on almost all of the topics introduced show the general interest and enthusiasm of the members in the work of the association.

The social features of the convention, while subordinate to the business meetings, were thoroughly enjoyed by the delegates and visitors. The banquet and excursions arranged by the entertainment committee provided a welcome relaxation between the long business sessions. The association is to be congratulated upon its businesslike methods and the excellent character of its proceedings, and the well-known ability and energy of its newly elected officers is a guarantee of the maintenance of the present high standard which this association has reached.

TAXATION OF STREET RAILWAYS.

It is admittedly difficult to determine an equitable basis for the taxation of public service corporations such as street railways, and the tendency to impose additional burdens upon these corporations in the way of taxation appears to be growing in spite of the fact that most of our street railroads are now bearing as heavy burdens in the way of taxation as they can be expected to carry. This fact was prominently brought out in the presidential address of Mr. G. Tracy Rogers at the Syracuse convention of the New York State Street Railway Association, in which are given some convincing figures relative to the street railways of New York state. These figures taken from the last annual report of the State Board of Railroad Commissioners show that for the year ending June 30, 1902, there were but 11 of the 99 operating roads in that state which paid dividends, three of these being in New York City. Of the eight other dividend-paying roads three showed deficits after so doing. The percentage of gross earnings paid by the railways of New York state during the year of 1902 was 5.2 per cent which would seem to be their full share of the tax, yet for several years these roads have been faced with a proposition to tax their mortgages. Should such a law be passed it would undoubtedly seriously affect the sale of these companies' securities and greatly retard the future development of street railways.

The same tendency towards excessive taxation of street railway corporations is noticeable in most other parts of the country and arises probably from a misconception of the earning capacities of these roads. There is undoubtedly a popular opinion among those not conversant with the subject that the operation of a street railway company results invariably in very large profits, but a glance at the financial statistics of street railways is sufficient to disprove this conception. It is a fact that while some of the roads in the largest cities exhibit large earnings it is only by careful and economical management that many other roads are maintained on a paying basis. It is, therefore, against public policy to burden street railways with more than a fair share of taxation, as such a course will inevitably retard their development, which, if uninterrupted, materially increases the assessed valuation of real estate wherever these roads are extended. It should also be remembered that whatever taxes are paid by the street railways are paid indirectly by the traveling public and to make such taxation excessive means that either the service of these corporations must be reduced or the rates of fare increased.

Street Railway Association of the State of New York.

Twenty-first Annual Meeting Held at the City Hall in the City of Syracuse, N. Y., October 6th and 7th, 1903.

The meeting was called to order by President G. Tracy Rogers of the Association at 10:35 a. m.

After the roll call, which showed about 125 representatives of members to be present, the mayor of Syracuse, Hon. Jay B. Kline, welcomed the association. The president then delivered his annual address, as follows:

Presidential Address.

Gentlemen: Nine years have passed since we met in annual convention in this, the "Central City" of the Empire State. The wonderful changes which we see in the street railway construction, equipment and service, and the cordial relations which I understand exist between the public, the city officials and the street railroad in this beautiful and thrifty city, fostered and solidified within that time, illustrate the results achieved by courage, capital, diplomacy and good management.

The year past has been one of general thrift and prosperity. This

is most fortunate, as otherwise the smaller and interurban roads

The enterprise of railroad extension must have the hearty co-operation and good will of the people along the route, as the short-sighted policy of placing obstacles in the way of street railway development, or of imposing serious restrictions and impracticable regulations for operation, will result in the abandonment of many projects from the completion of which the entire community would reap valuable and substantial benefits.

The most poorly constructed electric railroad, operated in the most shiftless way, would not willingly be dispensed with by the community which it serves, even inefficiently.

The electric railroad, if not seriously hampered, and with a fair amount of encouragement, is bound to progress, as it will give the best system of urban and interurban transportation that the world has ever known, therefore, its progress must not be retarded. Its growth should be carefully fostered, regulated and



DELEGATES, SUPPLYMEN AND VISITORS AT THE SYRACUSE CONVENTION.

would have suffered equally with the other factors of summer life whose prosperity has been injured by the unseasonable summer weather. The results for both have been most disastrous and are to be deplored. I wish to congratulate the roads of the state upon their handsome gain in gross receipts, made under the existing circumstances. The electric roads of the state continue to improve the conditions of life, and are a power for public benefit. They continue to work changes in the sociological, moral and financial growth, a factor in producing the present prosperous condition of our people.

I believe that the most liberal and fair-minded man realizes what we are doing, and to a degree understands the difficulties and appreciates the many obstacles which have to be overcome in our construction, operation and in every department of our work, also in our relations with the public. Wherever the rails of an electric railroad go, there follows increased population and prosperity, therefore, the people who build and operate these roads are entitled to a fair return upon their investments, and an adequate recompense for their services.

Any movement tending to hamper or obstruct the completion and extension of electric railroad transportation facilities is a serious menace to the general public good, the merchant, and especially the owner of real estate in outlying districts.

guided, but it should not be limited and circumscribed with useless restrictions and conditions.

The state of New York has been far behind many of the sister states in the construction of interurban electric railroads and until a comparatively recent date, inactivity in this particular has prevailed, but the present extensive, thorough and I must say perfect character of the interurban construction now under way, particularly in the central portion of our state, will soon place us foremost in the matter of electric interurban transportation facilities. The builders of the numerous roads recently constructed and now in process of construction, although tardy, will be able to take advantage of the experience and mistakes of others, thereby working out a material benefit which will redound to the traveling public as well as those investing in the properties.

Considerable attention is being paid to the light freight and local express business on interurban roads. I think this a desirable step, not only for profit, but because of the material assistance in developing the territory through which smaller roads operate. The interurban proposition today, in all of its departments, is worthy of our most careful thought and consideration. Its problems are still new, and contain many questions which must be worked out by careful thought and experience.

The evolution of equipment, track construction and the power

station; the development of power transmission; the introduction of the rotary converter; the third rail and the multiple unit system of control, have given great impetus to the interurban road.

What the steam turbine has in store for us remains to be seen, but from present indications, I judge that there is still another surprise for us through its introduction. No doubt the 500-volt system will remain standard for some years to come, especially for city systems, but we hope that in the near future, the inventor will solve the questions before us and introduce more economical power for use upon our interurban roads. It may be, that the next step in this great development of power will be the perfection of the present experimental use of the alternating current motor upon the cars.

I am informed that the inventor will have the alternating current motor in actual use within the year. I am also informed that this motor is constructed to operate with a direct current as well as an alternating current. This will be of great advantage to provincial cities operating both urban and interurban lines.

It is to be hoped that the American railway, mechanical and electrical associations will work out for us a system of standardization. There is nothing more important, or which deserves more thoughtful attention at this time than this question. While we are working to this end on our individual properties, a general standardization plan should be perfected, which would greatly cheapen maintenance and improve the practical operation, as well as assist in transporting our patrons with a greater degree of safety and economy.

I have each year called your attention to the fact that we are carrying the United States mail at a rate which does not pay actual expenses. It is to be hoped that the committee appointed by the American Street Railway Association will succeed in obtaining an increase in the rate.

It is often suggested by the public press that the street railroads are making a vast amount of money out of the streets, to the exclusion of the citizens who are being deprived of their rights, but these self same men are never ready to come forward with their money to invest in this character of valuable franchises. Some one must furnish the intelligence and the capital to improve the streets, which were primarily intended for transportation purposes. While the majority of the franchises of our state are perpetual, this title does not prevent an arbitrary and rigorous supervision of all details of construction and operation by the state railroad commission, or the local authorities.

I believe it to be of great benefit to any property to be in close touch with local officials, and if the securities are placed locally, the integrity of the enterprise is assured; thereby it will be much easier to obtain the local legislation absolutely necessary, insuring a more sympathetic co-operation of the public which we serve.

I am pleased to note that the once much mooted question of municipal ownership of street railroads is one which has been finally settled adversely in the minds of the American people. They full well appreciate what municipal ownership of street railroads would mean under our system of politics. The American citizen has learned that it is safest to keep the transportation facilities of our cities out of local political control.

In the greater city of New York, the street railways have progressed rapidly in the construction of the improvements indicated in my last address, but no new construction propositions of interest and importance have been advanced. The city is resting meantime awaiting the completion of the underground subway, and to determine its effect both upon the growth of the city at large and the present transportation facilities. It is to be regretted that the delays of the past year, caused by strikes and inability to procure machinery, will prevent the completion of this great improvement as early as anticipated.

The lease of the elevated lines to the subway operating company is another step in the line of consolidation of railroad interests which has been so noticeable during the past five years.

A subject which is of the greatest interest to cities, affecting especially at present those of the first class, and which will undoubtedly affect the other cities of the state, is the status of the law under which the public, upon paying a fare of 5 cents, demands a transfer as well as a re-transfer upon the lines of a system. The extent to which the net earnings are diminished by this obligation will at once be recognized as serious and militating against the best interests of street railways. Its effect is shown by the reduc-

tion of the average fare on roads in Manhattan Island to 3.40 cents and on roads in the Borough of Bronx and Westchester to 2.64 cents, and the evidence that 30 per cent of all payers of fare request a transfer ticket. While the issuance of transfer tickets, in my opinion, is of great value to the companies and undoubtedly increases their income the law under which transfers were first given has been so construed as to make it optional with a passenger as to what point and upon what lines he would ride, thus depriving the company of the exercise of the discretion which is vested in its board of directors to operate their road for the best interests of the public.

This condition, overburdening as it does some lines and preventing the distribution of traffic upon others, which reach substantially the same point of destination, rapidly wearing out the equipment, militates, in my opinion, strongly against the best interests of street railway companies and of the public itself.

While I am not prepared at this moment to recommend in what particulars a change should be made in the present methods, I am of the opinion that this paramount question of importance should receive our full and complete consideration.

The transportation facilities of the various railroads of the city of New York, as well as those of the other large cities of the state, were taxed beyond their capacity during the holiday season of last year. As an outgrowth of this condition of affairs, and in pursuance of the clamor of public and press, hearings were held by the state railroad commission at which numerous reform societies and individuals appeared and were heard, offering suggestions for relief and proposing ordinances or laws for facilitating transportation, some of which suggestions were partially feasible, others utterly impossible and impracticable. Later the congestion receded and the transportation situation resumed its normal condition, but not until the reform societies and individuals above referred to had studied the situation and discovered the many insurmountable embarrassments and obstacles which the managers of the various transportation companies daily encountered. There is no question as to the probable honest intent and purpose of the societies and individuals who seek to revolutionize transportation methods, but it is generally attempted with no knowledge of the true conditions of the situation as it exists, and uniformly without any experience, consequently unreasonable demands are made and impracticable suggestions for relief offered.

Legislation pertaining to street railroads, owing to the evolution and rapid growth and development of the business, occupies a prominent place in state legislative matters, therefore, it has become necessary to modify and amend somewhat the existing street railway laws enacted during the days of horse car operation, to properly meet the present day requirements of financing, construction, operation and maintenance of the great network of street railroads throughout the state of New York, also to afford proper protection to investors and adequate facilities for prospective development. Unfortunately there has been an apparent disposition on the part of the public and press, in certain quarters, to attack vigorously all legislative bills pertaining in any way to street railways or their operation; oftentimes without even inquiring into the merits, necessity or intent of the proposed law. This condition of affairs has developed until now the introduction of a street railroad measure in either branch of the state legislature is the signal for an unwarranted attack, arising, I think, from a misunderstanding or misinterpretation of the true text of the proposed measure, rather than from a desire to do the street railway interests of the state an irreparable injustice. Street railroads are entitled to the same consideration at the hands of the legislature as accorded to an individual, firm, or any other corporation, particularly in view of the fact that they are a prominent factor in the building up and broadening out of the territory through which they operate, and when they ask for legislation, special or general, their motives or honesty should not be impugned or questioned, at least until the proposed legislation is thoroughly investigated and understood.

The street surface railroad laws of the state of New York are at present in a somewhat chaotic and decidedly ambiguous condition, owing to the general character of a number of the most important sections which affect both steam and street railroads in a manner that it is almost impossible to draw the line of distinction. This is due to the fact that at the time the laws were enacted the steam railroad interests of the state were paramount, those of

the street surface railroads being entirely subordinate and not seriously affected by the laws, as they were governed largely and almost entirely by local municipal acts. It would be much more advantageous to all parties concerned, and prevent misunderstandings, misinterpretation and endless litigation if the street railroad laws were properly codified and made applicable to street railroads in plain, certain and decisive terms.

The street railway interests of the state of New York are large and rapidly growing. Millions upon millions of dollars are already invested in transportation enterprises by the public; millions more are required to complete the necessary growth and development, particularly the much needed interurban construction which is comparatively in its infancy in New York state. In order to interest capital in street railway enterprises, adequate, just and equitable protection is necessary and must be afforded by shaping laws, both local and state, to that end.

We, in asking for legislation, either local or state, make no mistake in frankly and clearly setting forth the necessity and reasons for the required legislation, as well as what we hope to accomplish thereby.

It is often the case that men elected to make our local and state laws have conceived the idea that it is their duty to oppose any request that we may make. Those very men, after careful observation and upon becoming more fully acquainted with the true situation, appreciate the difficulties that we experience and the struggles we are necessarily making to meet the requirements of the exacting public, and to build up the territory through which we operate.

We also make no mistakes in taking state or city officials and the public into our confidence, as we must have their co-operation. The evolution of the street railway from the tramway to the electric railway has been so rapid and startling that the public has become so suspicious and apprehensive that its rights will be imposed upon, that it is difficult to obtain necessary legislation to meet the changes.

The injustice of being denied the privilege of carrying negligence actions to the court of appeals is an unwarranted discrimination, without reason or justice. Legislation modifying the present law in this respect should be secured if possible. Last year I called your attention to the injustice of the present law whereby a negligence action can be brought any time within three years from the date of accident without giving notice. An effort was made again last winter (without success) to have the law amended, giving the individual and the corporation the same consideration that is now given municipalities, whereby notice is required of an accident. The association should again make a determined effort to have this law placed on the statute books, thereby to a degree stemming the tide of unjust speculative litigation, with which we are almost daily confronted.

I also call your attention to the condemnation law affecting our rights to condemn easements of abutting property owners in the streets of cities. I feel that this is an important question which merits your thoughtful consideration.

For a number of years we have been confronted in the legislature with a proposed mortgage tax bill, taxing our corporation mortgage. I consider it imperative to remind you of the disaster which would befall us in event the proposed law should be enacted. The street railroads are bearing, in the way of taxation, all the burdens that should be imposed upon them.

The percentage of net income paid in taxes by the street railways of the state as shown by the last annual report of the State Board of Railroad Commissioners, for the year ending June 30, 1902, was 35 per cent.—when the Ford franchise tax bill was passed it was 28 per cent. This percentage does not include the amount of the Ford franchise tax which was assessed for 1902, but not paid by the large companies for that year, they claiming the law to be unconstitutional, but the court of appeals has since declared it constitutional, and the amount assessed against these companies for that year must be paid and added to the above percentage, which will very materially increase the above rate.

Of the 99 operating roads of this state for that year, but eleven paid dividends, three of these being in New York City. Of the remaining eight dividend paying roads, three showed a deficit after so doing.

The percentage of gross earnings paid for taxes during the year 1902 for the maintenance of state, local and municipal government,

was 5.2 per cent. It would seem from the above figures that we are now paying our share of the tax. Should a law be passed taxing our mortgages, it would seriously affect the sale of our securities, which would result in retarding the future development of street railroads throughout our state, which development, if uninterrupted, would materially increase the assessed valuation of real estate to an extent which would largely offset the expected revenue to be derived by the enactment of a law taxing our mortgages.

I do not believe that the state of New York can afford to enact any law that will in any way thwart or retard the prospective great development of street railroads, particularly the interurban service.

It is time to enter an emphatic protest against the policy of imposing every year some new burden of taxation upon public service corporations for the purpose of reducing and ultimately abolishing the annual state tax levy. If the legislature is able to make reckless appropriations from a state treasury swollen by the tributes annually extorted from public service and other corporations, and still the members of the legislature can go back to their constituents with a reduced state tax levy, the people may be deceived for a time, but the policy is essentially vicious and must inevitably lead to ruinous results. Extravagance and corruption will be encouraged, and the sense of official responsibility for the expenditure of the people's money will be destroyed. Ultimately, the people will learn that excessive taxation distributes itself, and that every citizen must bear his share of the burden of public extravagance. If street railroad service is to be extended and improved, the people who travel and whose property is transported must ultimately pay for the extension and improvements. Rates of fare and freight must increase with increased burdens of taxation or else the public accommodations must be correspondingly reduced. Street railroad corporations are limited to their five cent fares, and they cannot maintain, improve and extend their railroads if their resources for such purposes are to be exhausted by increased taxation.

Even if all the state taxes should be paid by the corporation, the various municipalities would receive no direct benefit therefrom, and would inevitably seek to imitate the example of the state by demanding that corporations should also bear a larger proportion of the heavier burden of local taxation. The next step would be legislation requiring additional payment by public service corporations into treasuries, based on percentages of gross receipts or other similar devices, which would prevent all further extensions, betterments or improvements either of roadbed or equipment so earnestly desired by the public and demanded by the press, and in most instances would mean receiverships and the loss of savings invested by the public in street railroad securities. Such legislation would not interfere with state expenditures and would present a very seductive appearance to legislators, who would still be able to keep up the false pretense of reducing the taxes of their constituents while encouraging a more elaborate municipal expenditure.

I have called your attention to the unjust discrimination in the state franchise tax law, whereby we are taxed one per cent of our gross earnings and other public serving corporations pay but one-half of one per cent. An effort should be made to correct this injustice.

The committee on rules of this Association is to be congratulated upon its splendid work. No greater endorsement can be had than the action of the American Street Railway Association in adopting the code prepared by our committee without change. I understand that the committee is to report on the rules governing interurban service at this meeting.

The discussion at the recent meeting of the American Street Railway Association upon Mr. Vreeland's paper, "Right of Way," brought out some most excellent ideas, which I believe we should attempt to put into actual practice in this state. I think we should follow President Ely's example and request our respective school superintendents to set aside a few moments each week in instructing the children of our schools as to the rules of the highway. If that plan could be adopted, we would later on have people upon our streets familiar with the common rules and laws governing the use of the highway by pedestrians and drivers of vehicles. If people could be taught to cross the street at crossings, it would save a vast amount of time, also prevent confusion and accidents.

I understand that the accidents on the roads of this state are on the decrease. I believe this result is largely due to the fact that people are becoming used to the electric car and familiar with the

dangers, together with the greater experience of and the increased care taken by our motormen. An effort should be put forth, I believe, to have ordinances enacted, giving proper regulations to the passage over public ways and streets, and regulating the operation of trucks and other heavy vehicles as far as possible and practicable. Every facility should be afforded by the local authorities to regulate the use of the street and assist in promoting rapid transit. The question as to whether a car should stop on the near or far side of the street is being agitated to some extent. I believe that stopping cars on the near side, in cities where the streets are paved, would be a great saving in time and accidents.

The pleasant relations existing between the employers and employees of the roads of this state is a matter of congratulation. This situation is largely due to the application and practice of the sentiments expressed at these meetings, and the encouraging and assisting of the mutual benefit associations, and in maintaining the club and reading rooms connected with our roads. It is our duty to make the life and lot of our employes as comfortable as possible—we should go out of our way to do this, also showing true personal interest in their future welfare, and if possible assist them to better their position in life, thereby creating a sympathetic and harmonious co-operation as well as loyalty to the service and faithfulness in the performance of their duties.

Proper discipline promotes manliness and candor. Just and considerate discipline cannot help but command the respect of employees. Courtesy and civility on the part of the employees to the public will make the road popular and will tend to eliminate the annoying occurrences which often arise between them and the exacting public, and thereby reflecting credit upon the management.

The success of the management of a road is largely in having loyal, enthusiastic and efficient co-workers in all departments, and it is the duty of the management to encourage breadth of thought and personal interest in all employees, thus broadening the ideas and interest of the co-worker and teaching him to think. The more closely we can have employees identified with the development and prosperity of the roads, the more efficient and ambitious they will be to rise from the ranks. To every such employe a helping hand should be extended.

The plan so successfully worked out by the steam railroads, through their R. R. Y. M. C. A., is a plan well worthy of our consideration. A suggestion has been made that the steam and electric railroads work together in this laudable departure.

The large attendance of supply men at these meetings is most gratifying, as they always add interest to the occasion. The annual meeting with the men with whom we deal, and the pleasant interchange of social relations must necessarily prove of benefit to the interests we both represent.

I feel that the Association is greatly indebted to the supply men and representatives of the press, who have for years attended our state conventions. For a number of years they were an important factor in keeping the Association together. It was largely through their efforts that new members were induced to join. Nine years ago, in this city, when I was honored by being elected your president, there were but twelve street railway men present, outside of the local representation, and at Rochester the year preceding, but eleven. At Rochester there were twenty-seven supply men and representatives of the press in attendance, and at Syracuse thirty-three. The purpose of the meetings at that time seemed to be to spend a few hours in pleasure seeking, the actual business of the Association being of secondary importance.

I cannot refrain from alluding to the great changes which have been brought about in the growth and usefulness of this Association, which are due to the hearty interest taken in its future and usefulness by all its members and officers. I have had occasion to call upon you many times and have always found you ready to respond promptly and with hearty interest in the work required. I have but to refer to the printed reports of our meetings to show the influence and benefit to the great interests in this state which we represent. I feel that the good this Association can do is but just begun, and when, not long ago, one hour was all that was required to perform the business of the convention, the full day and one-half is now insufficient to perform the work of the Association and discuss the many questions of importance to us all which are brought up for consideration.

At one time it was very difficult to obtain papers to be presented

and still more difficult to provoke a frank discussion on them. Now the time allowed is insufficient.

I feel it my duty to call your attention to the splendid work of the executive committee; these men representing large interests and having great responsibilities, have always been ready to spend their time and money, and to travel across the state in the interest of the Association.

In closing, I bespeak an even wider and more important work for the Association in the future, which result can only be attained by a continuance of the same hearty support and co-operation of the individual members accorded the officials and executive committee in the past. The Association has demonstrated that it is an important factor in the development and protection of the business interests which we represent, and its usefulness should be increased and perpetuated.

After the reading of the reports of the secretary and treasurer, Mr. Duffy read his paper on "Transfers, Their Use and Abuse."

Transfers—Their Use and Abuse.

BY JOHN E. DUFFY, SYRACUSE, N. Y.

When asked by the president of this association to prepare a paper to be read at this convention upon "Transfers—Their Use and Abuse," I hesitated in giving consent, feeling that this subject, of so much importance, should be dealt with by someone with a wider experience than is to be found in the city of Syracuse; and, in presenting this paper, no claim is made that the conditions enumerated and met with in this city are applicable to any other locality, but, as to the general laws governing the right of passengers to ride between any two points in a city in this state, where a line has received a franchise under the laws of 1884, or the railroad laws now existing, a discussion of the general practice cannot help but prove to be useful and beneficial. It is not always possible to give all passengers a continuous ride covering all points of the compass in every city or village and, therefore, the use of the transfer ticket has come into existence. Whenever it is possible, it should be the duty of the manager in routing the lines to so arrange them that as large a percentage of its patrons should have the benefit of a continuous passage as is possible from the standpoint of economical operation.

There is, perhaps, no part of the successful operation of a street railway that has caused the management more thought and worry than the adoption of a transfer system that would prove satisfactory to its patrons and not leave loopholes that could be taken advantage of by those who think it is no sin to beat a corporation. It may be disputed that the giving of transfers by railway companies to complete a passenger's journey from one point to another point on its system has not proven beneficial but, in a large majority of cases, the adoption of such a system has been highly beneficial to the receipts of the company adopting it and to such a large extent that most of the street railways of this state, and generally throughout the United States, have, from year to year, extended such privileges very liberally and the management of one of the largest systems in this country has stated that in its opinion there is nothing, since the adoption of electric traction as motive power, that has done more to increase its receipts than the giving of transfers.

Riding on the street cars in cities of moderate size is a habit to be acquired and the more attractive the habit can be made the larger proportions it will assume, and managers are today providing parks, pleasure resorts, summer theaters, beautiful cars and everything that will tend to stimulate travel and attract passengers, and the transfer is one of the reasonable privileges that companies intend to give their patrons and only trying to provide that the passenger shall not be permitted to ride back toward the starting point of his trip for a single fare.

The transfer, under legal requirements and from the standpoint of the company presenting it, is not intended to be a "stop over" ticket but to be used for a continuous passage from one point to another point on its lines, not reached by the car on which the passenger's journey began and it is only proper that reasonable rules for its use may be made and it is too often, in trying to enforce such rules, the manager finds that, regardless of the thought and energy

expended in perfecting the system of transfers, it is more perfect in theory than in practice; but, as attraction of passengers to your cars is the first consideration, the impositions practiced on the part of the public are put up with.

The ideal system of transferring is the station where all cars would pass through, and which would prohibit a large number of the general abuses that are now practiced. This is impracticable in a large majority of cases so that the street transferring is the one in general use. It is sometimes a problem to provide for the congestion that this causes at more important points of transfer, and especially is this true in the large cities at what are known as the rush hours, but as the transportation of passengers is the business of a railway company, this is generally taken care of successfully, and here it might be added that one of the troublesome questions that presents itself is the collecting of the fares on the large cars that are constantly being added to the service of all roads. With the collection of cash fares, making change, etc., the transfer ticket should be simplified so that the conductor can see at a glance what it is. Do not make it so complicated that his examining it to see that it is good takes up so much time that he will lose three or four fares that he might have collected while looking at the transfer. Have all of the spaces that are to be punched and looked at as large as can be. The daily dated transfer has done much in this respect and different colors for different directions is another change to be commended.

The registration or nonregistration of transfers is a debatable question and one on which all managers do not agree.

One of the most general forms of abuse practiced by passengers is the over staying of the time limit and when they intentionally do so invariably claim that the transfer has been received within the proper time and that conductor, who issued the same, punched it improperly.

Another is that the people living between parallel lines coming toward the center of the city, come in on one line, get a transfer back on the other line, stop over and do their shopping, returning home for a single fare.

Another is the abuse by clerks and others returning from meals, by obtaining a transfer to the line on which their brother clerk rides and he, in turn, coming back obtaining a transfer for use of the succeeding clerk. This is practiced in some places.

Another is the obtaining of transfers by passengers, who have no use for them, and the giving of them to newsboys or saloons and they, in turn, distributing them to persons who are not entitled to their use.

The liberal giving of transfers has, to a very large extent, aided in increasing the business of the system with which the writer is connected. The lines of this company may be compared to the spokes of a wheel, radiating out from a common center to all points of the compass and a large number of the lines parallel each other for long distances or converge together at the outer ends, and, in other cases, start from the same point at outer extremities and come together again at the common center. In some cases it has been necessary to prevent abuse to make closed lines of them as far as the use of the transfer is concerned. In other cases it has been necessary to make the last junction point the transfer point, instead of the first point of intersection as is commonly the case; but, it is possible for a passenger to go from any one point in the city to a point distant in any other part of the city for a single fare.

The Stedman time limit is used and is lived up to as close as possible, although great care is taken before ejecting a passenger from the car on account of nonpayment of fare, because the time limit on transfer has expired, on account of the liability of error of the issuing conductor, which, in one or two instances, was proved on trial of cases brought against the company to be the case; and, here it might be said that there is a wide difference of opinion amongst passengers as to the time limit on the transfer being of any account, claiming that the transfer is good any time within the 24 hours in which it was issued and this causes a great number of disputes between passengers and conductors.

On account of the size of our road, conductors punch the date on the transfer, and we have found that there is a liability of error in this way. Conductors are required to place the transfers collected on each trip in an envelope and deposit such envelope in a box provided for that purpose at the common center where all cars pass. Collections of the envelopes through the day are made

at regular intervals and are turned in to the auditing department to be checked by clerks, whose duty this is, with the trip card of conductor to show that the number called for by the trip card has been turned in. They are also checked for sequence of time to show that conductors have issued them properly according to serial number. All spoiled and unused transfers are turned in at the close of the day's work with their cash to the receiver. Transfers short in envelope, punched wrong date, or no date, are charged to the conductor, the same as register shortage. All other errors in punching of transfer are called to the conductor's attention.

Transfers are registered on single registers the same as cash fares, on double registers transfers are registered on one side and cash fares and tickets on the other side.

It is shown by our reports that one passenger in five, who rides, rides upon a transfer. This is a yearly average.

The trafficking in transfers by employees is a trouble that we have not experienced to a very great extent and gross abuses of transfer privileges are generally called to the attention of the officials of the company by the conductors to be remedied where possible.

In conclusion, it may be said that the transfer is here to stay and companies, while desiring to be as liberal as is consistent with good business policy, must adopt such measures as will prevent them from being imposed upon too generally as has happened in several cases, notably, the systematic robbing practiced by conductors and accomplices in some of the large cities, the forging of tickets, as practiced in another city, and must ever keep a watchful eye on this important branch of their business; as the volume increases new difficulties will be met with by those in charge and must be handled according to the local conditions that present themselves. The public know that they are entitled to certain privileges after they have paid a fare but are hard to satisfy as to how far those privileges extend, some believing that the laws are all made to fit their side of the case, that the corporations have no right to restrict those privileges in any way, that they can ask for a transfer at any time throughout their trip, get off at any place they desire, stay as long as they want to and then board any car that comes along and be carried to their destination; and, on the part of the railway companies there does not seem to be any concerted effort to find out how far the laws fit their side of the case, but go on from year to year satisfied because their business has increased and hoping that the public will be contented; but experience has shown that regardless of how much is given, they will still ask for more and rail at the hard-heartedness of corporations if they do not get it.

Discussion of Mr. Duffy's Paper.

Mr. Rockwell: There is one part of that paper that I would like to take exception to, and that is the statement that the transfer has come to stay. I would like to see it abolished altogether. It is the most burdensome thing that has been imposed upon railroad companies. I would rather give the passengers a four-cent fare, and abolish the transfers altogether. They do it in Philadelphia, and I do not know why it cannot be done in other places.

Mr. Cole: In the last Census Bulletin I think it is stated that the use of transfers during the last year has increased about 20 per cent. This is especially true in cities of the third class. In Elmira the demand for transfers is greater than in any city of its size. Every other passenger calls for a transfer; 50 per cent of the travel upon the road is upon transfers. I think one point that might be brought up is the consideration of a standard method throughout the state in the use and handling of transfers, in order to educate the public up to their proper use. Today there are hardly any two roads using similar transfer-punching systems or having transfers that look at all alike, so that the people in using them do not know how to look at them to see whether they are punched right or not; and one of the sources of complaints from the public is from the fact that they claim that the transfers have not been issued properly, and it has been the occasion of several lawsuits.

As to the use of transfers, looking over cities of the third class that have put it into effect, I think there is no question but that it has effected an increase of riding in those cities. Take our own city, for instance. A few years ago there was very little transfer riding done in the city, but after the consolidation of all the lines there was inaugurated a general transfer system, and it had the effect largely to increase our receipts—about 22 per cent for that

one year. So I do not think the transfer is entirely an evil. The evil comes from the abuse and improper handling of it. If the misuse of transfers could be done away with I think there is no question that their use would lead up to a great increase in our receipts.

Mr. Nicholl: The experience of the reader of the paper in Syracuse is very much the same as we have had in Rochester. I would very gladly, in some respects, do away with the transfer altogether, and accept cheaper fare. But I do not believe that would quite remedy matters. As bearing on our earnings, I really think that the transfer is a great thing, and that the liberal use of transfers will increase our receipts. We have to educate the people, especially in a city of the layout of Rochester, where it is very easy to walk anywhere and find the center, and I presume the same thing is true in Syracuse; and in such cases I think we want to make it as easy as possible for people to ride. In our city the increase has not been very great in the use of transfers. It has kept at about 30 per cent, I think, ever since the use of transfers was adopted.

I am very much in favor of what Mr. Cole says, that there should be some action taken in the way of standardizing transfers, although I can see many difficulties which would come up in that respect, because all cities are not laid out the same and would require different forms of transfers. But at the same time I think there might be something done to educate the people to the use of a certain form of transfer, so that there would be no mistake, and a conductor going from one road to another would understand it easily without receiving fresh instructions. I do not know whether it is a subject that is worthy of the appointment of a committee for its consideration. I think the convention cannot do better than to take some action in that line.

Mr. Mitten, Buffalo: I hardly think we can look for the doing away of the transfer system, because in the way that lines are laid out and built in cities of the size of ours it would create a clamor for the different operation of the lines and such a change as to make the expense of operation very much greater on cross-town lines or lines which do not directly reach the center of the city, or with the majority of the passengers it would become very unpopular. The residences on cross-town lines would be hard to rent, for the reason that the people would be obliged to pay two fares to get to or from their homes; so that we would find a condition of quite high rents in localities reached with one fare, and houses going begging on the lines where two fares were demanded. That would be against the interest of the railway company.

We now endeavor in Buffalo to use the transfers as a method of building up the newer districts, and as soon as the volume of transfer passengers becomes great enough we endeavor to run such lines of cars directly to the center of the city. In the newer districts we have the tracks; we have our investment. If we should cut out the transfer system it would be a great many years before those districts became paying portions of our system.

Personally I believe in the transfer to an extent, and where there is the issue of a transfer upon a transfer, if that is confined to pleasure travel, I do not think its effect upon the earnings will become very detrimental. If your passenger leaves his home and can go to his place of business or his objective point, and by the paying of one fare can procure a transfer which will take him on the return trip, then, of course, you have lost a fare. But with us, where belt lines are becoming quite popular, if our passenger in an effort to beat the company leaves his home to go to an outlying district and rides around a belt line, taking a transfer and riding the entire distance around it and transfers home, he is getting a pleasure ride; he is acquiring the habit, and we have his five cents. I do not think we lose in those cases. While the transfer is not an unmixed blessing, I think it can be used to our advantage.

Mr. Rockwell: I am perfectly willing to agree with all that the gentleman says in regard to building up suburban property through the use of transfers. But let us look into the matter a little farther. When I suggested making a universal four-cent fare I did not mean that you should charge four cents for your average riders. Each fare would remain the same five-cent fare; but I should use something similar to that used in Philadelphia, which is the interchangeable or exchange ticket. That exchange ticket

becomes practically a transfer. The passenger pays one fare. In going to work in the morning he buys an exchange ticket, paying, we will say, for example, eight cents, as it is in Philadelphia; you can make it six if you want to. He pays six cents and receives an exchange ticket, and that exchange ticket is good for a transfer if he wants to use it that day. Fifty per cent, I think it is safe to say, of the regular riders in Philadelphia do not want a transfer; they do not want to go on another line, but they go on and buy the exchange ticket just the same, and that ticket is good at any time on any line, just the same as though bought from the ticket office. He accumulates those tickets. Every time he gets on, if he has not an exchange ticket in his pocket he buys one, and he accumulates them in that way; and then when he wants to ride again, if he does not happen to have an exchange ticket he pays his fare. If the people on a certain line were opposed to an eight-cent fare, there are many places where there are short distance riders where a six-cent fare would be advisable. Paying it every time that a passenger rides back and forth to his work it might be a burden, perhaps; but he rides at other times, and if he gets the benefit at some time later in another direction he begins to see it after a while. If you can obliterate the transfer I am satisfied that you are going to increase your gross receipts, provided it does not do the harm which Mr. Mitten suggests to suburban property. I admit that is an important point. But I do not see why it cannot be worked out. Local conditions have always got to be taken into consideration. The same rule would not apply in Rochester and in Buffalo and in New York. The local conditions have to be always worked out by the local management, and each can work out a transfer system of his own in the shape of an exchange. There isn't any system but what it can be used on.

Mr. Cole: In New York City nearly every transfer that is granted today contains a clause that passengers shall be carried upon it within the city limits. There are very few cities where it would be possible to issue a ticket for six cents, making the additional charge.

I would like to ask in regard to ringing up transfers—whether they find that they have any difficulty or greater loss in ringing transfers up than those who do not ring them up. I think that is a point that is of considerable interest in handling transfers.

In answer it was stated that transfers were rung up in Buffalo and in Rochester, but not in New York City and Utica.

Mr. Cole: I would like to ask if there is any trouble through not ringing up transfers? Suppose a conductor has twenty passengers on and has five transfers, and he should only ring up fifteen fares while he has twenty passengers on; how can your inspector tell which are cash fares and which are transfers?

Mr. Rockwell: That subject was brought up in Brooklyn, and it was considered unadvisable to ring up transfers, because they are not worth a nickel. The object was to make a transfer a worthless piece of paper.

Mr. Root: As far as that particular point affects the railroads in New York, our system is simply this: Our detective force which keeps track of conductors are instructed to pay no attention to the comparative number of people in the cars and the number on the register. Any one familiar with New York and the conditions under which we operate will know the number of short rides we have and will immediately recognize the impossibility of trying to reconcile the number of people recorded on the register and the number of people in the car. It is not at all an unusual occurrence to have a car on Broadway start at Bowling Green and go up to Wall St. and have 25 on the register and only have five in the car, the distance from the Bowling Green to Wall St. being probably half a mile. And that condition, to not so exaggerated an extent, prevails all over New York, or at least the island of Manhattan; so that with very few exceptions on isolated portions of the road it is impossible to reconcile the number of fares on the clock with the number of passengers on the car. For that reason it is absolutely immaterial to us as to whether transfers are rung up. Like a great many others, we are very strongly against the ringing up of transfers. We have followed the matter very closely in all its relations, and we do not consider that the company is defrauded to any material extent in the use of the transfer system. I might add that we are using now on the average about 550,000 transfers a day.

Mr. J. P. E. Clark: I think that a very important point bearing

upon the question of whether transfers are a good thing in connection with the operation of a railroad, particularly in the smaller cities, is their use in connection with pleasure resorts. In Binghamton we have had a practical experience both ways. Our franchises are of such early date that we are not by them required to issue transfers. For a number of years we operated without transfers. In the meantime we established pleasure resorts in connection with our lines, which are a very prominent factor in our earnings, particularly during the summer months. We found that it was an absolute necessity to issue transfers in order properly to maintain the resorts. There was an unjust discrimination arising in this respect; parties might live possibly a mile from the resort and be obliged to use two lines, and to be charged 10 cents (or, if you please, six or eight cents, as some gentleman has suggested) immediately led them to believe that it was for their best interest to stay at home. Therefore we have found that the issuance of transfers in Binghamton has stimulated our traffic, particularly during the summer months, from 20 to 30 per cent, and we do not believe that we could maintain or operate the two pleasure resorts that are controlled and operated by the Binghamton Railroad Co. were it not for the transfer system. That the privilege is abused frequently and repeatedly there is no question. The only thing we can do is to keep the closest watch possible. I quite agree with Mr. Cole and Mr. Nicholl that if a standard form could be agreed upon it would be advantageous to the railroads, but I firmly believe that the transfer is one of the modern street car conveniences that the public has a right to expect and that the roads in their own interest should maintain.

Mr. Allen: In Utica (it being a very small town) we do not register the transfer; we treat it as of no value. To reply directly to Mr. Cole. The inspector's duty is to tell what happens on a car; not to make any comparison at all of the condition of the register with the number of passengers, except to tell what the condition of that register is and what passengers are on the car. We take the transfers from the conductor each trip. Of course, he has his envelope in which he encloses his transfers, and in comparing the conductor's statement the inspector's statement must be taken into account.

We are firm believers in transfers. We do everything we possibly can to urge the people to use them. We have increased our receipts very materially since the use of transfers has been inaugurated upon the system. I would like to ask if there is a member of this association who has tried the use of transfers who would now withdraw them if he could?

The President: There seems to be no response. I will ask Mr. Allen one question. You told me recently of a few years ago having four-cent fares. Have you now four-cent fares on the road?

Mr. Allen: We had until recently a nickel fare, but we placed on sale six tickets for a quarter on Dec. 1, 1902.

The President: I would ask, before we close this discussion, what is the custom in Philadelphia?

Mr. Root: Merely in a general way I know there are some lines on which they give a transfer for five cents, but on the majority of lines they have what has been described as exchange tickets and charge eight cents, the ticket being good at any time. It may be of some interest, although a little aside from the question, to know that the Interurban Street Railway Co. of New York about six or eight months ago obtained a very satisfactory contract with an advertising concern for advertising on the back of transfer tickets. This is a matter which I know has been taken up in a great many cities and has been, as far as I have been able to find out, successfully carried out. But we have a contract now which more than pays us for the price of the tickets, which is quite material where the number runs up to two hundred millions per annum. And it has a secondary value, in that it makes it much more difficult—practically impossible—for the tickets to be duplicated by any outside parties, as has occurred, for instance, in Boston. No ticket is got up that cannot be duplicated; but with the advertising matter on the back of it it is made very difficult, because no one knows until the ticket is presented for that day what the advertising is to be, as it is changed every day.

The next paper was:

The Physical Examination from the Physician's Standpoint.

BY DR. J. J. MOOREHEAD, NEW YORK CITY.

From present indications it requires no prophet to predict that the profits of a street railway company will soon cease to be based on the number of passengers carried and the operating expenses, but instead be counted by the number of accidents occurring and the amount that the legal and claim departments require to pay in adjusting them. Every large city seems to be an epidemic center for the development of the claimant bacillus, and like most germs of that sort, many are infected by contact therewith, and none become better until he takes the gold cure dispensed by the treasurer's department. These conditions have made necessary the establishing of a medical examining department; and it is of this that I wish to say a few words that may seem to justify its existence.

In determining the value of what we may call the "physical investigation" of the claimant, the surgeon is called upon to answer three main questions, namely:

1. Could the accident, as described, reasonably cause the effects complained of?
2. Are these effects actually present?
3. If they are present, will they be temporary or permanent?

In confirming or refuting what is claimed, he is guided by visible or objective symptoms and by subjective or invisible symptoms. His task is comparatively easy if all the ills are of the former class, but if to a simple scalp wound are added the symptoms of ringing in ears, dizziness, spots before the eyes, or a host of other subjective signs, then is his labor of a different kind. This suggests the question as to the advisability of an examination, where the effects of an accident are evident, and where a visit from a surgeon would exaggerate the claimant's already great self-importance and induce him to add to his ills. This query would readily be answered if all claimants were honest, and if objective and subjective symptoms were not closely allied, and if the element of exaggeration were not present in nearly 80 per cent of the cases we are called upon to diagnose. If a man in a brawl or in falling down stairs receives a battered face and a black eye he will probably return to work next day; but if the same injuries be received in a fall from a car he immediately goes to bed, and when examined a week later two physicians are in attendance, his head is swathed in bandages and a trained nurse is keeping the ice bags replenished to aid the medical men in their diagnosis of "threatened meningitis following concussion of the brain."

In a general way we can divide all claimants into three classes, to wit: Honest, partly honest, and shamers. The first class is rare enough to demand a special note in the making of a report; the second, the most numerous and the hardest of properly estimating, and the third often demand a searching scrutiny that resolves itself into an effort on the part of the examiner to get the claimant off his guard and thus fail to maintain a symptom hitherto well mimicked.

It may be of interest to cite a few of the commoner complaints and show how readily some of them are disposed of.

The most familiar of all alleged effects from railroad accidents are those under the general caption of "nervous prostration," "railroad spine," or "neurasthenia." Such a claimant rarely presents greater objective signs than a small discoloration on his back, but what he lacks in outward manifestations he makes up in subjective signs. There is no ill in medical lore they have failed to inherit; they cannot eat and cannot sleep; they have no memory; and, to use their own terms, they are "mental and physical wrecks." On examination they appear generally in good health, and their memory is so apt that the minutest detail connected with the happening and sequence of the accident is readily recalled, and they act out precisely how they fell, and all this despite their assertion that memory and muscular power are bygone things. Of all the cases the surgeon examines these are the hardest, and his opinion is most guarded concerning them. Frequently they are complicated by asserted paralysis of a limb, and you find your claimant in bed at the time of your call, and you are told that no power exists to rise therefrom. This occurred not long ago in a collision case, and the injured woman was surrounded by the usual sympathisers who

cheerfully told her she was crippled for life. There was a suspicious resistance in the paralyzed leg during the manipulation and it readily remained in the position it was placed, even when suspended above the bedding; suffice it to say that this woman got out of bed and stood alone before the examination ended.

Deafness is frequently consequent upon a blow on the head, according to many claimants, but the majority of these cases have been hard of hearing for years. In two recent cases the removal of a piece of ear wax brought about a marked change; another showed a hole in the ear drum that followed the child's recent attack of measles, and of course it had nothing to do with the accident.

Internal injuries are frequently asserted, especially in women, and this term is designed to cover anything from dyspepsia to a ruptured spleen.

Floating kidney comes under this class; and a woman from out of town said her right kidney was displaced six inches owing to a fall as she was about to get on a car; her physician made the diagnosis for her because she had a bruise on the right side of her abdomen, but he forgot to examine the opposite kidney, which was even more movable; and also neglected to lay the blame on a recent long illness which had caused marked loss of flesh.

Within three months three cases of appendicitis have been traced to car accidents by the attending doctors because the abdomen in each case was slightly bruised. Injury is the rarest of all the causes for such a condition, and in two of the cases which were operated upon, an inspection of the appendix showed that it had been inflamed for years.

Tumors and various enlargements are favorite claims, birthmarks even being foisted on the unsuspecting examiner. This was well shown last spring in the supreme court, where a very reputable physician supported a veracious plaintiff in her claim that an enlargement on the back of her neck was due to a "fatty tumor" following a sprain and bruise of the neck. The examination made a few months previously had disclosed a bony enlargement such as we all have in about the location where a man buttons the back of his collar. This was pointed out to the jury, and each salesman felt his own neck and brought in a verdict for the company. Many times the swelling over the "Adam's apple" (technically known as goitre) has been said to follow a bruise in this region, but this is readily proved due to other causes.

Ruptures frequently follow our accidents, if all the claims regarding them are to be believed. As against this is the experience of many competent physicians that such effects occur only in those having a tendency thereto, and do not result, therefore, directly from a fall or a blow. One case is recalled following a collision, in which a large rupture was claimed, but this individual had worn a truss so long that his skin was shiny by the friction produced.

Disabled joints, especially the shoulder, constitute a large share of alleged effects. These individuals will many times forget their part when suddenly asked to remove or replace their clothing, and in so doing widely move the part supposed to be immovable. Not long ago a woman on the witness stand claimed inability to move her right thumb, and she kept up the deception before the judge and jury until she had her attention riveted, and she was then asked to remove the glove from the other hand, and in so doing she moved the alleged stiff thumb.

Fractures are exceedingly common and are frequently hard to diagnose, especially if they are not seen until several weeks after they are received, a plaster of paris cast having meanwhile been employed, causing a stiff joint. In such cases we have found the recent installation of an X-ray apparatus of extreme value and predict that certain doctors well known to us will have fewer cases of this sort and more sprains and contusions when they learn that their schemes can be literally seen through. It is our practice to allow the claimant to view the examiner's hand first and then his own, with the double object of showing how plainly the bones are outlined and also relieving him of any fear. With the machine employed as stated, accidental burns never occur and an opinion of the gravity of a case can be instantly formed. Its value was recently shown in a case where the attending surgeons had set a fracture and dislocation about the elbow and in which they expected a speedy recovery. An examination of a fraction of a minute with the ray showed that the fracture had been set poorly, and that the dislocation had not been set at all. There was still greater swelling about the parts and little handling could be attempted, and the

diagnosis was made without removing the bandages. A bad outcome was predicted in our report; and the physicians have recently stated that this man was operated upon in West Virginia because the "dislocation slipped out of place," as they put it, and another operation is to be attempted within a few days in a New York hospital.

These are some of the more frequent sequences alleged that would result in large damages were they incapable of medical disproof. That many cases are defeated on medical testimony alone is also true, and we have recently had two experiences illustrating this very forcibly. In one instance paralysis of half the body, with convulsions and loss of memory, was alleged as a result of being struck by a car. The claimant presented a sorry appearance, and there was no question of some of his symptoms. Suspicion, however, was in some way aroused, and it was learned that he had been in a certain hospital prior to the alleged accident. On investigation we soon learned that he was a well-known clinical exhibit and had been used by many professors for the past decade to exhibit the very symptoms he now manifested to the court and jury. When some of these professors appeared in court as our witnesses, he suddenly pleaded illness and hurriedly left the court and has not been heard of since. His injury was not due to the accident on our lines, but occurred fifteen years ago in the New York Central freight yards, where he fell from a car. In the other case a verdict of \$7,700 had been rendered for the death of a man six months after the receipt of a compound fracture of the wrist which had practically healed two months before his demise. His doctors claimed that his sudden death was due to an abscess of the brain from the original injury, and they performed an autopsy to prove their contention. We contended that this brain condition was due to a long standing ear disease and showed that 80 per cent of such abscesses follow such ear troubles. On appeal, the presiding justice reversed the verdict on the medical testimony alone, and his opinion analyses the expert testimony with skill that would excel that of many a physician.

So much then for the physician in his effort to present exact conditions medically to the claim agent leading to the adjustment of the case and in his testimony at the trial of these actions.

But aside from what value he may possess in his detection of the shammer and the exaggerator, there is what might be termed the moral function exerted alike over claimant or his physician or attorney. The time is not far distant when some method will be demanded to curb the growing tendency to make minor accidents an excuse for the legal blackmail now so universally levied on street railway companies. Let it become known that the company insists on a rigid physical investigation of every case, then it is not too much to predict that many of these cases will fail of their own accord. A claimant will not hesitate to furnish a long list of witnesses to support his version of the occurrence, but he hesitates at submitting his alleged numerous infirmities to a doubting examining surgeon. The verbose attorney's bill of particulars, rich in such phrasing as "Sick, sore and disabled, and has been and will be subject to much pain and suffering for a long time, if not permanently," will dwindle into less roundabout terms if he knows a medical examination will disprove his statements; and the member of my own profession who knowingly calls a simple sprain a severe fracture will be more cautious of his moral and professional standing when he learns that an X-ray is to dispute him and that a plaster of paris splint cannot cloak even so bold an attempt at deception.

It is perhaps too ideal to hope that one day there will be what may be termed a medical jury to pass on cases of the sort we are all so familiar with. Such a jury within a very few moments could verify or nullify the alleged symptoms, and their decision as to the medical merits of a case would make unnecessary the unseemly contentions of so-called experts who usually succeed in baffling rather than aiding a jury of the laity. Much valuable time would be saved to all concerned and the hopeless congestion of the courts would be much relieved and more equitable justice dispensed.

There is also another feature of the surgeon's relations to his company, and one that is not always taken at its full value, namely, his knowledge of his own profession and his acquaintance among them. It is our practice to index the various physicians we meet and in this way we soon learn their bias or fairness. An honest physician with an honest claimant meets the company more than

half way, and an amicable adjustment results minus the interference of the ambulance-chasing legal light. A scheming physician may seek to distort and exaggerate his patient's illness prior to the examination, but at the bedside he knows that every statement needs ocular proof. Strange as it may seem, he will not hesitate to stretch his moral fibre, but he balks in the presence of another doctor when called upon to swear falsely regarding medical axioms.

There is an auxiliary branch of the medical investigation almost as important as the physical examination, namely, the seeking of what we term the hospital record. As soon as possible after an accident one of our staff appears at the hospital and obtains the ambulance or accident ward diagnosis, the disposition of the case, and the attending doctor's name. The latter is then interviewed, and from him the exact nature of the injuries learned, with their possible outcome. Any statement made by the patient as to how he was injured is also learned, as is also his condition regarding alcoholism. In this manner we are able to obtain information at first hand from trained observers who are generally alert for the malingerer. In very many cases facts obtained from these hospital doctors have won cases that otherwise would have resulted in large verdicts. Incidentally our acquaintance professionally is much enlarged, as in the ten hospitals of our city maintaining ambulances for emergency work there are seventy-eight doctors who are well known to us, twenty-six of whom leave the hospital each year, many of them remaining in the city. A special address book is kept and any of these hospital men can be located, even though some of them are at the present moment in Beirut, Pekin, Paris and Honolulu.

That the medical examination has a legitimate place in the investigation of nearly every case we firmly believe, and it is our conviction that its monetary value is equal to that of any other single line of work in the disposition of claims.

Discussion of Dr. Moorehead's Paper.

Mr. Almy: It seems to me there are two or three things that Dr. Moorehead did not touch upon along this line. I speak from the standpoint of the lawyer, and I would like to present two or three points that seem to me to need attention. In the first place a doctor who makes a physical examination for a railroad company, employed by the company, it has been my experience, is always open to the suggestion that he is biased, and, therefore, it is not always wise for a railroad company to put the examining physician upon the stand. For the purposes of his testimony in the case, that seems to me to be the smallest element of the value of a physical examination. But you find that a lawyer going into court with the papers in a case, the first thing he looks at is the physical examination, because there he finds the patient's first version of how the accident occurred; not in legal form, but what he has told the physician about how the accident occurred. You get his own version. So many times in the trial of these cases we find that the few words that the patient has said to the physician about how the accident occurred give a clue whereby his testimony can be broken down absolutely. Again, they very often make admissions to the physician which when brought to their attention they feel that they cannot deny. The other lawyer has not got at them strong enough; he has not brought up the point; they have not mentioned to him that they told the physician certain things; and very often you will find an instance where you can win a case on admissions made about the circumstances of the injury or something that happened at the time. I remember a case where an old Irishman was suing a railroad company, and in the course of the examination the physician found an old break in his arm, and he said to him that the arm was broken years before. He said, "How do you know?" He said, "I know it was." He said, "Yes; it was broken twenty-eight years ago, in Ireland." For the moment I think the old man had forgotten that. He went on the stand and swore that the cause of the crookedness of that arm and the fact that it had been useless for nearly a year and a half was a bruise received on it just above the elbow. When faced by that physician and put back on the stand after the physician had testified to deny the statement that we claimed he made to the physician, he admitted it, and we won the case. That was a serious case, and it was a case which, if it had not been for that admission, I am satisfied would have been lost.

There is another thing which the doctor opened up to a limited extent. A man going into a case wants to know in the first place what the injury really is; he wants some knowledge of it in order to carry on his case. I remember a case that was tried where it was claimed the man could not raise his left arm up to his shoulder. We had had a physical examination of that man, and the doctor said, "It is all foolishness. He can raise his arm; there is no sort of question about it." He was asked if he had ever seen him raise his arm. He said, "No, I never saw him, but he can do it." On the trial he was asked to show how far he could raise it at that time, and asked how far he could raise it before he was hurt—and up it went; of course, demonstrating to the jury in a moment that there was nothing in it whatever. Another thing; if you have a physician who has examined the patient and you know that what he tells you is right, you can depend on it and go as far as you like. I know of a case in Brooklyn only last year where three reputable physicians, supposed to be experts along their line in New York City, went on the stand and testified that a man had a heart murmur and that it was the result of a bruise received upon the chest in a collision, by reason of being thrown upon the seat in front of him in an open car. We had a physician who examined that man—a physician in whom we had confidence—and he said positively that there was no such thing, that there was no heart murmur. It came to issue in court, and the judge said that he thought the case was particularly a case where doctors disagreed, and that we ought to have some person who had no interest in the case examine it. There were three eminent experts on the plaintiff's side, and there was a doctor on the defendant's side who had examined the man and knew what was or was not the matter with him. Of course, we consented to the suggestion of the judge in a minute. A doctor was called and examined him at the order of the court; he did not see either side and did not know what he was examining for except that he was to examine his heart. He came directly from the examination and went on the stand and nobody had said a word to him. He said there was no heart murmur. The result of that was that we won that case, because they were putting up a fraudulent claim. So where doctors disagree, if you have a man that you can depend on, you can take any kind of chances.

In the line of the thumb illustration. I saw a case once where the plaintiff claimed that she could not shut her hand, and the doctor said she could shut it. So when the doctor was on the stand he was asked that question, and he said that she could shut it. The patient was brought up there and we made the claim that we could shut the hand for her. She was brought up, and the doctor shut it. Now, you would not dare take chances like that unless you had a physical examination and knew absolutely what the situation was. Therefore, I think, from the lawyer's standpoint, for the purpose of preparation and for the purposes of the trial of cases of that kind, that there is no one element in the investigation of an accident that is so valuable as a physical examination of the claimant.

The next paper was:

Physical Examinations in Accident Cases.

BY W. A. DIBBS, NEW YORK CITY.

Physical examinations, the reports of which are pretty dry reading, but most essential.

By the time you get through perusing a few hundred medical reports a month as we have you are pretty well acquainted with the human frame and its functions.

We believe it most advisable to get an examination whenever possible and it invariably means a strong argument in settlement. We will have the claimant present his case with a plea that he is injured for the remainder of his life. That he or she is the most maligned one in existence. That he is suffering the tortures of the damned, but as soon as the suggestion is made for an examination he tells you that there is nothing to see or feel. We more than ever insist upon an examination, as our suspicions are certainly aroused. After the examination, and he is told by the surgeon he is in a healthy condition (and the type of his kind are usually pretty healthy) he or she frequently come to your own terms, or, we might express it charitably, and say that their minds have been relieved. Then again those of the above class, despite the fact that

nothing is the matter with them, will not admit that there is nothing physically wrong, and still believe that they are intense sufferers. This has been instilled into their minds by friends and unscrupulous physicians, something with which we are blessed in New York. Then our troubles begin. If it is a case warranting settlement, all your arguments and blandishments are of no avail. It means to pay a price which you know is not commensurate with the injuries, or stand a suit, with the physician to back up the claimant, and probably get a verdict against you that will make you swear, even if you are a railroad man. I might here cite a few cases similar to the above which came under our observation recently:

A youth fell from a moving car. His physician took charge of the case, acting in an advisory position as well as physician. He presented the claim, contending that the boy was thrown by a sudden start, and had received a dislocation of the shoulder. Our examination, made shortly after the accident, failed to bring out any evidence of dislocation (generally a pretty hard condition of affairs to disprove). Nevertheless our surgeon was positive that the injuries claimed did not exist. The boy resisted the efforts of the surgeon to flex the arm beyond a certain degree. This was a case just as we explained. The boy believed he was permanently injured, and the doctor fathered the thought. All the time previous to the trial (we had refused the claim) the boy had the arm either in a sling or carried partly helpless at his side. On the day of the trial our astute counsel while cross-examining him asked him how far he could raise his arm. He could not get it beyond a level with his shoulder, but when he asked how far he could raise it before the accident he forgot himself and his teachings and put the arm far above his head. It is needless to say that the jury gave us a verdict.

A patrol wagon with a number of police officers was hit by a car. All of the cases were disposed of except one. This particular officer weighed probably 250 pounds, and could hardly walk on account of his fat, and he was rather short. He alleged that he was so nervous that he could not sleep, although it took considerable punching to awaken him whenever we called upon him. He had all kinds of backaches and all kinds of headaches. We had him examined, and all we found was fat. We declined to deal with him, as his claim was too exorbitant. After he found out his game had no effect he started off on another tack, and began to develop facial paralysis. Whenever he thought someone from the road was near he began to screw up one side of his face, and kept it that way for some time. We demanded another examination and, to our surprise, we got it. In making a test our surgeon got him to stick out his tongue, but he forgot himself and stuck it out on the wrong side, and when he found that out it was quickly moved to the other side, but he was too late.

An interesting case came up a few weeks ago. A woman of respectable appearance claimed she was thrown by a sudden start, and that the shock affected certain muscles, which in course of time became powerless, and she was unable to retain urine, and at the same time had bladder hemorrhages. At the call of our doctor she volunteered to show him the discharge of blood, but was unable to do so. Later on, however, she did show him a discharge that had the appearance of blood, but on closer examination it was found to be snuff which she had carefully dropped into the receptacle.

A woman from the South claimed to have injuries she had sustained by falling against the edge of the car seat. On examination she was found in bed apparently paralyzed from the waist down, and paralysis of different functions. She complained of a girdle sensation about the waist. She was able to withstand sudden and unexpected pricking with a needle, even under the toe nails, without flinching. An abrasion of the skin over spine some two inches in length was found. There was something about the case that aroused the suspicions of the surgeon. One of the reasons was the fresh appearance of the abrasion, and that the skin about the abrasion was not black and blue. We were to have a test made with a battery, but the woman requested that it be put off for a short while as she could not stand a thorough examination at that time. Arrangements were made to continue the examination the following morning. When he arrived there it was found that she had left on the midnight train. Upon investigation it was found that her husband had used a knife and scraped her skin over the spine, and that he did it just before our physician had arrived there.

Another woman claimed that she had received a fracture of the knee-cap. Upon our doctor's examination it was found that the leg was put up in a very pretty cast of plaster. The woman was attended by a presumed trained nurse. At the removal of the plaster for the examination we were unable to find signs that there had ever been any injury. The woman contended that as a result she had become completely paralyzed, and the doctor in attendance was grossly deceived by her. She was able to gain the sympathy and support of a number of charitable women, and also several physicians. She remained in bed for several months, but got tired of the game and left for the West, from where we received a report that she had been arrested for forgery, and seemed to be then in first-class physical condition.

These are quoted just to show the paramount importance of an examination, and, of course, the surest way to detect the fraud. An argument might be raised as to what effect morally the examination has on the majority of cases, and from our experience the effect can be easily seen. The injured lose their aggressiveness, and then say: "What will you give me?" and are glad that they get something, no matter how small. A discourse on this point can be lengthened, but the fact nevertheless is apparent that the examination does have a material moral effect. Of course, there are exceptions.

Now let us take up cases of more serious moment—I mean cases of severe injuries. We are presented with a claim running into big money, if we may apply that term. Presuming that your claimant has a fractured femur, or leg, or arm; we may add ribs. The fracture has been reduced by the attending physician and plaster applied frequently before we are aware of the extent of the trouble, and frequently when a claim is presented for adjustment all signs of the fracture are gone. Though the demand is made upon the severity of the injuries, it is advisable to get the examination as soon as possible. The claim will be based upon the length of disability, a fact easily established by the attending doctor.

Now we come to another type, namely, internal injuries. Most of these are subjective and hard to disprove, but if examined within a short period after they occur something can invariably be noticed. We have had cases of this character which upon the closest medical examination were found to be well developed cases of appendicitis (something new in the way of claims), the attorney and doctor contending that the appendix was injured in an accident, though the disease at the examination was so far developed that it could be plainly seen that it was there before the accident.

Dislocations of shoulder after replacement are deceiving, though they do sometimes leave a permanent affection. Women with internal trouble brought about by child bearing have endeavored to foist the damages on the road, but a surgeon well versed can without much trouble detect the real cause.

There is still another type that can be touched upon, and that is brain concussion, an injury the consideration of which it is pretty dangerous to delay. It might or might not leave a permanent effect. An early examination is most advisable. Whenever a concussion is claimed to have existed another examination later on will be advantageous. The surgical examination is almost as imperative for the defense of an action as witnesses, and we have upon a number of occasions won our cases on the medical testimony alone, and we presume others have done the same.

Let us say a few remarks about some of the so-called doctors. How they ever passed an examination in anatomy heaven only knows. It recalls to mind where one doctor, when asked if he knew what a fracture was, he replied: "Why, certainly, it's a contusion." Some of these fellows, to the detriment of the reputable ones, have a good deal to do with fostering of fraudulent claims, they declining to allow an examination of patients at first, and they advise holding out for exorbitant sums. After the examination has taken place and they are told that the patient is but slightly hurt they usually recede from their independent stand and accept the diagnosis of the company's surgeon, who they know is, and has to be, a doctor in all that the term implies. Here it is again that the moral effect is brought to bear fruit.

We can take up in a few words our experience with the reputable physician. It is an experience upon which we can look back with a good deal of admiration for the medical profession. Doctors of this kind come out straightforward and tell you that the patient is a serious subject or he is not. They never stick to the former

or say that there is no chance for a complete recovery, nor do they act as legal advisor, telling their patients that such and such a lawyer might get a lot of golden dollars, but they do advise arbitration and counsel peace. Physicians of this kind are plentiful in New York, and our experience with them has always been of the most pleasant nature.

It probably will not come amiss to explain the system in the claim department of our road, showing how the medical records are kept. A form provides for the file number, date, place of accident and circumstances, attending physician, and whom to communicate with to arrange for examination. The record is made in duplicate, and also entered in a book. One copy is sent to the company's surgeon and the other filed with the papers.

Upon the return of the surgeon's report the receipt is checked off in the book and the report with the papers. If there is no examination to be had the surgeon indorses his part of the blank and returns it to the office with the proper explanation, and that is put away with the papers. A record is also kept stating how many cases each physician has had and how he is disposed toward the road, and how he appears upon the witness stand.

Claim agents, with whom I have had much to do, are very much divided upon the necessity of having immediate attention from the company's surgeon. While such prompt attention may be given to the injured in small towns and villages or in places in which the accidents are not numerous, it seems to me that as far as the larger cities are concerned that it would be impossible, and in many cases undesirable, to have the immediate attendance from the company's physician. In such larger cities there are, first, the well appointed ambulances of the various hospitals, and second, the representatives of the school of the "first aid to the injured," and frequently many passing physicians, through whose efforts the suffering of the injured is allayed. In the denser populated portions of the city, where the greater number of accidents occur, doctors are to be found in the immediate neighborhood who, as a rule, reach the scene of the accident within five or ten minutes after its occurrence, making far better time than could the company's physician.

It seems to me that the standing of the company's physician who is regularly at the scene of the accident, at or about the time of its occurrence, is greatly injured, if not entirely destroyed, if in this way he becomes a portion of the investigating force of the claim department. There is no doubt that their standing in the medical profession would be impaired by the continuance of such a line of conduct.

Discussion of Mr. Dibbs' Paper.

Mr. Cole: I would like to ask a question. Take a case where the company's physician has attended a case of (we will say, for instance,) compound fracture of the elbow or wrist, in a comparatively aged person, and the wrist or elbow, after it has been treated, is stiff, has anyone ever known of a suit being brought against the company and an attempt made to prove that there was improper treatment on the part of the physician?

Mr. Dibbs: We do not allow physicians to attend the case all the way through. It is just the mere examination for the purpose of adjustment or disposal of it.

Mr. Danforth: The practice in Rochester is to employ not one physician, but a number; we distribute our work around among the reputable physicians of the city. Our physicians in these cases do not attend the injured party, but simply make examinations.

Mr. Allen: Our practice is the same, with this exception (and I presume our practice in that regard is governed by the fact that Utica is a small town), that our physician looks after the injured party or attends him to the completion.

Hydraulics in Connection with Street Railway Operation.

BY C. E. PARSONS, GLENS FALLS, N. Y.

Before the possibilities of the electric railway were recognized nearly all of the accessible water powers of the country had been developed for use in various arts and industries. So when the demands for cheap transportation increased it became necessary to find immediate means for supplying energy, and steam seemed to be the only available source. Railways were projected, built, and

operated in a few months' time, and although the cost of energy by steam was high, there seemed to be no other means of getting a quick return on the capital invested. Today the engineer, with his knowledge of what may be done in electrical transmission and conversion, recognizes that water powers are much the most important factors by which the cost of electrical energy may be reduced.

The new hydro-electric development at Spier Falls on the Hudson River is to play a most important part in the operation of the street railways in the eastern part of the state. Some of the features of this plant and of the one at Mechanicsville, together with their various transmission systems, give an idea of what may be done in reducing the cost of energy as used for electric traction.

Within the past year a most complete system of connecting railways has been put in operation in the Hudson and Mohawk valleys, and lines now run from Gloversville on the west to Albany and Hudson on the east and south, and Lake George on the north, and all of the intervening cities have the benefit of the most modern electric railway engineering and construction. Six different railway systems are located within a radius of 45 miles of the Spier Falls plant. The Hudson Valley Railway connects Albany and Warrensburg and the adjoining villages. The Ballston Terminal Railway connects the various manufacturing villages in the vicinity of Ballston. The United Traction Company's lines are located in Albany, Troy and vicinity. The Albany & Hudson Railway's third rail system covers the territory from Albany south to Hudson. The Schenectady Railway Co. operates lines between Schenectady, Albany and Troy and has a line to Ballston and Saratoga nearly completed. The Fonda, Johnstown & Gloversville Railroad covers 34 miles between Gloversville and Schenectady. Three of these systems are now using power from Spier Falls and Mechanicsville.

The Hudson Valley Railway is connected with the Glens Falls transmission line at Glens Falls. The voltage on this line is 20,000, and part of the current is used in the railway rotaries at this point and the rest is transmitted over the high tension lines, located on the right of way to the Wilton sub-station. The 18-mile line from Saratoga to Glens Falls is supplied from the rotaries at this station. The railway company has a complete system of high tension lines, and connections may be made with very little additional copper, so that the whole 125 miles of line may be operated from Spier Falls. The United Traction Co. of Albany is under contract to take 6,000 h. p. at its sub-stations in Watervliet and Albany, and a large part of this power is now being supplied. The Schenectady Railway Co. is receiving power over three separate transmission lines. Two are from the Mechanicsville plant at 10,000 volts and one from Spier Falls at 30,000 volts. These lines reach sub-stations at Latham's Corners on the Troy branch, Colonie on the Albany branch, and the Dock Street station in Schenectady. The railway company also has a 10,000-volt transmission system connected with its steam plant.

With the prospect of so much of the energy being used from Spier Falls for railway purposes it became of the utmost importance that a reliable and constant supply should be assured. The one object which of all others has been kept in view since the very inception of this water power development was to so build that the supply of power would never fail.

One of the first questions to be decided in a water power plant is the size of the units, both of wheels and of generators. The Spier Falls plant is laid out with four more generators than can be run in extreme low water. This gives a spare set of generators during the low water months, and provides for the sale of 30 per cent more power during the eight months of the year when the supply is abundant. Another feature which also applies to most plants is that of the construction of storage reservoirs to regulate the flow during the summer months, and it is easier to provide for additional units to be supplied from this storage, while the first part of the plant is under construction, than at some future time when foundations would have to be put in with the aid of coffer dams. The additional cost of the masonry and rock work for spare units is small as compared with the expense of a shut down if future extensions are found to be desirable. In regard to the question of the comparative size of water wheels and generators there seems to be a difference of opinion among designing engineers, and at first consideration it might seem as if there were no necessity for a wheel much larger than the generator. The Spier Falls

wheels are built to develop 40 per cent more power than the rated capacity of the generators and the wisdom of such construction has already been demonstrated in the following manner. It became necessary, in order to fill power contracts, to start the generators before the dam was carried up to its full height, and the wheels are now operated under a 64-ft. instead of an 80-ft. head. Because of their large capacity they are able to maintain the speed and develop the full rated power of the generators although the head is 20 per cent less than that for which the wheels were designed.

The protection of the canal and forebay is a most important feature and a thorough study of existing plants was made before the present layout was adopted. The canal and intake rack run parallel with the river, and the racks are made continuous with ample space behind them. This gives a large rack surface, and the velocity being correspondingly less, there is not so great a tendency for drift wood to choke the water supply. This arrangement allows the larger pieces of wood to be floated down the face of the racks and over the waste way at the end, instead of lifting them out bodily. A practice which should be avoided where feasible is that of placing the intake square across the current. If this is done heavy projecting piers must be built to take the ice thrust in times of high water. The plant at Mechanicsville unfortunately has this arrangement and there was serious trouble with the ice almost every year until a series of ice breakers was built diagonally across the river. In order to facilitate the making of repairs on the hydraulic equipment, and to enable any part of the system to be laid up without interrupting service, a series of grooves for stop logs was arranged both for the canal head gates and for the gates in front of the penstocks, and any of the gates may now be repaired or replaced without affecting the others.

The question of the governing of a plant is one to which altogether too little attention is usually given. It is impossible to attain accurate speed regulation with the best governor that can be built unless due consideration has been given to the principles upon which depends the speed of a water wheel. The function of a governor is to vary the energy delivered to the wheel as the generator load changes, and this can be satisfactorily done only when the gates and gate rigging are so designed that they will respond quickly to the governing mechanism. The limitation of speed control is that imposed by the inertia of the water and to obtain good governing, the one most essential thing is for the water column to respond promptly to the varying aperture of the gates. It is to the water column therefore that attention should be given from the moment the plant is begun, if the accurate speed control which is now demanded is to be obtained. The shorter the penstock, the sharper the downward pitch and the less the velocity, the better on the whole will be the regulation. It must be remembered also that the water column does not end at the gate; and long and contracted draft tubes and shallow tail races may have a serious effect on the governing, even if the work above the wheel is correctly planned. A frequent cause of disaster is the sudden and dangerous rise of pressure in the penstock due to sudden closing of the gates, and there seem to be but two practical methods of eliminating this danger. Standpipes are effective if properly built but are expensive and a source of trouble in cold climates. The problem seems to be solved at Spier Falls by the use of Lombard relief valves. They are easily adjusted, open and close quickly and have a discharge area large enough to afford ample protection. As a result of a study of the foregoing principles and of the adoption of the most modern governors the regulation of the Spier Falls plant is very satisfactory.

The switchboard is another part of the system which needs to be carefully studied if shut downs are to be reduced to a minimum, and the one at Spier Falls is to be modern in every respect. It will be possible to put any one of the ten machines on any one of the eight outgoing circuits, by means of the small controlling switches on the operating board in the center of the station; so that in case of trouble with the generators there will be no delay in changing. The transmission lines are all to be built in duplicate, and two separate pole lines running through different sections of the country will reach the larger centers of power distribution.

There is a great deal of scepticism among railway managers in the east as to the reliability of water power as applied to electric traction. This is largely due to the fact that designing engineers

have not given the proper study to their hydro-electric developments, and numerous shut downs and poor regulation have caused the more conservative to withhold their approval. From the results which will be attained in the Spier Falls plant, and in other modern plants of this character under construction, it seems safe to predict that water power will be as reliable as steam, with the additional advantage of a saving of 50 per cent in the cost of energy.

Discussion of Mr. Parsons' Paper.

Mr. Pardee: Mr. President, I would inquire whether any of the transmission lines were carried through villages?

Mr. Parsons: They are carried through some small villages, but not through large ones, on pole lines through the streets.

Mr. Pardee: Did they adopt any means of protecting or taking care of them?

Mr. Parsons: We have in the principal streets, but not many in the side streets.

Mr. Clark: I would like to inquire into the advisability or the non-advisability of labeling poles for high power transmission wires with danger signals. I would like to learn whether it is customary to do it and whether it is thought advisable not to do it, and what the legal status of the proposition is.

Mr. Parsons: I am not prepared to say in regard to the legal status of it; but we label all our high tension wires dangerous where they go through villages. Usually where it is twenty or thirty thousand volts the danger signal is put up.

Mr. Mitten: We have not labeled ours; still, we only go through very small hamlets and on what is practically a private right of way, only striking the streets at highway crossings.

Mr. Danforth: Our line passes largely along private way. They are not labeled, except where the line passes through a small hamlet.

On motion an adjournment was taken until 2 p. m.

TUESDAY AFTERNOON SESSION.

The first paper was:

Track Construction and Maintenance.

BY T. E. WILSON†, BUFFALO, N. Y.

The close relationship of the terms "Construction" and "Maintenance" does not seem to be fully appreciated. The track upon which all the traffic has to be carried is one of the most essential parts of a railway, and yet the importance of the track and track work in relation to the operation of the railway, and the portion which the maintenance of track bears to the total operating expenses does not seem to be fully recognized by street railway officials. This proportion is usually high and due to a great extent to the fact that the majority of our street railways were originally built by promoters with regard to immediate cheapness of construction rather than the ultimate economy in operation. While this was justified in many cases by the tracks being constructed in advance of the prospective travel, still in too many instances the mistake has been made of adhering to the original types and standards of construction long after they were inadequate to the greatly increased traffic and the heavier equipment. The result of this is seen on the auditor's books, the road having to sustain an undue continual charge for maintenance. If those who originally built street railways had to maintain them they might have been built differently. This rebuilding of old track to take care of increased travel and heavier equipment makes necessary the construction account of which has been aptly said, "The construction account can never be closed until our railways are built. To attempt it involves a destruction account of fearful magnitude. Under our present system we are perpetually rebuilding our railways, not reaching the life of our works, and thus running capital to waste. A better system will strike at the root of the evil by correcting, not nursing, the defects of our permanent way."

It behooves us, therefore, to carefully review our standards of construction in order to be certain that we are building for the future.

†Chief Engineer International Railway Co., Associate Member American Society Civil Engineers, Member American Railway Engineering and Maintenance of Way Association, Member Engineering Society of Western New York.

Rail.

On October 9, 1901, the Committee on Standards of the American Street Railway Association reported in favor of a T-rail for use in city streets whether paved or unpaved, the recommendation being: "We recommend a T-rail as the most desirable under any conditions."

This is the generally accepted solution of the rail question, the familiar arguments of the T-rail being small resistance to tractive force, ease of installation and the keeping of vehicular traffic away from the tracks. And yet it would seem that we lose sight of the most important point, viz.: the maintenance of the pavement along the gage line side of rail. On Archer Ave. in Chicago, a mile of Trilby girder rail and a mile of T-rail were laid side by side about two years ago in order to convince the municipal authorities that T-rail was the best. The writer inspected this stretch of track lately and found that while the girder rail track was practically as good as new, the paving along the inside of the T-rail had been rutted out badly by the teams, in some places the ruts being four inches deep. That track looks as if it would have to be entirely repaved within a short time, and meanwhile is a constant menace to the wheels of all vehicular traffic, with a consequent liability for accident. Again, the track on North Main St., Buffalo, was relaid four years ago with a semi-groove girder with block stone paving in the tracks. Within a year afterward the paving stone next to the gage had worn down to the lip of the rail but no further. It has remained in the same condition for four years and will apparently outlive the rail. If this track had been built of T-rail repaving would now be in order.

So it would seem that we cannot afford to overlook the fact that the pavement along the T-rail is subjected to much greater wear than along the girder and may be a source of expensive maintenance on busy streets. As to the question of keeping the vehicular traffic away from the tracks, this might possibly be the case on wide, smoothly paved streets of cities of less than 200,000 population and where there is very little trucking. But in the narrow busy thoroughfare of the larger cities, where there is not room enough in the street for the vehicular and car traffic, this would be impossible, and a rail must be installed which will provide for the trucking as well as for the cars, and afford the best protection to the paving adjacent to it.

These were the reasons which probably led up to the adoption of the Crimmons or Trilby shaped rail (so called on account of its resemblance to a foot when inverted), which has been laid in New York, Chicago, Washington and many other cities, which finds its highest development today in a section weighing 137 lb. per yard, now being laid in Philadelphia. The extra weight of this rail has nearly all been placed in the lip, solely for the purpose of furnishing a runway for the tires of vehicles and keeping them off the pavement. Another argument against the T-rail is that nearly all the municipal authorities of our larger eastern cities, and the public, are against its adoption on account of the aforesaid rutting, and the city ordinances usually prohibit it. As public carriers, we can scarcely afford to ignore their point of view.

A practical solution of the rail question would seem to be to use the 9-in. Trilby type in the busiest thoroughfares of our larger cities where the trucking is heavy, and the traffic congested; the semi-grooved girder in the quieter streets and those districts which by reasons of architecture and location have become fixed as resident districts; and the T-rail in the smaller towns and cities, and in the suburbs of the large cities.

Besides the shape of the lip of the girder rail, which has already been mentioned, there are two other important points to be carefully considered, viz.: the width of base and the depth of groove. The base on a 9-in. girder should not be less than 6 in. This makes a firm support when superimposed upon concrete, and lessens the tendency of wide gage, due to tipping. Too little attention is paid to this point by street railway engineers. When the track and all its fillings are new a narrow base does not matter so much, but after 8 or 10 years of continuous service, with the pavement loosened and the ties rotten, the 6-in. base should do its work well.

The depth of groove should not be less than $1\frac{3}{4}$ in. With the use of a concrete roadbed the wear upon the head of the rail is undoubtedly greater than with a flexible roadbed, and every 1-32 in.

of increased depth means a longer life for the track, depending of course upon depth of wheel flange and condition of traffic.

Very careful measurements in Buffalo have resulted in determining that the average wear of head for four years on the busiest street has been 1-32 in. per year. The largest tread operating over this track being $\frac{3}{4}$ in. and the original depth of groove being $1\frac{1}{4}$ in.; a very simple computation gives 16 years as the life of this track. In this connection it will appear strange to the old trackman to speak of the life of the rail being fixed by the wear of the head, rather than the joint, but this is one of the results the welded joint has achieved. To be paradoxical, after the joint is welded it ceases to be a joint.

Joints.

With the advent of the welded joints came a great decrease in maintenance. The cast welding of joints has been carried on for some eight years, especially in the west, with varying success. The percentage of breakage never seems to have been less than $2\frac{1}{2}\%$. The electric weld we are all familiar with and it seems to be the highest type of joint today. The per cent of breaks during the last year has been kept down to the astonishing figure of one-tenth of 1 per cent. The only objection to this joint is in its method of application, a train of four cars being necessary which occupy the track and interferes with the regular traffic. Another drawback is that it is not possible to contract for a small number of joints on account of expense attached to shipping the equipment from place to place. This puts it beyond the reach of all roads who have less than 2,000 joints to weld.

Among the best of the mechanical joints is the riveted splice bars of the Philadelphia Rapid Transit Co. It consists of the regular splice bar, with rivets substituted for bolts, and the space between the rail and the bar is filled solid with molten zinc.

With the introduction of concrete roadbed came the necessity for a steel tie, as with a track whose life is estimated at from 15 to 20 years, it would hardly be economy to install ties with a life of from 10 to 12 years. These steel ties should be secured to the rail by means of brackets which fit up well under the head of the rail, and which accomplish the same purpose as a brace tie plate or a tie rod. Old rail can be very readily used as a tie when cut up into proper lengths.

Where wooden ties are used on interurban work, they should be white rock, or burr oak, or long leaf southern pine. Cedar, while being long-lived, is too soft, especially with heavy interurban passenger and freight service, and will not hold a spike.

While on the question of ties it may be of interest to note that the steam and electric railways of the United States are using over one hundred million wooden cross ties per annum. The prices are constantly advancing and it is evident that we will be forced to turn to the steel tie as a substitute for wood. As a starter, the entire roadbed of the Pittsburg, Bessemer & Lake Erie R. R. is being equipped with steel ties.

Roadbed and Paving.

One of the greatest, if not the greatest, source of expense for track maintenance is on account of no ballast, loose track, and consequent failure of pavement. Miles upon miles of track in which the rail was good, the joint perfect, and the tie sound, has been torn up and relaid because the ties had been laid in the mud, concrete placed on top of them and around them, in fact any place but underneath them, and the whole surmounted by a 3-in. veneering of asphalt laid right against the rail. Could anything be more short sighted? Such a track will last from three to six years, depending upon traffic, and then suddenly the pavement will all go to pieces.

"Never lay asphalt against a steel rail" has come to be a street railway axiom.

Brick, sandstone, granite, all make a very acceptable pavement, but in order to preserve the pavement it is necessary to have a foundation of concrete, and this means concrete under the rails and ties.

The concrete roadbed consequently, either of the beam or solid type, has come to be recognized standard, and although some objection is made to this construction on account of the rigidity of the track and the wearing of the rail, yet a railroad can better afford to have the head of the rail wear for a certain period for no maintenance, than to have it wear a little longer time with constant repairs to pavement.

Costs.

Owing to different prices of material at various places, estimates of cost must necessarily vary with the locality. The following may be of interest, however:

Construction.

1. Replacing old 6-in. track in asphalt with new 9-in. 94-lb. girder rail, portland cement concrete base, steel ties 10 ft. c. to c., welded joints, No. 1 Medina sandstone block paving with grouted joints, toothing and asphalt in 2 ft. strip, including cleaning up street, and allowing salvage on old 6-in. rail. Per foot of single track, about.....\$4.30
2. Relaying and welding rail already in street, concrete base, steel ties, pavement, etc., as above, except that there is no salvage. Per foot of single track..... 3.30

Maintenance.

The cost of maintenance of track and roadway of nine railways, per mile of single track, per year, for 1901, is given in the table below. It will be seen that the cost varies from \$215 to \$733 per mile. It is interesting to note that the larger the mileage the higher the cost of maintenance seems to be. Not much can be gleaned, however, from these comparative figures as the conditions are so diverse; for instance, the Brooklyn Heights is mostly on elevated structure and of course is more costly to maintain. The cost per car-mile of maintenance of track and roadway for the International Railway Co. for 1903, was .008 cent.

Cost of maintenance per mile of single track for year 1901:

| Railway Company. | Mileage. | Tracks & Roadway. | Remarks. |
|-----------------------------|----------|-------------------|---------------------|
| Brooklyn Heights R. R..... | 401 | \$733 | 6 mo. end. Dec. 31. |
| Cleveland Elec. Ry..... | | 630 | All city. |
| Montreal St. Ry..... | 103 | 469 | All city. |
| Rochester Ry. | 100 | 378 | City and suburban. |
| Denver City Tramway..... | 144 | 298 | All city. |
| International Ry., '01..... | 330 | 290 | City and suburban. |
| International Ry., '03..... | 357 | 258 | City and suburban. |
| Milwaukee, 1900..... | 255 | 250 | City and suburban. |
| Scranton Ry..... | 76 | 221 | City only. |
| Schenectady Ry..... | 32 | 215 | City and suburban. |

As potent a factor as any in the economical construction and maintenance of track is the organization not alone of the track department, but of every individual job undertaken. All work should be carefully laid out and planned beforehand and the plans rigidly followed. As little initiative as possible should be left to the subforeman. Cheap tools, cheap material and cheap foreman are not necessarily economical and are usually the reverse. And above all, a close watch must be kept on details, with a view to turning aside all the undirected and misdirected tendencies which might lead to extravagance, inefficiency, or whatever in the end might operate depressingly upon dividends, which after all constitute the ultimate aim of our friends the directors.

Discussion of Mr. Wilson's Paper.

Mr. Cole: How long do you allow your cement to set before you begin to run your cars over it, after you have graded on the side?

Mr. Wilson: Seventy-two hours.

Mr. Danforth: The city of Rochester has considerable mileage of Trilby rails. Within the city 25 per cent of the total mileage is of the T-rail, laid at the side of the street, outside of the curb line. We find the greatest trouble with the Trilby rail in the matter of snow and ice. The condition in northern New York, and particularly the western part, is that during the winter we have a great deal of very damp weather and wet snow. This snow falling on a grooved rail packs readily and fills the groove and causes considerable difficulty in operating. The best rail for the operation of cars in our section of the state, of course, is the T-rail. We have not attempted to use the T-rail in paved streets, excepting cross streets. I should quite agree with Mr. Wilson in limiting the use of the T-rail to small towns or in streets where there is extremely light traffic. I see no objection to the use of the T-rail, particularly the Shanghai 6-in. rail, in brick paved streets, residence streets, where there is very light or almost no teaming. Mr. Wilson has

brought out very nicely and convincingly the danger of using the T-rail in a street where there is a heavy vehicular traffic. As I have said, we have 25 per cent of our tracks laid with T-rails, but it is so situated that we are not bothered with teams.

Mr. Lewis (Schenectady): Mr. Wilson's experience in track work and my own have been so nearly along parallel lines that I do not imagine that I would voice any sentiment in regard to track construction or building essentially different from those which he has already expressed. I think it is true that the question of track construction is becoming very important. I do not think it has had attached to it the importance in the past that it should have had; but I think the necessity of having a better roadbed than has been had in very many instances is being recognized. I have had a chance lately to witness and have witnessed some very fine track construction showing all the essentials of a good track which Mr. Wilson spoke of until it got to the bottom of the ties. The roadbed and track from the ties up, or from the bottom of the ties up, was as good as could be put in, but it was laid on mud. It seems to me strange that such things as that are done in this day of electric railroading. I believe with Mr. Wilson that the concrete construction in paved streets is absolutely essential, for this reason: In open track work, where the joints can easily be got to at any time of the year, flexibility is correct theoretically and practically; but when it is not possible to get at the joints a construction must be used which will make the joints practically indestructible. Now, if a road is so small that it cannot afford to put in electric or cast-welded joints, it should use the very best type of mechanical joint, such as a bridge joint of some kind, of which there are several good examples in the market, such as the joint of which Mr. Wilson speaks as being used in Philadelphia. I think that is perhaps one of the very best mechanical joints which is in the scope of a small road to have. An electric welding plant is an expensive plant to have. I don't suppose any railroad company in the country today owns one; but there are some roads which do own a cast welding plant. But the day of the old girder rail joint, the old fish-plate, the ordinary joint, which is not a bridge joint, is past; just as distinctly past in open T-rail work as it is in girder work. We should at least have a bridge joint if we cannot get something better than that. There is no question in my mind about the matter of paving around the T-rail. I have passed through the same experience that Mr. Wilson speaks of. A T-rail in paved streets is not to be thought of for permanent work.

There is one thing I have had in mind since the Saratoga convention. I do not know just how much the managers of electric railways are interested in it, but I have felt considerably interested in it and want to mention it. There is a new association in the electrical field, the American Railway Mechanical and Electrical Association. It has been organized by the master mechanics and electrical engineers, but it does not take in the extremely important question of roadbed construction and maintenance. I tried to interest some of the mechanical and electrical engineers in it, but I did not have much encouragement. I talked afterward with some managers of railways and found more encouragement. But I believe that the parent association is so taken up with questions of policy and management that the matter of track construction and maintenance, which is of such great importance with our present heavy cars, will not receive proper attention and discussion. It must be taken up by those who are practically concerned with it, the engineers. The organizations of different railway officials, owing to the difference in the management of different roads, overlap each other; some departments embrace both operation and track work; some have the mechanical department in the track work, and some the electric department in the track work. So there is no clear-cut distinction as far as the engineering and mechanical parts are concerned; but there is quite a clear-cut distinction between the management and all the engineering questions proper. It would seem to me that if track construction and maintenance are going to receive proper attention and be systematically discussed and standards adopted it must be by some association which takes up particularly engineering topics. I thought perhaps I might interest some one at least in that question, so that topics embraced in practical railway construction could be taken up in the association and the scope widened. I believe if the engineers were interested in it perhaps the scope of the present association could be changed so it could be taken up. There are these questions of standard track

construction, standard section of rail, the depth of throat, width of throat, and special work of various kinds for suburban, interurban and city tracks. More than that, there is the matter of interurban roads, which nearly every large city has or will have. Nearly every large system has an interurban connection; and the work which has been done on many of those lines has been far from creditable, and there is a good deal to be discussed along those lines. I, for one, would be very much pleased indeed to see the engineering association of the street railway companies embrace in its scope the question of track construction and maintenance.

I just happen to think of one more thing that Mr. Wilson spoke of, and that was the ballasting, which perhaps I have touched on a little before. I meant to. We are building some road from Troy to Schenectady, and nowhere are we putting less than a foot of ballast under our ties. On our Albany road we are putting in a foot of crushed stone. That crushed stone costs us less perhaps than it would in many locations, because we have our own quarry and plant for crushing. We are putting crushed stone under the track. We think the conditions of the traffic warrant it, and the maintenance will be sufficiently less to justify it. On our other interurban propositions we are putting in a foot of gravel, as good as we can get.

Mr. Wilson: Before we leave the question of snow and ice on the Trilby rail I would like to hear from some one connected with the Metropolitan, which perhaps has more of the Trilby rail than any other company in the country.

Mr. Starrett: In the absence of other representatives, perhaps I can say a word regarding that. The climatic conditions in New York City are widely different from what obtain in other parts of New York State, especially the northern and central parts. We do not look for the trouble that we should expect in this vicinity, and practically do not get it. There are only a few days in the year when we have snow enough to appreciably affect the Trilby rail. We in fact do not have as much trouble with the groove in the Trilby rail as we used to have with the rail which was formerly laid, which was a semi-grooved rail. In fact, that used to fill up with mud and in the winter with snow, so that we had to run a scraping car or digger over the road to clean it out. We rarely do that with the Trilby rail. The design of the Trilby rail, or the groove at least, is such that it is practically self-cleaning—that is, if used with the proper flange on the wheel; but in order to be at all self-cleaning the proper flange must be used with it. We experience very little trouble either from mud or from snow and ice.

Mr. Allen: I don't think I can add anything to the paper that Mr. Wilson has read to us on the city work. On interurban work we have tried as near as we possibly could to follow the type of construction that has been used on large steam roads in the past few years. We have on the Utica & Mohawk Valley made great efforts to secure a roadbed that was properly drained. Our roadbed for more than 90 miles out of our 114 miles is constructed on private right of way. Passing, as we do, through a valley and on the hillside, we have encountered some difficulties in the way of drainage that would seem to be hard to overcome. We have constructed on the uphill side of our roadway a series of two ditches, one near the line of the right of way, just within the right of way, which receives the water that comes from the hillside; and from this outer ditch it is conducted to and through and under the roadbed and under the track structure. About four and a half feet outside of the end of the ties on the hill side we have constructed still another ditch, which gathers what water falls on the right of way and would overflow the outer ditch.

Drainage may not seem to be a very important problem to some interurban roads, but with us, having, as we do, in practically the summit of the Mohawk Valley, a great deal of rainfall, that locality being practically in the watershed of Lake Ontario and of the Mohawk and Hudson Rivers—we believe we have, and in fact the records show, as kept by the government, that the rainfall at the Little Falls Station is considerably greater than it is at the Syracuse or Oswego station. The question of drainage structures beneath our roadbed is one that we have taken a great deal of pains with. Our culverts throughout are built of concrete, and are, as we believe, sufficient to take care of all the drainage. Our roadbed is made of the excavated material which we have found in the cuts. On top of this roadbed we have placed eight inches of gravel or crushed stone ballast. Upon the crushed stone ballast we have laid

oak or long-leaf yellow pine ties, spaced from 18 in. to 2 ft. on centers, depending upon their proximity to joints. The rail we have used has been the A. S. C. E. standard 80-lb. T-rail, in 30-ft. lengths, and supported by one or the other of two types of iron joints. We have used the Weber and the Continuous joint. We have had the greatest portion of this road in operation something over a year. Our cost of maintenance has varied as the quality of the gravel under the track structure has varied. I believe that if we had the roadbed to build over again, instead of spending the labor and energy we have in placing the gravel which we have found and which has been accessible to our work trains, we would pay the additional cost of putting broken stone under the track structure. The first cost of crushed stone would be perhaps 25 per cent greater, but the cost of maintenance would be considerably less.

Mr. Mather: I do not know that I can add to the remarks that have been made by the gentlemen who have preceded me, but some of my experience I can give. Curiously enough, in our Auburn & Syracuse road the part that has cost us the most in maintenance from Skaneateles to Syracuse has been the stone part. I think in the first year or two more work will have to be put on that to get it into a good road, but afterward I admit it will outlast the gravel. But the gravel that we have on about seven miles of the distance from Syracuse to Skaneateles has lasted very well; it has kept up under heavy traffic. More curiously still, the 60-lb. rail laid three years ago from Skaneateles to Auburn has cost during that time I do not think for the seven miles over \$400 for maintenance.

The President: Four hundred dollars a mile?

Mr. Mather: No, sir; the whole thing. Seven miles was made of gravel and was ballasted by means of a snow-plow. It was got down in very good shape and has simply lasted. In the 60-lb. rail I think one can notice more flexibility of the track itself than with a 70-lb. rail; but the rigidity of the 70-lb. rail is all that we desire. I have my own opinions, of course, about the weight of rails. I do not object to the use of a 100-lb. rail, if one can get it, but I would rather put the money into, I think, about a 70 or 75 or even an 80-lb. rail, which is ample for all the requirements of interurban traffic. Given sufficient ballast, a well drained road, and plenty of ties, I would rather accept the lighter rail. I think too much importance is attached to the weight of the rail. I notice the financial companies ask the first thing what the weight of the rail is. If a rail will break in the distance between the ties its utility as a carrier is ended. One cannot expect that throughout a 30-ft. rail there will be no deflection. The platform upon which it is placed is, in my opinion, the important part. From the foundation to the top of the tie is the important part. Any neglect there will certainly redound to excessive cost of maintenance of track. I would very much rather personally take a light rail (say 50-lb.), with plenty of ties and plenty of ballast, and put the roadbed down as it ought to be put down, and guarantee a better track than with a 90-lb. rail, with fence-posts for ties, spaced four or five feet, as many early roads were built, and without ballast. The 90-lb. rail will not keep the track up. It will help some. I think one can better afford to make a careful study of the size of rail that will amply carry the cars under proper loads from tie to tie, and there, in my opinion, the utility of weight ends. If there is any excessive deflection I think it rests with the ties and ballast. Rock ballast undoubtedly, once it is settled, is the very best that can be obtained. I would have it crushed not to exceed an inch and a half; I would to a certain extent (depending on the nature of the rock) have it screened, so as to get the most perfect drainage. But an important thing to be considered in laying a new roadbed with rock ballast is that the ties in one or two places may rest on the edge of a stone. A car running over that tie will disturb the stone, and the tie certainly will go down. I think the experience of all railroad builders would be that no amount of tamping will put a stone ballasted road in as good order as the more compact gravel ballasted road would be in at the same time; but I think at the end of three years the advantage will be very much in favor of the stone ballast. So far as our city traffic is concerned, in Auburn we have been unable to use concrete, not having had the means. The road is too small to go into very expensive construction. We have found that six inches of crushed stone, thoroughly rolled, after digging the trench and rolling the sub-grade, taking care that nothing was done during wet weather and that the roadbed was allowed to be dry before the

superstructure was put on—with the trench rolled and six inches of stone thoroughly rolled into the softer sub-grade, and then gravel placed on top of the stone, gave very good results. We have had some of it down for eight years, and I do not think in probably nine miles and a half of girder rail construction we have nine low joints. It has stood wonderfully well. The earth was very rigidly packed at the bottom, part of it being old macadam, and had been built for a great many years. Auburn has well macadamized streets. We had a magnificent base to work on. That, with the precaution of packing the earth and our foundation stone well into this has had practically the same result as if concrete had been used. There has been no possibility for that stone to shift in any way, and to all intents and purposes it was concrete. That road in a great many places was laid in a macadam pavement, and the streets have since been re-paved, and in only one or two places has the foundation been able to steal away from the ties and leave any hollow, and that was over bridges, and that we could not help. We have had some thought of filling that up with concrete, but we have not done it. The brick paving has gone over it. We filled it in with crushed stone the last time it was paved, and since then have had very little trouble, but that is only a comparatively short time. That is about our experience in ballasting.

As far as that point is concerned, we are all very much in favor of the T-rail construction. For our projected road from Rochester to Syracuse we have secured through all the villages the right to lay T-rails, and at Fairport we have put in about half a mile of 70-lb. T-rails. That is the only construction we have on the Rochester, Syracuse & Eastern at present. We have very carefully looked after the foundation and have put in specially made brick. Teams are able to drive, even with 1-in. tires, upon the track. It allows a 1-in. tire to go in exactly $\frac{3}{4}$ in. and as far as vehicular traffic is concerned, it is far ahead of any other rail. Whether it will last under that traffic or not I do not know. I have not had experience. I have no doubt that Mr. Wilson's observation will be ours, probably, except that we have through those villages very light traffic compared with what he speaks of. But we are in hopes that we will be spared the taking up of that pavement for some years. I am not able to say what the result will be, whether it will bear out our hopes or not; but in Auburn we have about two miles of such rails (in macadamized streets), and the maintenance of that, although it is only a 45-lb. rail, has been comparatively light. The maintenance of the macadam has been very light indeed; but then, unfortunately for the purpose of illustration, that is on Seymour St., a street that is not much affected by heavy traffic. We have, unfortunately for illustration, no T-rail in any street that is heavily affected. On the brick pavement the tram rail does not seem to have worn at any particular point other than on the head, but there is not much traffic, and we have had the brick pavement in there for the last eight years. There is no point in that pavement that has shown any particular wear. Still the outside of the girder rail would be as susceptible to wear as the inside of the T-rail. I am quite sure that under heavy traffic there would be the chance that Mr. Wilson speaks of, of wearing a rut that would be objectionable for vehicular traffic, and probably dangerous. But we feel in our interurban building that we desire as much T-rail construction as possible, and in the villages I think we can maintain it to the satisfaction of all parties.

The President: I would like to ask if anybody has used to any extent the 60-ft. length T-rail?

Mr. Mather: Yes, we have used it, and we have used it at a place that is especially dangerous for expansion, since it is in a rock cut and the reflection from the rocks surrounding it raises the temperature to a very great extent. When I saw it in construction in the winter time I was very much afraid the first thing we would have to do in the spring would be to relay it, but there has not been even there that objection. That is between Skaneateles and Syracuse. But on the 60-lb. 60-ft. length from Skaneateles to Auburn the first two years that we operated it we had two places that the sun kinked. There were two each year, and in every place, rather to my astonishment, in each case it has been on the top of a hill, not in the hollow. All we have done for it has been to slack off six or eight joints on each side and throw the rail in place, and we have had no return of it. This year I do not know of any place where there has been a sun kink on the entire line, and there are all 60-ft. lengths.

My practice has been largely before this on steam roads. From a steam road point of view I do not like the 60-ft. rail. From the point of view of the better bonding, I think I do. I think as long as no danger shows in it we will continue to use the 60-ft. length, for the sole reason that it is more easily bonded. I do not know that it affords any better riding. I have not noticed that. But we have a pretty fair riding track.

Mr. Nicholl: We have 34 miles out of 38 miles of T-rail. We have 34 miles laid with 60-ft., 60-lb. T-rails. The superintendent of that division is present.

Mr. Wilcoxon: We used the 60-ft. rail on the Rochester & Sodus Bay division, and we found that it ran about three or four or five joints very nicely, and then we got an opening all the way from half an inch to an inch sometimes, breaking the bolts right out. We have not had any trouble outside of that.

Mr. Wilson: On the Lockport division of the International Railway for a distance of about 32 miles it is laid entirely with 85-lb. rails in 60-ft. lengths, with the exception of about two miles. We had some trouble at the curves because they were not fully filled up to the top of the ties and sufficient shoulder given, but since that work has been done we have had no trouble on account of expansion or contraction. I recommend that length of rail on account of the bonding and the joints.

Mr. Rockwell: We have 22 miles on the Lakeside road laid with 60-ft. lengths of 56-lb. rails from beginning to end. For trolley road work I would not use anything else.

Mr. Wilson: The American Society of Civil Engineers has recommended 33-ft. lengths. Of course, it probably had in mind steam railway practice.

Mr. Lewis: Mr. Wilson speaks of the rail on the Lockport line and the difficulty he has had. I remember distinctly the trouble we had when I was in Buffalo. It occurred in a section of road a mile or two outside of Lockport. The track was laid in the middle of the winter and laid with very tight joints, and the contraction sheared the bolts in some places in the winter, and in the summer the expansion threw some of the joints out of line. We easily overcame the difficulty and I don't think that there has been any serious difficulty since. I am decidedly in favor of the 60-ft. rail. I do not think there can be any question at all with reference to rails laid in city streets which are paved. I think that has been demonstrated. And I think that very much better bonding can be got by laying a 60-ft. rail in open track work.

Mr. Mather: There is one other thing that I have in mind that may not be generally known. As the section of the rail increases the expansion may be disregarded. A light rail will expand more per foot of track than a heavy rail. That is accounted for by the fact that the entire section of a light rail may heat up from the sun's rays, clear to the center of the metal; while in a heavier section there is always a part which remains cool and does not expand so much. So that the expansion of an 80-lb. rail will not be so great as with a 60-lb. rail; and yet it is the sixty that I have given my experience with.

Mr. Clark: I would like to ask Mr. Wilson if one of the plans he advocates for the drainage of the ordinary gravel-ballasted interurban or outlying track (and how far it is practicable and advantageous, if at all) is to leave the tie exposed in accomplishing the drainage?

Mr. Wilson: I think by following out steam railroad practice to the bitter end on our suburban roads we can get very fair drainage. By that I mean, the giving of a slant to the roadbed, so that the water will drain from the center into the ditches. On city work we lay a drain tile on each side of our track, which is a 4-in. tile, and is connected into the sewer.

The President: If there is no further discussion, we will now take up the time which has been allotted for discussion of the Railway Young Men's Christian Association work. Mr. F. J. Pearsall of New York is with us and will address us.

Street Railway Y. M. C. A. Work.

Mr. Pearsall: Mr. President, and Gentlemen: There are two topics that I noted in the list sent me by your president that it seems to me are intimately related. They are "Reading and Club Rooms for Employes" and "How Can We Increase the Efficiency

of Employees?" One of the significant developments of recent years has been an increasing recognition of two things on the part of employers and men. One is that the way a man spends his time when off duty has a direct relation to the efficiency of his service when on duty. If I am correct, it is this to no small extent that justifies this association in devoting some time to the consideration of a topic of this kind. The second significant thing is a recognition on the part of employers that their full duty is not done when the employe is given his wages. That was emphasized most happily by your president this morning when in his opening address he said, "It is our duty to make the life and lot of our employes as comfortable as possible; we should even go out of our way to do this."

Now in connection with the opening of club rooms and reading rooms for men we have in mind more than merely the occupation of the men's leisure time. In connection with some of the work which has been done among the street railway men of the state (and as to which in a few minutes I am going to ask a statement to be made by two gentlemen who are members of your organization) there is more than merely the filling in of the time by games. There is the giving of those men an opportunity to have a bed in a convenient place. I learned quite recently in connection with one street railway company in the state which is operating a reading room, that some of the men got in from their runs late at night, and being unable to get the last car out, living far out in the suburbs, from necessity, on account of small rents, and unable to walk the distance home, they have spent every night in the car barn, sleeping on the seats of the cars, as in this particular case, or in other cases sleeping on wooden benches in the reading room, and getting up in the morning in that condition to go to work. That was the best they were able to do. I am glad that there is under consideration in that particular city a plan for the introduction of dormitories in addition to reading rooms and game rooms.

It was 31 years ago that the first Railroad Young Men's Christian Association was organized, and that was in Cleveland. The growth of the organization in the last ten years has been by far greater than its growth during the first twenty years. This is a significant statement when it is understood that the organization has been dealing with the presidents and the managers and the superintendents of railroads—gentlemen whose hard business sense enables them to see through a proposition about as soon as any class of men on top of the ground; gentlemen whose occupation is such that they have all kinds of propositions made to them, most of them not worth considering. Now, after close contact with the kind of work that the Railroad Young Men's Christian Association has done through these years, the managers are giving their hearty co-operation in extending these organizations among their men, more than ever before, because the organization is better understood. The Railroad Young Men's Christian Association is the railroad man's club, and when I say that it is putting it as briefly as it is possible to put it and as accurately. They spend their time bowling, playing billiards, in the reading room, or in the lunch room, for many of the organizations have lunch rooms for the men; or in the dormitory upstairs. Many men who run from one point to another and are away from home every other night find this place a club, where the privileges are within their reach.

At the present time, after this 31 years of effort, it is rather significant that the organization possesses a membership of 62,000 railroad men. It owns in buildings and real estate property amounting to \$1,250,000. Another significant thing connected with those figures is that at the outset the leaders of this movement among the railroad men felt that if they were able to get the men to contribute one dollar for every two dollars that the companies contributed it was a good proportion and about as much as they could be expected to do. But during these years the proportion that the men have given has increased so that the men now give more than a dollar for every dollar that the companies contribute. If I read that statement aright, it means that the men themselves are more interested in this organization. It is not a missionary movement to them, but it is a movement among themselves; it is not a going down of outsiders among the railroad men to do missionary work with them. It is a club composed of railroad men themselves. Eighty-seven of the 114 railroad branches in the country own their own buildings, and buildings are going up faster than one a month, and only in one case in two years has one of those build-

ings been erected for the Railroad Young Men's Christian Association where it has not been opened entirely free from debt. In erecting the buildings the companies usually contribute three dollars to one dollar contributed by the men, and in that ratio they agree to contribute up to a certain amount, that ratio being larger than the ratio for support, which is about dollar for dollar.

Now, I have spoken somewhat at length in describing this kind of work, because it seems to me that there is a similarity between steam railroad men and street railroad men. I have been interested to hear one or two gentlemen speak inferentially of the fact of their having been connected with steam railroads formerly. The two are so related that the character of the employes is quite similar; their tastes, their mode of life, all mark them as being men of similar calibre; and men who can be reached by the Railroad Young Men's Christian Association on the steam railroads can be reached, I believe, with equal efficiency by the same organization among street railway employes.

Before I speak farther about this matter I want to call on two of the gentlemen who are here today, members of your organization, who have some knowledge of this work as it is now being done in the state of New York, and I am going to call first upon Mr. Nicholl of the Rochester Railway.

Mr. Nicholl: I am not much of a man to make a speech, and have not had an opportunity to write one beforehand. I was rather under the impression that my friend Pearsall was going to make more of a speech before he called upon me. If I had not, I think when I went out a few minutes ago I would have stayed out longer.

Aside from any religious views that I may have, or that I ought to have, I am really very much struck with the Young Men's Christian Association work amongst street railway men, and I have good reason to feel that way, from the fact that a little over a year ago we in Rochester organized the first street railway Y. M. C. A., they tell me, in the world. I have my doubts about the correctness of that statement, but they say that it was the first in the world. And I promptly became the first member—not because I knew anything about religion, because you know street railway men cannot possibly know much about religion; they do not get any opportunity to go to church or to attend religious services of any kind; on the contrary, they are continually up against the real thing in the way of dealing with the public, who are not, as you know, always considerate, and very often liable to try your patience—try the patience of the conductor and motorman as well as the man in the office.

A little over a year ago we started with one member, and two or three persons joined very soon afterward. In May last our association was asked to send delegates to Topeka, Kansas, to attend the conference, as they call it, of the Railroad Y. M. C. A. We sent, I think, four delegates to that conference, and at that time we had less than one hundred members. That was in May. Today in Rochester we have nearly two hundred members of the Young Men's Christian Association, men to whom really it has been of assistance, who have watched the development of things and have made up their own minds without the slightest coercion, that it was the proper thing for them to do to join this Young Men's Christian Association. You understand we have outside of the Y. M. C. A. a benevolent association that takes care of the men in the way of taking care of their families should they be disabled or sick, built very much upon the same lines as the Metropolitan and other associations. But the Y. M. C. A. comes in and takes charge of our rooms particularly and of the conduct in those rooms. In Rochester we spent between five and six thousand dollars in fixing up the rooms for reading, where we have all the popular magazines of the day, newspapers, etc., and billiard rooms, ping pong tables, etc., and besides that we have toilet and bath rooms prepared, and a nice room where they can retire for religious meetings. Let me say that we are somewhat religious, for on Sunday morning last I understand that they had thirty-five of our boys who voluntarily attended what they call a prayer meeting in the morning. It certainly has done a great deal of good morally. Before we had the Y. M. C. A. in charge of the rooms there was a great deal of blasphemy and all sorts of disagreeable talk about the rooms. Since they have been in charge we have not heard a word of it. Everything has been nice and courteous; the men have been courteous to each other, and you will never hear a blasphemous

word spoken, because as soon as there is something of that kind the secretary goes up and in a very quiet and gentlemanly manner does not insist but requests that it be discontinued, and rather shames the man. I think it has a subduing effect on those men, to make them more patient than they otherwise would be in their connection with the public.

I cannot but say that I am heartily in favor of it, and I think that the manager makes a mistake who does not allow the Y. M. C. A., where they can do so, to exercise its influence in the same way as it has in Rochester, through their secretary, who is the only man that they appoint, the other men being appointed by our own men themselves. Of course, there is an incentive to the men to belong to the Y. M. C. A. Men outside of the association are required to pay a little more for their games of billiards and bowling and for the use of towels, etc., than the men that belong to the association, but it is quite trifling. Still it is sufficient to make the men feel that it is a good thing to belong to the association. They of course come under the influence of the secretary and others perhaps who feel religiously inclined.

Mr. Pearsall: I would like to have the gentlemen here know that Mr. Nicholl was at the big railroad gathering at Topeka, where President Roosevelt and he—we shall have to put the president first, because it would be treason to do otherwise—made the two leading addresses in the convention of railroad men which was attended by thousands, and his speech was applauded most heartily and circulated in the press.

I would like to say this with reference to the religious element of the organization. In the first place we do not hide it. In the second place we do not apologize for it. And in the third place we do not intrude it.

I ask your attention to this one fact, that in the 32 years that we have been working among railroad men—and I was a railroad man myself; I went into the secretaryship out of the railroad service—in that time the religious side of the work has been handled so wisely and unobtrusively that it has won its way into the confidence of railroad officials who, if it were sectarian in its character or obtrusive in its methods would throw it out of the railroad service. The association stands for twentieth century religion. It believes that affording a man a chance to have a clean bed and a square meal is a religious act. It stands for the kind of religion that I believe you gentlemen stand for and believe in. A significant thing is that railroad officials who were afraid of this movement fifteen or twenty years ago are now not only its leading supporters, but are the leading officials in the state and national organization.

I am now going to ask if Mr. Clark of Binghamton will say a word.

Mr. Clark: I feel myself in a somewhat embarrassing position at this time in attempting to discuss a proposition concerning which I have a comparatively limited knowledge, and particularly in following in the wake of my friends Secretary Pearsall and Mr. Nicholl, who to my knowledge made a long, extensive and very eloquent address upon this subject at the national convention held recently at Topeka, which address I read with a great deal of interest and a great deal of pleasure.

My first contact with Railroad Young Men's Christian Association work occurred about three or four months ago, when it was my pleasure and my privilege to participate in the dedicatory exercises of the new Railroad Young Men's Christian Association building in Binghamton. I am ashamed to say that notwithstanding there had been a local branch in the city of Binghamton bearing the name of the Railroad Young Men's Christian Association for a number of years, I was not aware of its true character, the class of work it was performing, or the great benefit it was extending to its members. You may imagine my surprise when I accepted an invitation to make a few remarks, upon entering a beautiful brick structure of considerable size and finding gathered there several hundred railroad employes with their families, who were to be addressed by President Truesdell of the Delaware, Lackawanna & Western Railroad Co., and T. W. Oliphant, secretary of the Delaware & Hudson Co., and two or three prominent Erie officials.

Before we commenced the exercises we were shown about the building and we found a splendidly equipped place. We were taken to the first floor where we were to have a collection of money turned in for the building fund. We were shown into several of the club

bathrooms or lavatories, and everything that goes toward completing the sanitary regulations of a well kept institution of that character; and when I was informed that all those advantages and all those privileges were afforded to the members of the Railroad Young Men's Christian Association at a very nominal cost, I can assure you I was surprised. Upon going downstairs we were shown through a handsomely equipped reading room, a finely furnished billiard room, card rooms, a first class assembly hall, and the office. We were then taken to the lower floor and were shown splendid bowling alleys and other athletic conveniences. I can assure you, gentlemen, that it was one of the most completely equipped club houses that I have ever visited.

At the completion of the exercises I casually said to the secretary of the local association that I thought privileges of that character would be a great thing for street railroad employes. "Well," he said, "why don't you take advantage of them? You are eligible. Your boys are at perfect liberty to attend and participate in these benefits upon paying a nominal fee (I think two dollars a year). They can enjoy the bedrooms upstairs at a cost of ten cents a night. While we have not perhaps presented the proposition as thoroughly to the street railroad interests of the country as we should have done, yet your men are eligible, and we would be glad to welcome them to membership at any time." As a result, the following day I posted an order on the bulletin board setting forth what I believed to be the advantages and stating that those privileges would be accorded to them gladly; and I am pleased to state that within ten days from the posting of that notice upwards of seventy of our two hundred motormen and conductors connected themselves with the Railroad Young Men's Christian Association of Binghamton, and have from that time enjoyed its privileges and advantages with great benefit to themselves and to ourselves. There is no question but what the refining influences of the association are a benefit to the men. I am not speaking from a spiritual standpoint at all; I am going to put it upon a plain, ordinary business basis. I think as a business proposition that this subject is worthy of the most thorough and careful consideration of the street railroad companies of the state of New York, because anything that has a tendency to refine or elevate men necessarily increases their efficiency; and I believe that the seventy men from among our motormen and conductors, notwithstanding the fact that they have been members comparatively a short time, are improved and benefited by the privileges which they have enjoyed. I think as an economic proposition the street railroads of the state can well afford to consider the advisability of taking advantage of the privileges that the Railroad Young Men's Christian Association affords.

In a conversation with National Secretary Moore, following the occasion which I mentioned a while ago, he stated to me that they were going to take up more actively the question of identifying street railroad employes with their work; and he said furthermore that when our membership had increased in the city of Binghamton to one hundred he would be very glad indeed to establish a railroad branch, and I shall be very glad (and I am sure Mr. Rogers bears me out in the statement) to have him do exactly that thing. We believe, irrespective of any spiritual or religious benefit that they may derive from their intercourse with the officers of the association and their associates, that as a business proposition it will be both profitable and pleasant. Therefore I say, without taking up further time, that I think this is a matter of considerable importance to the street railroad companies of the state of New York, and a question to which they should and I believe will give due consideration.

I presume it goes without saying that if the street railroads of the country generally take advantage of the throwing open of the doors of these various associations throughout the United States, possibly the question of their assisting in their maintenance may arise; but I believe that any co-operation along consistent and economical lines tending toward the development of the Railroad Young Men's Christian Association movement among street railroad employes will be money well invested and well spent.

Our boys, irrespective of creed or of belief, take advantage of the manifold privileges which they enjoy; you can see them daily enjoying the privileges of the lavatories; you can find them at the tables in the reading room; you can find them participating in games. I say to you unhesitatingly that I believe it is infinitely

better for an employe of any street railroad company, when his day's work is ended, to seek diversion with the Railroad Young Men's Christian Association rather than in the temptations of the saloon. As I stated before, anything that has a tendency to elevate or that has a tendency to improve the morals and conduct of the men is a good thing for them, and necessarily the railroad companies must inherit a benefit therefrom also. Therefore I say in closing that I am most heartily in sympathy and accord with the work, and I sincerely trust that the street railroad companies not only of the state of New York but of the United States generally will give this question careful consideration.

Mr. Pearsall: I wish to make two statements. The first is that I presume that in New York there are only a few cities where the street railway men are as closely related in various ways to the location, for instance, of the steam Railroad Young Men's Christian Association building as to enable them to take advantage of the facilities to the same degree that they do in Binghamton. In most cases it is very likely that the managers will find it desirable, if not necessary, to establish reading rooms for their own men, as Binghamton may in the course of the months, as they find out that the men themselves call for such an organization and promise their support to it.

Now with relation to the Young Men's Christian Association form of organization, I have three things to suggest regarding it. I believe it is desirable, because in the first place it brings into its work the experience of more than thirty years and adopts methods which have been tried and proven by time. In the second place, it has been training secretaries, many of whom came from the ranks and know how to appeal to the men; and after all that is the chief difficulty in any kind of work of this character. It is not the money that is the chief difficulty. It is one of the hardest things in the world to try to do good to others, and I believe you gentlemen know it quite as well if not better than I do. The difficulty is in helping a man in such a way as not to pauperize him for one thing; not to knock his support from under him by making him think that you are going to carry him in your arms and help him unduly. It is not the lack of money chiefly that stands in the way. One of the wealthy men of the United States, feeling his responsibility in view of his great wealth, has apparently searched to find how best he could spend his money for the benefit of his fellows in order that he may not die a rich man. Today he has only found one method so far as we are able to see, and the danger seems to be as great that he will die in spite of all a rich man as that some of us may die poor men. The third thing regarding the Young Men's Christian Association is this. There are two supervisory organizations which look after these individual associations, which isolated would be likely to do a less efficient work; the state committee, whose secretary for the railroad work I am, and the national committee, whose secretary Mr. Clark mentioned a moment ago. We follow up these individual organizations, try to co-ordinate their efforts, and carry along the plan from one place to another, and in any way we can, without cost to those organizations, endeavor to make their work efficient.

I hope, gentlemen, that the support which has been given to this work by the officials of the steam railroads, men who stand and have stood as leaders in all that is best and largest in the steam railroad world, men such as Mr. Ingalls, Mr. Depew and Mr. Vanderbilt—that the support which has been accorded to the association of railroad men by these gentlemen may be emulated by similar cordial support by the leaders in the street railway work of the Empire State.

Mr. Nicholl: I must say that the eloquence of our friends Mr. Pearsall and Mr. Clark together has made me more convinced than ever that I did right in starting this movement in the city of Rochester, and I am more convinced than ever that it is a very important thing for this association to take in hand. Having that in mind, if it is in order, I would be glad to move that this matter be referred to our executive committee, to take it into consideration and under investigation through the proper channels, and make recommendations as to what we shall do at another meeting.

The motion of Mr. Nicholl was put by the president, seconded and carried unanimously.

The President: We will now hear from Mr. J. B. Storer, of Syracuse, on "Power Transmission for Interurban Lines."

Power Transmission for Interurban Lines.

BY J. B. STORER, SYRACUSE, N. Y.

The successful and efficient transmission and utilization of power is something which has been an object of study for many years, and, while it may seem to be in a very advanced stage, yet there is certainly much room for increased efficiency in transmission, conversion and distribution—particularly the latter two—before it can be said to have attained anything like perfection in connection with interurban railway lines. It is, of course, the ambition of electrical engineers to so perfect their type of equipment as to make it advantageous to the great steam railroads to adopt electricity as a motive power, but unless some very radical improvements are made in the present electrical systems it will be a long time before any such change will be seriously considered.

A computation of the series of losses that occur between the steam engine driving an electrical generator in a centrally located power house and the driven wheels on a motor car is not so apt to make one enthusiastic over the efficiency of that system as it is to bring to one's mind the thought of the extraordinary losses that must occur in a steam locomotive to make such a wasteful electrical system as widely used as it already is. It is safe to say that on an average not over fifty per cent of the energy delivered to a generator is utilized in actually moving the cars. The rest is consumed in the generator, transformers, transmission line, rotary converters, distributing lines, motors and gears. However great this loss may be, there are, fortunately for the electrical men, other factors besides the mere consumption of coal—labor being the chief one of these—and this gives the electrical outfit such advantages that steam locomotive manufacturers have been forced to make great advances in their own line. The compound locomotive engine as now used on the principal steam railroads is a very different machine from the old simple engines that have made such records as coal consumers. It now becomes imperative that the electrical manufacturers should bring out a corresponding improvement if they are to retain the prestige they have already gained.

In considering the possible improvements that may be made in the electrical system as now used on interurban lines, the separate sources of loss must be considered independently to see where and how they may be decreased. It is safe to say without going into details, that no further improvements can be made in generators, transformers, rotary converters or motors that will sensibly affect their efficiencies. The only thing remaining is to cut down the losses of transmission and distribution. This can be done by either one, or both, of two ways; that is, to increase the voltages or increase the size of the conductors. The transmission loss cannot practically, or commercially, be reduced to less than five per cent unless the original cost of power be very high. In general it cannot be reduced to much less than ten per cent—the customary figure for present lines—for too high a voltage brings an increased risk of operation that may more than offset any advantage gained in small losses, and large conductors bring up the first cost too much. This also applies to the distributing system, except with regard to the percentage loss, which can seldom be placed at even as low as ten per cent. The location of sub-stations closer together than customary may materially reduce the loss, but only at a very considerable increase in cost of attendance, which in general more than offsets the gain. The transmission and distribution losses therefore seem to be at a minimum the same as in the apparatus, and it becomes evident that the desirable increase in efficiency must come, not in the present system, but in some other one that will possess all the advantages now attained, and will reduce waste energy to a minimum by doing away with all unnecessary steps or transformations in the power generated. It remains to be seen what this next improvement will be.

Among the many questions pertaining to power transmission that have been more or less the subjects of discussion, that of the frequency of the system has perhaps attracted more attention than any other. It has been attacked on all sides, but the great majority seem to favor 25 cycles as being the best from an operating standpoint. This is, of course, due to the better regulation on the transmission line and also to the greater success met with in the manufacture of rotary converters of this frequency. It is a question, however, if this is not due more to the fact that, owing to the choice of 25 cycles at the Niagara plant, rotary converters of this frequency were

developed more rapidly and to a greater extent than others. It is a measure standardized that as a strictly railroad frequency, as well as for general systems making use of direct current for lighting purposes through rotary converters. Later experience has shown that for almost all purposes except the strict transmission of the power a higher frequency might better have been selected. Even the transmission drop due to inductance may be so regulated by means of compound wound rotary converters that no difficulty is experienced in lines operating at as high as sixty cycles. This is due to the high power factor that can be maintained over widely varying loads and without hand regulation. In this respect as well as in efficiency, the rotary converter will always be preferable to motor generators. This applies to both induction and synchronous motors, for, although the latter may be adjusted for a high power factor at one certain load, their power factor changes with every change in load and unfortunately it changes in the wrong direction. This cannot be overcome on a railway system by hand regulation of the field rheostat owing to the too rapid fluctuations of load.

The induction motor, while it may have a lower power factor at full or partial loads, than can be attained with the synchronous motor, has a much more even effect on the transmission line, and it is one that may be provided for as a certainty. It is, therefore, preferable to the synchronous motor, but as stated above, the rotary converter is preferable to either.

The question of frequency for railway circuits is decided under existing conditions not so much by what may be considered as the best for the purpose as by conditions imposed by something that may be quite at variance with what is considered strict railway practice. Most power equipments for new railways, as well as for old roads that are being reconstructed, are installed with a frequency the same as the nearest large water power or steam plants, purely for commercial reasons. This has been made possible only by the success finally attained in the manufacture of rotary converters of high frequencies, which, although it comes at a considerably later date than the success attained with 25 cycle converters, is nevertheless just as marked. There are today in New York State large railway systems operating at 25, 40 and 60 cycles, and the representatives of those companies will verify my statements that all are operating equally successfully and satisfactorily.

The long transmission systems for electrical railways involve so many considerations of a commercial nature that the electrical engineers having their design and construction in charge, must in reality often entirely subserve their own personal preferences from a technical point of view, to the other conditions. In fact it is incumbent on electrical engineers to make themselves almost as familiar with financial and commercial matters pertaining to railways as they are with strictly technical subjects. This is owing to the necessity of being able to realize, in a measure, the possibilities of the future with reference to consolidations and the consequent necessity of having everything as interchangeable as possible, and to decide how much considerations of this kind should influence the character of any installation. The laying of a few sections of rails between local railway companies to complete a through road is a small matter compared to connecting a number of power houses together through high voltage transmission lines and operating all as one common system. One is a purely mechanical piece of work and once completed it is done for all time. The other is but started when it seems to be completed.

The necessity which frequently arises in comparatively small railway systems, of putting in a power transmission outfit at a reasonable cost—in fact, at a small cost—also emphasizes the necessity of having a grasp of strictly commercial conditions so that a successful outfit may be installed without burdening the company with such a heavy fixed charge that it is unable to operate on a profitable basis. There are many engineers, for example, who profess to believe that a high voltage transmission line built with poles having anything smaller than an 8-in. top, or with wire smaller than No. 3 or No. 4, can never be maintained in successful operation. The difference in cost, however, between a pole line of the above type and one with poles having 6-in. top and with No. 6 wire, is very marked, and would make considerable difference in the interest charge. There is no question but what the latter outfit would be entirely successful if carefully erected and would be durable, having no higher percentage of depreciation than the former.

There would certainly be greater reliability of operation on a system with two complete lines of No. 6 wire than with one of No.

3 wire, and the cost would be practically the same. The reliability of the smaller transmission line is illustrated by one in central New York which has been operating for over five years in furnishing light and power. During that time no break has occurred in the twelve miles of line except when caused by a falling tree, which would have broken any line ever built. On a railway system using both No. 6 and No. 3 wire I was recently told that less trouble had been experienced with the smaller wire than with the larger. In general too much emphasis is given to making the poles all of a certain size top and too little attention is paid to the size of the pole where it enters the ground and where the greatest strain comes.

It would hardly be fitting to close an article of this kind and at this time without referring to the new single phase railway system as developed by Mr. Lamme of the Westinghouse Electric & Manufacturing Co. If it demonstrates its success as fully as its promoters claim it will, then it will have marked an advance in electric railroading that no one can overlook. Its main feature of improvement over the present system is, of course, the absence of rotary converters, with a higher distributing voltage and consequent lower loss as well as less cost of installation. With this system there should be delivered to the motor car wheels at least 15 per cent more of original engine power than with the use of rotary converters and direct current motors. This is a noteworthy achievement even in this day of extraordinary development along electrical lines.

The simplicity of the system from a transmission and distribution standpoint is also a feature that will make it attractive. It enables a single power house to handle with ease a railway one hundred miles long and with the least possible item of labor. The line could readily be sectioned, as in city service, and with high voltage feeders for each section, with transformers connected in as part of the transmission line, we have a system as simple to operate as an ordinary city railway plant. The transformers could be fused so heavily that nothing less than a continued short circuit would open the incoming and outgoing lines, suitable circuit breaker protection being given in the main power house as in present installations for each feeder circuit. It may be said that this would multiply the number of wires to an objectionable extent, but by using a common return this could largely be obviated, and duplicate pole line construction would render continuity of service almost assured. The main objection to the new system seems to be from commercial considerations rather than from anything electrical. The frequency—about 17 cycles—at which it operates is unlike any system in use, and as the motors are also alternating it precludes their use on direct current circuits except by the use of a double type of control for the cars, which is very cumbersome. Its advantages from an operating point of view, as regards efficiency and items of attendance or labor, must be demonstrated very clearly before its general adoption will render the present commercial objections ineffective. As the only really practical system of its kind, today, however, its full development is being awaited with the greatest of interest by the entire railroad fraternity of the country.

Discussion of Mr. Storer's Paper.

Mr. Barnes: Seeking for information, I would like to inquire why a pole is labeled "Dangerous" carrying a high voltage current.

Mr. Storer: I do not see any reason, if the transmitting line is operating successfully, why the pole should be labeled "Dangerous" with a 20,000-volt current any more than with 2,200. The general conditions, of course, are such that if a high voltage circuit drops on a cross-arm or on a pole, you cannot help but notice it, because it generally sets fire to the pole or the cross-arm and begins to burn it up. But the amount of leakage that would come from an ordinary pole I do not think would be sufficient to injure any person. It is more with the idea of keeping people away from it and impressing them that it is not safe to throw wires across transmitting lines than it is from any actual danger of the operating line itself.

Mr. Barnes: Have any tests been made of the voltage that can be taken from a pole in wet weather, with defective insulation? Would serious shock result to persons coming in contact with such a pole?

Mr. Storer: I do not know where any tests of that kind have been made.

The President: If the wire came in contact with the pole, would not it char it?

Mr. Storer: It usually sets fire to the pole. The pole is part of the ground just as much as the person who is standing on the ground and touching the pole, and for that reason I do not see that there could be any great danger.

Mr. Rockwell: Mr. Storer means that 22,000 volts would not kill any quicker than 2,000.

Mr. Storer: I have known of people taking currents up to 30,000 volts and living through it, so I do not think that electricity will necessarily kill.

Mr. Danforth: I would like to ask Mr. Storer concerning his statement or recommendation of six wires on single pole lines, for instance, in preference to three heavy wires, in giving more reasonable, proper, or continued service. In case of the breaking of an insulator on one circuit, or the breaking down of the insulation in any way, or a wire dropping off from the insulation upon a cross line and the cross line may be burned off, and very frequently the pole is burned to the ground. Does not that endanger the other circuit?

Mr. Storer: Certainly it endangers it, but in general the damage is not carried that far before it is discovered that one circuit is in that condition. Your ground detector should enable you to know that there is a grounding of one wire, and that circuit should be thrown out of service at once and the service put on the idle line before the damage could have reached any such serious stage as a person operating a system with one line would be forced into on account of the necessity of keeping the cars moving. With merely one transmission line you have to keep the cars moving and keep the line in service, whereas if you have duplicate lines you could detect a fault almost instantly and could take advantage of the ground detector and transfer the pressure over to the idle circuit and let the defective circuit remain idle.

Mr. Pardee: I would like to inquire if any one has had any experience with municipal interference with high voltage lines near highways?

Mr. Allen: We have a transmission line operating at 22,000 volts, and of about 3½ miles of that line 1,000 ft. is in a street in a village of about 1,200 inhabitants. A resident on that street made a complaint of the state board of health, claiming that we were operating a line at 22,000 volts pressure over and above his sidewalk, and that he thought it was dangerous. That communication was referred to the board of railroad commissioners, and in turn was referred to Mr. Barnes, and the matter is now being held without determination by the board of railroad commissioners. I think that is a very important question. I know of one situation on this line now, in a city of 25,000 inhabitants, where a transmission line of 16,000 volts is being held up awaiting the determination of the state board of railroad commissioners in this matter.

Mr. Barnes: I am not going to make any official report, but I agree with Mr. Allen in thinking that this is an important subject and one which should receive the serious consideration of this Association. The increase in the weight of cars operated and the speed at which they are run on suburban lines located through highways has materially increased the danger not only to the operation of the electric road but to travelers on the highway. There is this new element of danger appearing, if it is such; and if it is not, this Association should take steps to let the public know that it is not dangerous; and that new element is the construction of high voltage transmission lines. When you set poles through the streets and label them "Dangerous" the public has a right to believe that they are so; and if they are not dangerous the public should be informed and not be misled into believing that they are dangerous. It is a very serious question, I think, and one that should be thoroughly discussed.

Mr. Wilcoxon: On our high voltage line we found labeling the poles a very good thing. I do not know whether it is so in other parts of the state, but every boy out of Rochester for 40 miles has a gun, and when the line was first put up the insulators made the best kind of targets. We had a great deal of trouble with broken insulators, and finally we labeled the poles. We had some signs printed and they were placed on about every tenth pole, and a copy of the sign was given to the different public schools in the villages through which we ran, and the principals of the schools were requested to show the sign to all the school children and explain to them that the line was very dangerous and that there might be a liability to accidents in shooting the insulators providing the wire

should drop or anything of the kind. Since that was done we have had very little trouble with insulation along the line.

Mr. Brady: It seems to me the question of what is high voltage is something that has hardly been settled. In 1886, I think it was, I remember the war between the Edison company and the Westinghouse company regarding high voltages. The Westinghouse company I believe at that time spent a great deal of money in trying to convince people that a 1,000-volt line was not dangerous. Now you are talking about 2,000 and 10,000 and 20,000. I know that both of the large electric companies have reached a point where they are transmitting at 60,000 volts.

This question is one that immediately affects the matter of insurance. The board of underwriters presented a resolution on the subject at its last meeting, and which was held up for the time being, suggesting the restriction of these high voltage transmission lines to a certain distance from buildings. That matter is pending at the present time, I believe, before the National Board of Underwriters. It would not surprise me to see an effort made to have legislation enacted that would be very detrimental to the transmission lines where you are using high voltage, and inasmuch as the railroad business is developing so fast that would be very bad.

You will have to face that question sooner or later. I know now steps are being taken to bring the St. Lawrence power down through central New York as far as Utica and to Syracuse; and if that is done they must use fifty or sixty thousand volts. The time is coming when I do not believe there will be as much water going over Niagara Falls as would run a 100-h. p. wheel, but the power of that falls will be distributed east and west of that point for hundreds of miles. I do not believe there is a railroad west of Syracuse that within the next ten years will not be served by power from Niagara Falls.

Mr. Rockwell: Why not put the "Dangerous" label on all the electric light poles in cities that are carrying 2,400 volts? I would as soon be struck with 60,000 volts as with 2,400 although I do not want to be hit with either one of them.

Mr. Cole: At the last Electric Light convention in Chicago the question was very instructively discussed between the underwriters and the electric light men as to what constitutes a dangerous current for high potential transmission, and a complete report is to be made on that subject at the next meeting of the Electric Light Association. The claim among the electric light men was that a 22,000-volt current was no more dangerous than 2,200 on a well constructed line, so that no shock could be received from the pole in case of leakage or during rain storms, and that there should be some standardizing of the method of construction of high potential lines. That was conceded by both sides. It was conceded that both were equally dangerous if a man took hold of them.

Mr. Storer: Referring to Mr. Brady's remarks concerning what is high voltage, I wish to refer to a conversation that I had some time ago with Professor Ryan of Cornell University, who had been conducting some experiments in connection with the protection of transformers and high voltages, and he ventured the prediction that in our life time we would see power transmission circuits operated at not less than 500,000 volts. If that is the case it will be a very simple matter for the Manhattan to use its steam power plant as a reserve for the Niagara power. I would not be at all surprised if we were to see that time come, and the question as to what is high voltage today is no more settled than what high voltage was twenty years ago. The question is merely relative. With reference to the question of its effect on human life, that is a question depending entirely on the physical condition of the person getting the shock. We know of people that have been killed with a hundred volts, and we know of those that have taken all the way up from a hundred to thirty thousand without being killed. One person that I know of particularly was connected with a thirty thousand volt current so long and was burned so badly that both feet and one arm were amputated as a result, and yet he still lives, and aside from that he is in reasonable health, considering that there is only part of him left. I think that any steps that the legislature or the underwriters may take with reference to transmission lines and regulations as to their position and construction should be taken with a great deal of care, for if it is done unwisely it will certainly restrict transmission line construction and the distribution of power to such an extent as to be very detrimental to all railroad interests.

Mr. Connetter: We have one employe connected with the Syracuse Rapid Transit Railroad Co. who will stand with his bare feet on the ground and take hold of a trolley wire with his bare hands without any apparent disturbance.

Mr. Barnes: The matter that I had in mind was not a theory. It is a fact. The companies are today using a 22,000-volt current. In some cases those currents are transmitted on the highway. What Mr. Brady suggested I think is so; that the legislature may be called on to take some steps to prevent a danger which perhaps does not exist, and I think this Association can do a great deal in preventing unnecessary legislation in that direction by taking some initiative action in the matter. Without expressing an opinion, there is a great question whether the current transmitted at that voltage in the way it is at present is a danger to the community. One man may take 30,000 volts and live, but we know that an electric current will kill, and the general public know it; they know that people can be killed with a great deal less voltage than 20,000.

Some intelligent action on the part of this Association in determining whether the present transmission and construction of lines over which it is transmitted is dangerous or not would do a great deal to satisfy the public mind in the matter, and if it is not dangerous they should be convinced that it is not, and if it is dangerous some steps ought to be taken to minimize that danger.

My suggestion is that a committee be appointed by this association that shall undertake an investigation of the conditions as they exist today, and report at the next convention.

Mr. Peck: As the American Institute of Electrical Engineers have taken this matter up, I move that this Association appoint a committee of three to act jointly with that society and the National Board of Underwriters, the committee to be appointed by the chair, and report later. Motion carried.

The President appointed as members of the Nominating Committee Messrs. T. E. Mitten, H. A. Nicholl, and J. T. Smith.

On motion the convention adjourned till 9:30 a. m. Wednesday.

SECOND DAY'S SESSION.

The President: We will listen to Mr. Hart's paper.

Dispatcher's Duties and Electric Signals.

BY ORLANDO W. HART, FALL RIVER, MASS.

The system known as train dispatching, which is practiced on nearly all the steam railroads, in the United States and Canada, has, for its chief aim, the safe operation of trains along a single track line, and the fixing of their meeting points.

On double iron, the dispatcher's duties amount to little more than keeping apart the regulars and the extras, except in case of accident or other interruption to one or both tracks, which would make it necessary to move trains in an opposite direction from that given by schedule, then the dispatcher's responsibilities are far greater than under any ordinary conditions presented by single track operation.

Electric railways, except in a few instances, have not the advantage of manned stations along the line, with telegraphic communication with the dispatcher's office, as is the case with the steam roads. They are also at a disadvantage, owing to the large number of operating units and the fast schedules maintained on their urban and interurban divisions.

By the use of the modern high power telephone instruments and lines, it is possible, by the use of verbal orders, to derive, from a dispatcher's office, all the advantages now obtained by the use of the telegraph; but on most railways it would be impracticable to keep in operation the manned order stations, and so, some system of signals should be installed and maintained, enabling the dispatcher to set an order signal at any desired point or telephone station along the line, and to receive an "answer back" or reply from the station so operated, which would be characteristic of itself, recording the same, together with the date, hour and minute, of the operation, on an instrument in the office provided for the purpose. All movements should be simple and automatic in their action and positive in reply, but in no case should the "answer back" be received until after the signal is at "full danger", and locked in that position.

Only one signal should be operated at a time, but so arranged that in case of the setting of two or more signals, two or more movements of the office instrument should be made, and their replies recorded.

By the use of such a system, all the advantages of the manned stations could be obtained, together with the additional advantage of its being always on duty.

Any system of signals which will bring about these results is of vital importance, when set at special meeting points, either as a safeguard on crews forgetting orders which have been given, or in case of a car or train whose right of track having been overlooked, is running ahead of a car whose rights have been restricted by orders. And lastly the important factor of operation, enabling the dispatcher to correct a blunder should one be made. While this course is seldom necessary its importance is apparent, as an accident is generally the result.

The combination of this system of signalling with the telephone puts every car, train and crew in the direct charge and control of the dispatcher. The operation of the road, or the respective divisions thereof, will then be reduced to the one man on duty, through whom all operating orders should be sent.

The importance of the dispatcher is second to no official of the road. He must be strictly temperate, of quick, sound judgment, a cool, clear head, and of unquestioned ability. He must have a thorough knowledge of the road, the running time of cars, the ability of the crews, and how much dependence to place in them. In fact all the minute details of everything connected with the operation of cars and the character of the road must be known to him, but more especially the time tables and schedules.

All persons must recognize his authority, and his alone. All matters concerning time tables and rights under existing schedules should be his, regardless of opinion.

A dispatcher's duties are to keep the road operating, as near the running time given in the time tables as possible, and when "on time" there is little for him to do. As soon as a car becomes "off time" or late it is necessary for the dispatcher to take control of this car and govern its movements, properly restricting its right of track, and then moving up other cars against it, so keeping the road "on time", making the already late car later if necessary, but holding all other cars to the time table as nearly as possible. Otherwise his entire schedule becomes upset and the road late. At these times complete control must be had of all "extras", so they may be handled with due regard to the schedule.

He must daily test his instruments and signals, and report to the superintendent any defects or interruptions that exist, or have existed, and what measures have been taken for repairs. He must report all facts concerning employes disobeying orders, or disregarding the rules of his department, and order the removal of such men pending investigation, should he deem such a course necessary.

He must construct all orders, keeping in a book provided for the purpose an exact copy of the same, and in addition to this should be kept a train sheet, showing all the operations of the day, and then filed away for future reference.

A dispatcher can be held responsible only so far as his orders and authority go, and any accident that may occur generally is traced to carelessness on the part of the dispatcher and the two men at fault.

The weak point in all systems of order dispatching is that it proves little or no check on the employe, and when important movements are entrusted to them, either singly or doubly, if they blunder, the error goes on to the result without chance of detection. Human agents err, and the dispatcher's system is devised so as to keep a check on the employe. If no mistakes are made by them, no system would be necessary. But as it is a system is needed, which will reduce the liability of making blunders, and by demanding of the employe a full knowledge of the system, there is a chance of correcting the error as soon as made. The efficiency of the system is dependent upon the rapidity and surety with which it corrects the mistakes made by the employe.

Time is an important subject to be considered in the operation of railways, by the dispatcher system, and one to which little or no attention is paid. No employe should be allowed to carry a watch that will not run within thirty seconds a week. Certificates of the condition and reliability of their watches should be furnished the dispatcher, on regular blanks intended for that purpose, and signed

by the jeweler appointed by the company, and who shall be officially known as the inspector of time.

Standard railroad time should be adopted, and main regulators or master clocks should only be used for comparison, by the men. The steam railroad rule governing the daily registration of any variation, should be strictly adhered to and adopted.

All cars should be run according to schedule, unless superseded by special orders from the dispatcher.

An order from the dispatcher takes precedence always, and upon arrival of the car at the point designated in the order, the car falls back on its schedule rights, unless the order be renewed or extended. A special order is never considered to mean more than it expresses, and must not be used as rights not fully and distinctly expressed in them. Crews having special orders against a certain car must be governed strictly by their orders and rights, as against all other cars not specified. All cars running as extras or work cars, under special orders, are considered "wild", and their rights are only to the extent of their orders.

Whether written or verbal train orders are given or received, established forms should always be adhered to, when possible, and orders must be so constructed as to admit of but one interpretation and given in the same words to all employees affected by them.

Having given an outline of the system, it will be well to give an example of a movement made by a dispatcher, using the telephone and signal system previously described.

Should it become necessary to make a new meeting point for two cars, we will say for example at station No. 5, the dispatcher, by the use of the signal system, sets a signal at stations No. 4 and No. 6, for it is his purpose to operate only on the side of safety and use the double order system of orders. The replies having been received that both signals are at danger, the dispatcher must, by order, hold all other cars at these points until he hears the call from the crew having the right of track. The motormen seeing the signals at danger, or against them, will stop the car, and the conductor will go to the telephone station, and call the dispatcher's office; on receiving a reply, will say: "Smith and Jones east bound, station No. 6, signal set". This being the crew holding the rights of track, the dispatcher gives this order: "Smith and Jones, east bound, will meet Hughes and Wheeler, west bound, at station No. 5." This message is repeated by Jones, and if correct, he is given orders to have Smith, the motorman, repeat the message as he heard it; this is done, and if not repeated correctly Smith is again given the order till he has it correct. He must then listen on the line till he receives the O. K. from the dispatcher; should he hear the order given to the Hughes and Wheeler crew, he must note carefully the message, and should any mistakes be made, immediately call attention to the fact.

The message sent to Hughes and Wheeler, at station No. 4, should be in the exact words that it was given to the Smith and Jones crew. The O. K. in any case is given by the dispatcher in this manner: "Smith and Jones O. K.; restore the signal". Both crews now having the O. K. they can proceed to the new passing point. As a precautionary measure the dispatcher may now set the signal at station No. 5, and the first car arriving at the station will call the office, and the dispatcher asks for information regarding the other car. Upon its arrival being given, the time is noted on the train sheet, and orders given to restore the signal.

Unless new orders are given at this point the cars now continue on their schedule.

In the transmission of telephonic messages, giving orders for the movement of cars, it is best to use a slow, distinct monotone, with no special stress on any part of the message, but making the whole message of the same importance.

No variation from the original wording of the message can be allowed, when repeated by an employe, but it must tally, word for word, with the written order in the order book, then it will come from all men repeating it in precisely the same language as given.

It would be useless to discuss the subject of electric block signalling systems, as applied to trolley lines, and used alone as an operating measure, for none of the systems now shown possesses the first principles of a safe device.

No signal should be used as a running measure, wherein any wire or part, necessary for the operation of the signal, can be disconnected or broken, without the signal coming immediately to danger. A signal that does not do this is not worthy of even a moment's consideration.

At best, an electric signalling device, dependent for its means of operation on either the car or crew, should not be used as an absolute running signal, but only as a cautionary measure. Experience has proved this, and it matters not if some roads, who have used such signals, have never had an accident by their use, the time will come when too much dependence will be placed on them, and serious results will follow.

It would no doubt be very beneficial to the subject in question if the managers of the various railways of the country employing dispatchers would, during the coming winter months, send their dispatchers to a convention held for the purpose of discussing the question of safe operation, under the train order system, and also to adopt a set of rules and forms for the government of all the companies represented, and which, in their opinion, will be consistent with safety, and also make their association permanent, so that from year to year they may make such amendments to the rules adopted as they may deem advisable.

The President: Mr. Hart's paper and the discussion by Mr. Wilcoxon of Rochester are so closely related that we will take up the discussion after Mr. Wilcoxon replies to the topic of "Car Dispatching." The next order will be Mr. Barnes' paper.

Crossings of Steam and Electric Railways.

BY CHAS. R. BARNES, ELECTRICAL EXPERT, NEW YORK
STATE BOARD OF RAILROAD COMMISSIONERS.

The danger caused by railroad operation at grade crossings of streets or highways is directly proportionate to the number of trains operated on railroads and the amount of pedestrian and vehicular traffic on the street or highway.

Before the introduction of street railways every city or village street or country highway had a natural and legitimate amount of travel over it. This travel increased in the same proportion as the population or the business of the section through which the street or highway was located. This condition was changed by the introduction of the electric railroads. A line of cars operated through a city street usually affects the pedestrian traffic in a section on either side of it, increasing the number of people who pass over the street through which the electric railroad tracks are constructed, and to a like extent reducing the number on the streets in the territory which is tributary to this particular street car line.

For example—three city streets extending parallel with each other, with a line of street cars operated through the center one, all of them crossing a steam railroad at grade, there would, most invariably, be more people cross the steam railroad track on the street through which the electric cars were operated than on either of the others, even though the population were greater on either one of the other two.

This holds good in the case of parallel country highways, and perhaps to a greater degree for the reason that the suburban electric railroad reduces the number of vehicles in use on the highways tributary to it.

The above statements tend to prove that the introduction of the electric road has caused a greater number of people to cross over the grade crossings of steam railroads on the streets or highways through which they are constructed than did before, increasing the liability of accidents at these crossings and decreasing it at others. The danger is still further increased from the fact that a large percentage of the people passing over these crossings are in a car and if an accident occurs more people are liable to injury than though the same number crossed the tracks in the usual manner. In addition to the liability of injury to passengers, in an electric car, must be added the possibility of derailment of the steam train and the resulting possible injury to its passengers. Another feature of the operation of electric cars over steam railroad tracks which must be taken into account when considering the increased danger incident to such operation is the fact that the passengers in a car cannot exercise their judgment as to the safety of going over the steam tracks at the time, but must depend entirely upon the judgment of the two men operating the car.

Grade crossing accidents are usually the most serious ones which occur on electric roads, and in most cases result in loss of life. It is not necessary to use arguments or cite cases to impress on the minds of electric railroad managers the dangers connected with

grade crossing operation. They all realize the danger and have taken precautions to prevent accidents at such crossings on their roads. In most cases the precautions taken are not sufficient to prevent accidents and are of such a nature as to give the manager a sense of security which does not really exist. He reads in his morning paper of the Cohoes or the Newark grade crossing disaster, expresses sorrow for the passengers who were killed or injured, sympathizes with the manager of the road and congratulates himself that no such accident can occur at his grade crossing, for all of his motormen bring their cars to a stop and the conductors go ahead and pilot them across the steam tracks. In addition to this, the crossing is equipped with gates and the steam road company has a man there to operate them at all hours. That manager is sincere and honest in his conviction that his cars are operated over the grade crossing in a safe manner, and if an accident occurs at that point he satisfies his conscience with the statement that he has made the crossing as safe as possible and the accident was one of those, incident to railroad operation, which could not be prevented and which will happen as long as railroads are operated.

The investigation of accidents for a number of years shows that the above conditions which led the manager to believe his crossing safe added an element of danger rather than diminished it. The rule referred to is a good one if the instructions in it were properly complied with. This is not done. If this statement is doubted, let any railroad manager go on some road where he is not known and watch the operation over grade crossings. He will find that in most cases the rule is complied with in a perfunctory manner. He will find that the usual custom is for motormen to slow up within a few feet of the crossing, the conductor will run ahead about even with the front end of the car and usually hold a conversation with the motorman until they reach the first rail of the steam track and he will board the car and it will proceed over the crossing. I do not wish to be understood that this is done in all cases, but my observation is to the effect that this is the method in a large majority of cases. Complying with the rule in this manner adds an element of danger to the operation for the reason that if the conductor remained on the rear end of the car the motorman, for self-protection, would exercise more care than he does when the responsibility for the safety of his car is placed on the conductor, who does not know the condition existing on the steam track.

The operation of gates at a grade crossing of steam and electric railroads adds an element of danger to operation at that point, for the reason that gates are placed at grade crossings of steam railroads for the purpose of preventing pedestrians and vehicles from going over the steam tracks when a train is approaching the crossing. I know of no case where gates have been placed at crossings for the purpose of preventing an electric car from going on to the steam tracks when a train is approaching. These gates are usually operated by men in the employ of the steam railroad companies who are in no manner responsible for the safety of electric cars in going over the crossing. Accidents have been investigated where motormen have run through the gates and several accidents have occurred by gatemen raising the gates on double track roads after a train had passed the crossing in one direction and another approaching in the other, the gateman not seeing the latter one. Where crossings are equipped with gates, motormen and conductors will invariably become so accustomed to their use that they will depend upon their position as an indication of the conditions on the steam track. The most serious accident at grade crossings of steam and electric railroads in this state occurred at a crossing equipped with gates. There were 33 passengers on the electric car, 13 of whom were killed outright and 16 injured. Within the past three months an accident has occurred in this state at a crossing equipped with gates. The crew of the electric car operated it in the manner described above, the motorman slowing up approaching the crossing, the conductor running ahead to the front end of the car, a train was passing in one direction at the time and the gates were lowered for it. As the rear end of this train was going over the crossing the gateman raised the gates, not seeing another train approaching on the opposite track from the other direction. The crew of the latter train was attracted by the train which had previously passed over the crossing. Both the motorman and conductor when seeing the gates raised took this as an indication that

the crossing was clear for them and proceeded. From where they stood, had they looked, they could have seen the train approaching for 1,500 ft. They did not do so, depending entirely upon the condition of the gates, with the result that their car was completely demolished.

The board of railroad commissioners, acting under the authority conferred upon it by the laws of the state, has caused an examination to be made of every grade crossing of steam and electric railroads in the state, as to the physical conditions at the crossings and approaching them on both roads; the distance a view of the steam tracks can be had from the electric tracks; the number of trains operated on the steam road and the headway on which electric cars are operated over the crossing. The commission, realizing the liability of accidents at these points, and that the most perfect rules as rigidly enforced as possible were not sufficient protection at these points, even where gates were maintained, have ordered additional protection at these crossings. In cases where the traffic on the steam and electric roads warranted, they have ordered derail switches operated from a tower; in other cases where the traffic was not so great they have ordered derail switches, to be operated by the conductors of electric cars, the levers for operating these switches placed in such a position that the conductor must go onto the steam tracks before they can operate the derail. They have also ordered, where necessary, special work cut crossings and at all crossings copper troughs placed on the trolley wires.

There are at present 410 crossings of steam and electric railroads in this state; 164 are under or over grade, and 246 at grade.

The ideal protection at the crossing of steam and electric tracks consists of derail switches, in the electric tracks, interlocked with home and distance signals on the steam road arranged so that after a train has reached the home signal the derail cannot be set for an electric car to proceed until after the train has passed the crossing. In the case of a steam road with more than one track, this condition to hold good when a train approaches a crossing on a track over which trains are usually operated in the opposite direction; the home and distant signals to be set at danger before the derail can be set on the straight track and these interlocked so that the signals cannot be moved to safety until the derail is set at derail; semaphores rigidly connected with the derail switch both normally set at danger; a metal trough on the trolley wires extending over the steam tracks a sufficient distance to carry the rear end of the electric car clear of the steam track in case the trolley wheel leaves the wire; a first class special work cut crossing and all of the signals and derails to be operated from a tower located where the towerman can have an unobstructed view of the steam and electric tracks. In addition to the above equipment safety of operation requires that the derail and signal on the electric track should not be set for the electric car to proceed until the conductor has gone ahead to the center of the steam tracks and signalled the towerman to operate them. In addition to insuring the stopping of an electric car, before going over the steam tracks in regular operation, derails are necessary to safe operation on grades descending to steam road crossings, for the purpose of preventing runaway cars from going onto the steam tracks. Several accidents in this state resulting from this cause would have been prevented had crossings been equipped with derails. Metal troughs are ordered by the railroad commission to be placed on the trolley wires for the purpose of insuring the supply of power for the operation of cars over steam tracks if the trolley wheel leaves the wire. In this case, it is caught by the metal trough which is in metallic contact with the wire and the wheel receives current from the trough. This device is necessary for safe operation of electric cars across steam tracks.

I find managers of electric railroads throughout the state realize the importance of proper protection at grade crossings of steam railroads. There is, however, in some cases a difference of opinion as to the protection required at these points, but in a majority of cases the derails properly installed are considered by them the best means of protection and the order of the Board of Railroad Commissioners in reference to their installation is being cheerfully complied with.

Considering the large number of grade crossing accidents occurring throughout the country, managers of electric roads in this state are to be congratulated on the comparatively small loss of life and the number of persons injured at grade crossings.

Discussion of Mr. Barnes' Paper.

Mr. Barnes was asked whether the number of crossings stated includes crossings of switches, and replied, yes. Every crossing of a steam railroad track over which there is any operation, whether freight or passenger, is considered as a crossing of a steam railroad.

It was stated by a member that in his case the company reported one crossing, but there were two or three switches which were crossed, and he asked whether these were considered steam railroad crossings.

Mr. Barnes: Yes. We have had accidents occur at crossings of that character, and my experience has led us to consider them as steam road crossings.

Mr. Hart: I would like to ask Mr. Barnes if he prefers a stop-block or a derailing switch on street railroads?

Mr. Barnes: I do not wish to express an opinion on that. Any means of derailing a car or preventing its passage onto a steam railroad track in the manner described in the paper in my judgment is sufficient protection, whether a stop-block or otherwise.

Discussion on Oil Tail Lights and Street Car Controllers.

The President: The Board of Railroad Commissioners has suggested two topics for discussion here: First, "The Advantages and Disadvantages of Oil Tail Lights for Interurban Cars." I would like to have some remarks upon that subject.

Mr. Barnes: Several accidents have occurred in the state which have been caused by cars breaking down, being derailed, or stopping from other causes, and losing their supply of electric current, leaving them in darkness, and cars following have run into the rear end of them, and the number of those was so great that the Board of Railroad Commissioners has suggested to the managers of the roads the plan followed by steam roads, of having an oil light or signal on the rear end of each car, and especially on suburban or interurban cars, and not only on those operating at high speed, because we have had a number of accidents of that character occurring on what might be termed ordinary interurban or suburban roads. I am glad to state that nearly every road, with a few exceptions, has today its cars of that class equipped with oil tail lights.

The President: The next topic is "Street Car Controllers—Their Proper and Improper Operation."

Mr. Barnes: In that respect, it seems hardly possible that there can be any defect in the modern controller as manufactured by the leading electrical companies in that line of business; but the fact is that in the case of nearly every accident investigated—that is, collisions—the motorman has a stereotyped answer in reply to the question why he didn't bring his car to a stop, and that is, "The brake wouldn't work, and I tried the controller and that wouldn't take." In some cases I have come to the conclusion that that is the fact, whether through inexperience in its use or lack of knowledge of its construction, or because of an inherent defect in the controller itself. The matter is one which will bear discussion at this convention.

Mr. Cole: I think there is no question but what with all mechanical appliances, especially those with as many moving parts and as many working parts as a controller, there is some chance for a defect; but I think that necessarily has to be taken care of in the inspection. The system should be such that when a motorman turns his car in at night that car should be either absolutely reported O. K. or defective, and a system that will check off the repairs to the car before it goes out in the morning, showing what inspector made the repairs and that it is turned out O. K. It is entirely upon the inspection in the car barn to keep it in order.

Interurban Service.

The President: We will proceed with the different topics as suggested by Mr. Vreeland last year: "Interurban Service," divided into three heads: "a—Standard Equipment." Mr. C. Loomis Allen of Utica has kindly consented to open this topic.

Mr. Allen: Standard equipment for the successful operation of interurban lines is a question that is a very large one. Today within the limits of the state of New York you can visit each inter-

urban system or interurban line and you will find operating there as many different types of cars and as many sizes and types of motors as there are roads. Whether it is possible to adopt a standard car for interurban service is a question in my mind. Each system or each road has some peculiar conditions that must be dealt with. I have in mind a road operating through about forty miles of sparsely settled farming country, passing through three or four hamlets, and I do not presume that the gross receipts of that property will exceed a hundred thousand dollars in a year. Still upon that road are operated large interurban cars which will seat comfortably 62 people, and that weigh not less than 30 to 35 tons. I cite this instance as that of a road which has purchased equipment that is far greater than the demands of the traffic require. I have in mind another interurban road whose gross receipts are approximately \$650,000 a year, whose service during every day between the termini is never less than 30 minutes, and on Saturdays and Sundays and on all holidays is cut to fifteen minutes and possibly seven and a half minutes. The equipment used on that road is not a heavy equipment so far as weight is concerned, the cars seating approximately 48 people and weighing not to exceed 25 tons light. I cite you these two instances to show you the extremes.

What kind of car and equipment on the car could be used as a standard is a question which I think this Association should take up. Perhaps I might give my personal experience. At the time that the Utica & Mohawk Valley Railway Co. was purchasing cars for the operation of the road the question arose whether long, heavy cars should be purchased, or whether cars of less length and not so great weight, but more of them, should be purchased. A study of the conditions as they existed at that time showed that it was not a long rider we would have to deal with; that we would have to deal with the rider who would be on our cars not to exceed 45 minutes. We adopted a car not of great length and not of great weight. We believe that the people in that particular territory have responded to the service and to the policy which we have used in giving them that service, namely this, that it was not a large car hourly that the people wished, but it was a comfortable car and more frequent service. To be a little more explicit: We could have placed upon our system a car weighing approximately thirty-five to forty tons and seating from sixty to seventy people, and could have taken care of the traffic with hourly service. We have placed upon the system a shorter car and have given half-hourly service. The people have appreciated the increased service and I think have not been discommoded by the use of the lighter weight, shorter car.

As to the electric equipment on a standard car for interurban service, I hardly think it is possible to attain that point. There are so many local conditions controlling; grades, frequent stops, and the alignment of the road should determine the question of the size of equipment to be placed under an interurban car. As to the trucks, I think interurban practice has settled down practically to three types of trucks for interurban service; first, the Master Car Builders truck, which has come into general use; second, the large, heavy truck, as built by the Brill company and sold for heavy elevated service and for heavy interurban service; and practically the same type of truck which is built by the Peckham company.

When we take up the question of trucks the question of wheels comes to us. Those who have been operating cars at fairly high speeds with chilled wheels I think will feel that they have had some experiences that lead them to wish that they could feel sure the wheels that they were operating were thoroughly safe. It has been a question in my mind why it is that we do not get the quality of wheels that we did ten years ago. I am sure that in city service the mileage that we are making today on chilled wheels is not as great as the mileage that we made in the years from 1893 to 1898. The question whether a chilled wheel or a steel wheel is the proper thing to use on interurban cars from an economical standpoint is one that should be investigated very carefully. On the question of safety, I think general practice has shown that there is but one wheel to adopt, namely, the steel wheel. The question of whether the steel wheel is economical or not depends very largely upon the dimensions of the flange and tread; the greater the depth of the flange and its width the greater the life will be that of the wheel. What I have said of the dimensions of the steel wheel is true also of the chilled wheel. Steel wheels that by rea-

son of local conditions have to be designed with shallow treads and with shallow flanges will not, of necessity, give the service that a wheel that has the large tread and the deep flange will give. I think the consideration of safety alone should control the question of wheels. One of the most serious accidents that occurred in the territory surrounding the city of Cleveland last winter was due to the breaking of a wheel while the car was in motion at a speed of approximately forty miles an hour. The body of the car left the trucks completely, and rolled over on its side, and some of you probably will remember the photograph that was shown in the "Street Railway Review" for, I think, the month of March, of a car lying on its back. The photograph was shown advertising the quality of cars of a certain car builder. The question of wheels to me is one of the most serious that we have to contend with in the selection of car equipment.

As I said in the beginning, it seems to me a difficult matter to adopt a standard car. In steam railroad practice this was not so. Steam railroads are built with as little grade and as little curvature as possible. If the trolley road were limited to low grades and light curvatures it would not exist. The trolley has made its success through the fact that it has been possible to overcome grades and overcome difficult locations by the use of very sharp curves. Those two things alone would control in my mind, to a large extent, the question of what the car should be on any interurban line.

Mr. Rockwell: I would like to ask Mr. Allen whether he considers a 1-in. flange sufficient for fifty miles an hour?

Mr. Allen: I have operated cars having a $\frac{7}{8}$ -in. flange and a thickness of three-quarters of an inch at speeds up to fifty miles an hour. We have adopted on the Utica & Mohawk Valley the standard Master Car Builders' wheel with this exception, in the width of the tread. Our flanges are $1\frac{1}{8}$ in. in depth, $1\frac{1}{4}$ in. in thickness, and our tread is $2\frac{3}{4}$ in. Our special work has been designed and built for that. We have operated chilled and steel wheels over old girder rail sections which had originally only a depth of 1 in. from the head, which was difficult and which beyond doubt was expensive as far as the item of power was concerned, because the car was riding practically on the flange. But since that time we have been operating those wheels and not confining them to any one piece of track, but have operated them all over our whole system. There is not a double truck car in the city of Utica today that has not wheels having a flange of $1\frac{1}{8}$ in. depth and $1\frac{1}{4}$ in. thickness. We have chilled wheels in city and suburban service that have operated 36,000 to 40,000 miles, while wheels having a flange of only $\frac{7}{8}$ or $\frac{3}{4}$ in. depth have not given, on the same roads and the same streets, exceeding 20,000 to 25,000 miles.

Mr. Rockwell: I had not reference so much to mileage as to safety. The question in my mind is whether a $\frac{7}{8}$ -in. flange is sufficient for a speed of fifty or sixty miles an hour. Of course, you have had the same experience we have all had, in regard to having many sections of girder rail on which we could not use a deeper flange, and, of course, we are obliged to use what we have on hand oftentimes. In T rail construction, of course, we do not strike the same difficulty. Our T rail work or special road work will carry almost any type of flange, but girder rails will not. The great difficulty I find with the Trilby rails is to keep them clean, and I find that there is a great liability of springing an axle. In spite of all the care taken oftentimes the tracks will not be all alike, and if you do any interchanging with steam roads you will find many times cars that will not track at all; you will find the flange resting in such a way on the side that you are very likely to strain an axle. We use a 3-in. tread altogether.

Mr. Allen: I do not consider that the flange is the only dangerous point in the wheel. In fact I believe that the tread is just as great a source of danger, if not greater, than the flange. The flange trouble may occur in a steel wheel, although not to quite so great an extent as it does in the chilled wheel. But there are certain classes of accidents that we have connected with the tread of the wheel, namely the bursting of the tread of the wheel, that seem to me of far greater importance than the breaking of the flange. As an example, before we could equip our cars with steel wheels we had a case of a wheel bursting and approximately one-half of the rim of the wheel came off while the car was running at the rate of not less than 45 miles an hour, and it came up through the

floor of the car. That it seems to me is one of the most serious points in weak wheels.

The President: "Car Dispatching" is the next sub-head under the title of "Interurban Service." Mr. Wilcoxen, of Rochester, has kindly consented to respond to that.

Interurban Train Dispatching.

BY E. B. WILCOXEN, ROCHESTER, N. Y.

The question of the proper method of dispatching trains on interurban lines has no doubt caused the operating department more worry than any other subject, and although the handling of freight and express has been a little troublesome, it does not touch the vital part of the system as does the dispatching of trains. How are we to dispatch them in order to protect the public, our employes and ourselves? It must naturally drift down to one of three ways—namely, telegraph, telephone or block signal.

All methods have their advantages and disadvantages. We find the steam roads with their private rights of way, two to five tracks, telegraph, block signals, an efficient force of dispatchers—most of whom have spent years in the service and still having accidents. Can it be wondered at that we—with our single track, more frequent train service and stops, first upon and then off the public highway, with very often finances too low to permit the employing of experienced men and the required number of men—should have accidents, and that so many of our interurban superintendents are getting gray?

If we adopt the telegraph, we must naturally adopt the steam road system, which requires a larger force of experienced employes, with increased cost of maintenance. We will have the advantage of almost an uninterrupted service, which it is impossible to get from the telephone on account of atmospheric conditions. Also the benefit of operators and agents paid by ourselves, whom we are able to control and who will give our interests better attention than operators and agents receiving commissions for their services and who devote part of their time to other business.

The electric block signal we can safely say also suffers from atmospheric conditions and mechanical defects and cannot always be depended upon, so if the telegraph or block system is used, our resources must be such as to stand the increased cost of installation and maintenance, and furthermore, other methods must be provided for controlling trains when electric block is out of order. As in steam railroad practice, an automatic block signal system, in conjunction with an efficient dispatching system, would be an ideal situation. The present automatic block signal systems either provide for the operation of the signals and targets through contactors arranged along the trolley wire, which are operated by the travel of the trolley wheel, or through contactors placed along the track and operated by some attachment to the car. The electrical and mechanical difficulties due to the sudden making and breaking of circuits, makes the use of block signals more or less uncertain. Prominent switch and signal builders are endeavoring to produce a system which will use the rails for at least one side of the circuit independent of continuous current running therein, in a manner similar to that by which automatic blocks are now operated on steam railroads. During the past few months experiments have been going on along this line, but the system has not been sufficiently perfected to be put in regular operation. This leaves the ordinary interurban road the last method of controlling the operation of trains—namely, by the use of the telephone.

In the ordinary practice a telephone system is laid out along the railway, telephones placed in stations, agencies, on sidings or carried on the cars, and orders from the dispatcher transmitted verbally by telephone either direct to conductor or motorman, or to agent or operator, and with more or less formality. Train orders thus given vary all the way from an informal conversation between conductor and dispatcher, to a verbally transmitted order from dispatcher to operator, taken down on proper blanks, repeated, O. K'd, signed for and completed, strictly according to steam railroad practice. All railroads endeavor to have the verbally transmitted orders so worded as to remove, as far as possible, chances of misunderstanding, and the length to which each suburban road management goes in obtaining this end, depends largely upon personal characteristics and local conditions.

The Rochester & Sodus Bay division of the Rochester Railway system has been in operation four years, using the telephone system of dispatching trains. It is a single track line, extending from Rochester to Sodus Point, a distance of 40 miles, 13 of which is on private right of way with sidings every mile, a majority of which are used only for freight, and meeting points when trains become late.

Telephones are in agencies at each village, in sub-stations and on each car, and plugging boxes are placed at every siding. The dispatcher is located at Rochester, the western terminus of the division. Train crews receive written orders issued in triplicate form, motorman, conductor and dispatcher each retaining a copy. Meeting points of regular trains are denoted by heavy face type on time table, and which govern all regular trains when on time. The dispatcher keeps train sheet showing location of trains, which are reported by sub-station attendants at Ontario, 18 miles out, and at Sodus, 31 miles out. Conductors report the arrival and departure of trains at Sodus Point, the eastern terminus of the line.

Standard steam road signals are used with the following exception: No signal is used on rear end of a train during day, and only one red light at night.

Watches are inspected every three months, and train crews are examined twice each year. Train crews report for orders and register at each sub-station and at terminal points. They also report at meeting points when opposing train is late, and when unable to make meeting place on time. Agencies are equipped with red flag and lantern, which are displayed when train orders are to be given. At sub-stations and agencies the attendant or agent acts as operator, writing the train order in triplicate form, retaining a copy, and, after repeating to dispatcher, delivering two copies to conductor, who repeats to dispatcher, who in turn repeats to motorman with proper O. K.

On sidings the conductor acts as operator, and after repeating to dispatcher delivers a copy of the order to the motorman, who repeats to dispatcher for O. K. Train orders are numbered consecutively each day, commencing at midnight with No. 1. Extra trains clear regular trains at meeting points by three minutes. Trains are run under a number which is displayed on the left side of the front vestibule, corresponding with the same number on the official time table.

The motorman on a train carrying signals, when passing another train, sounds his gong or whistle three times, to call the attention of motorman on opposing train to the signal carried, and which is answered in the same manner by the motorman on opposing train. Should the motorman carrying the signal fail to get the answer, he immediately stops and calls the attention of the other motorman to the signal carried.

When the telephone service becomes defective and train crews are unable to get the dispatcher, the following rules immediately go into effect:

First class regular trains wait at meeting points until opposing train is five minutes late, then proceed with caution until opposing train is met. "Proceed with caution" means that conductor will go forward and flag all curves. We do not give trains going in either direction an absolute right of way, as we have found it safer to require both crews to proceed with caution.

When regular trains proceed after waiting the required five minutes, they are not allowed to make up time, but must run at least five minutes late until the opposing train is met. Second class trains wait at meeting points for first class trains ten minutes, and then proceed in the same manner. West bound extra trains immediately lose their rights as extra trains, and always follow west bound regular trains as second sections.

We have found this method of car dispatching to work very satisfactorily.

Discussion of Messrs. Hart's and Wilcoxon's Papers.

The President: We will take up this topic in connection with Mr. Hart's paper.

Mr. Barnes: In regard to the train dispatching matter the two able papers that have been presented here are on the right line. I do not know of any department in the operation of electric cars that needs more overhauling and revising and improving than the one under consideration. Nine-tenths of the collisions that are occurring on electric railroads today are the direct result of defects in train dispatching. It is a branch of the operation which should

be improved for the protection of the public and for the financial interests of the companies. I was very much interested in both papers. The first paper presented included a new feature and one which has not been considered, and that is where a train dispatcher makes a mistake, providing a means of rectifying it before a collision occurs; and with the class of train dispatchers that necessarily are employed by electric roads that is liable to and does occur. As an additional means of preventing an accident caused by a mistake on the part of the train dispatcher, I think a safer and easier method of preventing collisions in such cases would be that the train dispatcher should be able, either through switches in his office or by direct communication with sub-stations or the power-house, to shut off the current on the trolley wire, so that if the train dispatcher has made a mistake no collision will result from it.

A serious question, and one which should receive proper consideration, is whether it is advisable to give trains operating in either direction a superior right on electric roads. In deciding that question the class of employes on electric railroads must be taken into consideration. While that is the plan employed by steam roads, with their experienced engineers and conductors and train crews, it is a question whether today accidents would not be lessened by not giving either direction trains superior rights. I hope that the matter will be considered by the Association in some manner. The suggestion made by the reader of the first paper is a good one, that train dispatchers should be brought together and these questions discussed and some plan adopted by them and presented to this convention for its approval. The standardizing of equipment is a good thing, but the standardizing of train dispatching is more important and will prevent more accidents.

Mr. Pardee: On the question of shutting off the power in case of a mistake by the dispatcher, I would like to state that last summer an accident occurred on the Grand Rapids, Grand Haven & Muskegon road in Michigan. A dispatcher found that he had made a mistake and the cars would probably come together head on. He immediately telephoned to the substation and had the current shut off. One of the cars was on one side of a valley and the other was on the other side; they both saw each other, but they had no power to stop those cars, and they came together. If they had had power on they could have stopped, but they came together in a head-end collision on account of the lack of power.

Mr. Hart: I will say that on the Boston & Worcester Street Railway, between Boston and Worcester, they have a device whereby they shut the power off the entire line, whether it be east or west of the dispatcher's office. Nevertheless they have had accidents occur just the same. The only objection that I see to shutting the power off the entire line is that you upset your entire schedule which you want to adhere to as nearly as possible. By a device which has been in use on the New Bedford road for the last two years a system is used whereby they can set a signal at any terminal by telephone communication, and after that signal has been locked in that position so it can not be disturbed by any malicious person, the dispatcher feels safe to run a train against that signal. The signal used is only a 7-in. disk, which is not advisable, in my opinion, not being large enough. At least a 30-in. semaphore should be used, and I believe a constant light should be used in connection with it, and not dependent upon the operation of the signal for the illumination of it.

Mr. Allen: I think what Mr. Barnes has said is practical. I do not think there is a road in this state that has not at some point on its system an interurban line. I think we are all familiar with the good work that the Committee on Rules have done in handing to us the standard book of rules. If it is not out of order I would move that this subject be referred to the Committee on Rules. The motion was carried.

The President: The next topic is "Standard Methods of Fare Collection and Ticket Taking."

Interurban Ticketing.

BY J. E. STEPHENSON, PASSENGER AND FREIGHT AGENT
INTERNATIONAL RAILWAY CO., BUFFALO, N. Y.

Traffic on an electric line is so widely at variance with that on the steam roads that the subject of dealing with it is distinctly in a class

by itself and the problems which it presents must be worked out on entirely different lines.

To begin with, every electric car is at once a passenger coach and a moving ticket office; its conductor, both a conductor and a ticket agent; and its stations are on every street corner, at each highway crossing and, indeed, almost anywhere along the line. With this uncertainty of stations it is easily seen that systems in vogue on steam railroads cannot be applied to electric interurban lines.

In addition to this phase of the question, there is the likelihood that interurban cars will operate over different systems, so that the conductor must be familiar with and meet the regulations of the local lines over which he runs. In short, he may be forced to meet the requirements of several different lines in the operation of his run and must meet the need of the city as well as of the rural traffic. He must know the lines of the city as well as the regular city conductor. He must know the transfer points, the prominent places and, in short, be a sort of a directory. He must operate his car, seeing that passengers board and alight safely; he must collect his fares; he must sell tickets to the passengers between scores of points; round trip fare tickets between all the separate stations, one way fares, cash fares, transfers, etc., all must be handled in accounting and he must carry a full supply of tickets in order to meet the demands of traffic; he must keep his own books, make his own

International Railway Company
LOCKPORT DIVISION.

ROUND TRIP CASH RECEIPT.
GOOD FOR
ONE CONTINUOUS TRIP
Between stations and in direction indicated by bottom line.

TO BE KEPT BY CONDUCTOR.

Subject to Rules of the Company.

| FARE | CITY |
|------|----------------------------|
| 20c | Tonawanda to Buffalo |
| 25c | North Tonawanda to Buffalo |
| 30c | North Tonawanda to Buffalo |
| 35c | Martinsville to Buffalo |
| 40c | Lockport to Tonawanda |
| 45c | Martinsville to Buffalo |
| 50c | Lockport to Buffalo |
| 55c | Niagara Falls to Buffalo |
| 60c | Lockport to Buffalo |

CONDUCTOR'S STUB

ISSUED GOING NORTH.

NO. 1.

INTERNATIONAL RAILWAY CO.

TICKETS HONORED AND NOT COLLECTED.

TO BE KEPT BY CONDUCTOR.

Subject to Rules of the Company.

| FARE | CITY |
|------|----------------------------|
| 20c | Tonawanda to Buffalo |
| 25c | North Tonawanda to Buffalo |
| 30c | North Tonawanda to Buffalo |
| 35c | Martinsville to Buffalo |
| 40c | Lockport to Tonawanda |
| 45c | Martinsville to Buffalo |
| 50c | Lockport to Buffalo |
| 55c | Niagara Falls to Buffalo |
| 60c | Lockport to Buffalo |

CONDUCTOR'S STUB

ISSUED GOING NORTH.

NO. 2.

International Railway Company
LOCKPORT DIVISION.

ROUND TRIP CASH RECEIPT.
GOOD FOR
ONE CONTINUOUS TRIP
Between stations and in direction indicated by bottom line.

TO BE KEPT BY CONDUCTOR.

Subject to Rules of the Company.

| FARE | CITY |
|------|----------------------------|
| 20c | Tonawanda to Buffalo |
| 25c | North Tonawanda to Buffalo |
| 30c | North Tonawanda to Buffalo |
| 35c | Martinsville to Buffalo |
| 40c | Lockport to Tonawanda |
| 45c | Martinsville to Buffalo |
| 50c | Lockport to Buffalo |
| 55c | Niagara Falls to Buffalo |
| 60c | Lockport to Buffalo |

CONDUCTOR'S STUB

ISSUED GOING NORTH.

NO. 3.

reports, and the heavier the traffic, the heavier will become his duties. Then, after his day's work is done, its entire detail must be gone over again in the auditing department and the checking must balance.

So any system which shall be most simple, efficient and satisfactory, should appeal to every interurban passenger agent and officer.

I have for some time devoted much attention to this subject, and in that period many of the systems in vogue have come under my notice, and in each of them I have seen efforts to attain a greater simplicity and efficiency of the scheme of interurban ticketing, and I present to you my personal conclusions on a system of ticketing which, I believe, is carefully surrounded by safeguards and which at the same time is simple and easy of operation.

The system here presented, with a few minor variations, is not entirely new, but, I believe, with the exception of a few interurban lines in the west, is very little known. As a verbal description would fail of its purpose, I have had it prepared and printed in such a manner as to bring out its salient points, and the illustrations accompanying this article will serve to assist in its description, the tickets here represented being reduced to two-thirds regular size.

Illustration No. 1 is the form of round trip ticket carried by conductors and which is furnished to them from the station in books of 100, neatly bound and convenient to carry, a separate book being used for each direction. On the form is shown the various stations between which a ticket may be issued, and on collection of round trip fare from passenger the conductor separates the ticket in the

place indicating on the portion handed to passenger the reading of ticket for the return trip; thus, the ticket shown herewith is partially detached, showing passenger's half is good for trip on return journey "Lockport to Tonawanda." The conductor's stub indicates by index the value of ticket so issued, and the passenger's fare is recorded on the cash register.

It being the custom on the majority of interurban roads to allow free transfer to and from the city system, illustration No. 2 shows method of taking account of interurban passengers carried on city cars. A printed slip is furnished to conductors of the city lines on which is indicated the various stations to which passengers may be ticketed, and on presentation of ticket, this form is issued by city conductor and punched to show stations between which passenger is traveling, together with the date of the transaction, record of the number of ticket presented being entered on the face of the form, which is remitted to the company in lieu of the passenger's fare. A place being provided on the through ticket, the city conductor at the same time records by punch mark that the passenger's ticket has

been honored for city fare and therefore will not be honored again except for ride on the interurban car from junction point to passenger's destination. No. 3 shows return portion of ticket thus treated.

In the case of passenger boarding city car and desiring ticket through to interurban point, the conductor collects only the city fare, transferring passenger to the interurban car, credit for the transfer being allowed to passenger by the conductor furnishing a ticket at 5 cents less than the tariff rate, a place being provided on the round trip ticket for such fares.

A form of receipt or ticket for one-way cash fares collected is shown herewith as illustration No. 4; this form being arranged in a similar manner to the round trip tickets before described.

In addition to the various figures representing amounts of cash fare collected on the road, the company's passenger tariff of one-way rates is printed and is a guide both to passengers and conductors to the proper collection of fare. The illustration shows cash receipt partially separated to indicate receipt for 15-cent fare.

This system of interurban ticketing lends itself easily to the methods of the average interurban road in ticket accounting. The

International Railway Company
LOCKPORT DIVISION.

ONE WAY CASH RECEIPT.
For this Date and Train Only.
This Receipt for Fare Paid should be retained by passenger and shown Conductor on demand.

TO BE KEPT BY CONDUCTOR.

Subject to Rules of the Company.

| FARE | CITY |
|------|----------------------------|
| 20c | Tonawanda to Buffalo |
| 25c | North Tonawanda to Buffalo |
| 30c | North Tonawanda to Buffalo |
| 35c | Martinsville to Buffalo |
| 40c | Lockport to Tonawanda |
| 45c | Martinsville to Buffalo |
| 50c | Lockport to Buffalo |
| 55c | Niagara Falls to Buffalo |
| 60c | Lockport to Buffalo |

CONDUCTOR'S STUB

ISSUED GOING NORTH.

NO. 4.

tickets may be reported by conductors on every trip or on their sheet showing ticket transactions for the entire day; this being left to the requirements of the accounting department.

I do not assume to say that the system of ticketing which I have herewith set forth is the best, or that other systems which I may never have seen have not equal merit; but my opinion as to the strong points of this method is, as I said, formed after a careful study of all ticketing plans that have come to my notice.

The President: As there is no discussion we will proceed to the topic of "Extra Freight and Baggage Service on Interurban Lines." The first head is "Traffic Arrangements with Steam Roads and Boats." That was to be allotted. It was very difficult to find a road in the state that had any extensive arrangements of this kind. I would like to ask if there are any here who have arrangements with steamboats or steam roads that they will respond to this topic. If there is no one here, we will pass to the next topic, "Traffic Arrangements with Other Interurban Lines."

Mr. Nicholl: We have no special traffic arrangement with other

interurban lines. We are running a freight and express business over our own lines, but we are not turning it over to other lines except in one case where we turn it over to a steamboat company, and that is not sufficiently developed to be of any value to this convention. We anticipate in the near future we shall be compelled to make arrangements with other interurban lines for the transportation of passengers as well as freight. We have a number of contracts with other interurban lines or lines entering our city, and possibly our form of contract is a little peculiar. In fact I do not know of any other company that has precisely the same form of contract that we have with other lines in our city. To begin with our policy has been to welcome any reliable promoters who were really going to build a road, to welcome them to our city and to the use of our tracks under proper restrictions. One of the restrictions is that we retain the right to change the crews at the point of junction. That is, although we generally allow their crews to come into the city, at the same time we retain the right to put our own crews on their cars; and the crews of the entering company have to be under our orders and under our control. I presume the main feature of all these contracts is the same in that respect. But the point as to the compensation to be paid to the city road is the respect in which we are peculiar, and that is this: we require the incoming road, in consideration that they are allowed to do such traffic as they wish on their streets, to pay us the gross earnings on that line. They can pick up passengers or drop them off anywhere, or do a city business on the street on which they come in, but if the car earnings on that line are twenty cents we require them to pay us twenty cents for the use of track and power. They supply their own cars and provide their own men to run the cars and indemnify us from accidents. This is peculiar, inasmuch as I think as a rule the companies are charged a fixed rate per car-mile and the expense of running the cars is divided and the interurban company is required to pay to the city company so much for each passenger it picks up—about half or a little more or something of the kind. That is the main difference between the contracts. We not only give the incoming road the right to use our tracks and use our power and to do the same business that we do on those streets, but we give them the right to transfer. They issue a transfer which is specially designed or colored, upon which we carry a passenger to any part of the city or any other of our 5-cent lines, and in turn we agree in some cases to sell their tickets, where it can be done, to some resort point or something of the kind, or amusement point. Of course, we cannot carry a full line of tickets for a road extending from Rochester to Syracuse for all the way stations; but our conductors are allowed to carry, as a rule, one set of tickets to some special point without the city. Those tickets we sell and we take up their coupons. The transfers that they issue, the special colored transfers, which we take and which we honor and the coupons which we take up of theirs are redeemed at one half fare. We think that is fair, because we carry the passenger from some point in our line to the center of the city or to the connecting point with the suburban line, and we charge 2½ cents for carrying them there. And when they bring a passenger into the city or pick up a passenger in the city, they issue one of their own transfers and they redeem the transfer at 2½ cents. That evens up the matter of fares. It has been suggested by some of our friends that our arrangement is a little hard on some of the interurban companies; but when you come to figure out the privileges that they are getting without first cost, in obtaining rights of way through the city, and the value of the franchise, and the amount of fixed charges that we have to pay on the installation of the property, and power, etc., I think you will find that it is not very far out of the way. We have found it to work very satisfactorily to the companies that operate in that way.

The President: The next subject, and the last, is the "Development of Freight and Express Service," by Mr. Seixas.

Freight Development by Interurban Roads.

BY E. F. SEIXAS, ST. CATHERINES, ONT.

"The transportation service performed by the railroads includes the movement of freight, the carriage of passengers, and the transmission of mail and express matter. Each of these services merits

careful consideration. Whether viewed from the standpoint of public benefit, or considered with regard to the volume of business done and profits received by the company, the transportation of freight is the most important service performed by the railroad. The income from the passenger business is about one-fifth of the total income and earnings of the railroads in the United States, while the receipts from the freight amount to seven-tenths. Moreover, the social welfare is more dependent upon cheap and unfettered movement of commodities than upon inexpensive and speedy means of travel. Now, however important it may be that the relatively few people who may at any one time desire to take a journey should be able to reach their destination promptly and comfortably, it is of incalculably greater consequence that producers should be able to dispose of the commodities upon the sale of which their livelihood depends and that consumers should have the power of drawing upon distant as well as near sources of supply for the satisfaction of their wants and the gratification of their desires.

"The volume of freight transported increases rapidly with the progress of civilization and the diversification of men's wants. The freight business is carried on to enable men to secure what they want; and the more complex their demands the more goods will be produced and transported. The growing demand for the freight service has furnished a most powerful stimulus to inventors and engineers to lessen the obstacles to the movement of commodities by improving of tracks, cars and locomotives, and making other changes in the railroad mechanism whereby the costs of transportation have been reduced to their present small amount. Whether the endeavor of railroad companies to increase the speed of their passenger trains or their efforts to lessen the cost of freight movement have been the more potent incentive to mechanical improvements, it would be impossible to say; but the results accruing to society from these improvements have come more largely from the greater facilities for the shipment of goods."

So writes Prof. E. R. Johnson in his very excellent review of American Railway Transportation. So much for our friends the steam roads. The conditions that have caused such signal success in the passenger business of interurban lines that depend on electric energy for their motive power are to a great extent responsible for the hearty greeting with which the average shipper, be he merchant or farmer, hails the advent of the trolley, and for the great complaisance with which he views the humming, whizzing cars that frighten his team of colts and send clouds of dust into his wife's otherwise immaculate parlor.

The first condition that tells in favor of the interurban line is the frequent service and the frequent stopping places. The second is that the interurban line is more or less of a local affair, and for that reason is more intimately cognizant of local necessities. In the battle between the piston rod and the trolley pole passenger rates have suffered to a more or less extent, while freight rates have pretty generally remained where they were. The interurban lines have not found it necessary to inaugurate a rate war to get freight business from the steam roads, for they receive and are justly entitled to their proportion of the business on account of the increased facilities.

The present Niagara, St. Catharines & Toronto Railway was originally a steam road, constructed in 1886, and changed to electricity in 1899 and 1900, the first electric car running July 19, 1900, from Niagara Falls, Ontario, to St. Catharines. Prior to the change in 1900 the road had through poor management and consequent poor patronage fallen into the hands of a receiver, and was sold by the courts under the hammer, the present stockholders purchasing and converting it into an electric line, afterward extending the line to Port Dalhousie, and establishing communication with Toronto by steamers, which are also owned and operated by the company. A track connection had by the original company been arranged with the Michigan Central Railroad Co. at Niagara Falls, Ontario, which has been since maintained, and which affords free interchange of cars to and from all points in Canada and the United States, thus forming a line in competition with the Grand Trunk Railway system in the territory covered by the line and its steamers, for which purpose the original line was intended. The gross annual freight earnings of the line prior to 1900, or during the operation by steam, was less than \$20,000, and the freight handled was confined to low classes of carloads, such as coal, this being in fact the principal traffic handled. Very little attention was paid to the higher class traffic, such as package merchandise, and it was not until 1901 that

any marked increase was shown. This upward tendency was caused by an energetic and persistent endeavor on the part of the management to increase the development of the facilities which were practically dormant, in taking care of higher class traffic and leaving low class to itself. The methods of handling had to be improved, system organized, and particular attention paid to the dispatch of business taken hold of. There was no attempt made to reduce rates, the traffic being carried on exactly the same conditions as steam lines under all circumstances. It was found that accommodation to patrons had a great deal more effect than any benefits derived from useless rate-cutting could afford. Cars are placed at convenient points for shippers to load, they are picked up at convenient hours, and shipping receipts are given at the counters of the business firms by a responsible man who has the freight train in charge, thus saving the customer the trouble and time of going to the railway station to make shipments. All this tended to increase popularity and consequently, by increased shipments, revenue, until for the year ending Aug. 31, 1903, we are able to show an earning of 120 per cent greater than in 1900, and an operating expense of 52 per cent, as against a previous loss. The package freight must stay with the electric roads, as their methods will, if properly organized, hold it against steam roads, unless congestion is allowed, when the great advantage of quick handling will be lost. The handling of low class freight involves the expense of terminal facilities, which in large cities is practically prohibitory, and unless there is assured enough freight to keep a regular competitive service against steam fully alive, it is better that electric roads confine their business to the higher classes of package merchandise. With us it is found also that switching service is a source of revenue which if facilities are available is remunerative, we having arrangements to switch loaded cars to and from the Grand Trunk Railway, our competitor, and industries located on our tracks. This service is easily performed, and at a very little expense, the distance usually being short and quickly handled, and it pays because ordinary power is employed at times when we can afford it without detriment to our other interests. There is, in our opinion, ample revenue in the development of freight service for interurban lines provided as above that low class traffic is not sought after too closely and only taken care of when it involves the higher classes. No freight can be handled at a profit that pays less than 1 cent per ton per mile, and even at that figure there is not enough revenue to warrant short haul lines seeking it. To sum up, all that is necessary to make electric lines a factor in freight traffic is seeking high class freight, quick handling, and promptly attending to customers' requests, to secure success.

We have found that working arrangements cannot well be based upon a mileage pro rate unless a constructive mileage is allowed the smaller line, and it is not practicable to do this in our case (although conditions with other lines may be different and groupings may be obtained from connecting lines affording a pro rate) because we are a lake and rail line, peculiarly situated, breaking bulk, and our connections do not favor percentage arrangements. We therefore have worked almost our entire traffic on an arbitrary basis, receiving as our proportion on classes one to six under the official freight classification the following figures, viz.:

| | | | | | | |
|-------|---|---|---|---|---|----|
| Class | 1 | 2 | 3 | 4 | 5 | 6 |
| Cent. | 8 | 7 | 6 | 5 | 4 | 2½ |

per hundred pounds for our haul, whether long or short, and not participating in any reductions made by connections due to competition from various causes. We therefore submit that interurban lines are in a better position on an arbitrary basis than percentage, although the disadvantages of having no voice in rate making without consent is apparent by reason of non-participation in the reduction of rate asked, but this is only a matter of correspondence, we find, and is generally acceded to readily by connections upon representation of the facts. The classes shown above do not cover the low class or commodity traffic which I have alluded to in the first part of this paper, which are carried only by special arrangement between lines interested and generally calls upon the short line to reduce their earnings to merely what it costs to handle, hence the assertion that it is better to leave it alone except where it may carry other higher traffic with it, when it cannot profitably be turned down because the manufactured product might be lost, and as this is highly objectionable. We unfortunately had to take hold of an existing line, with its rates and obligations fixed, and were

unable to alter the existing divisions of rates, although we have from time to time endeavored to do so. Initial errors are costly, and upon interchange being arranged care should be taken to have all traffic arrangements thoroughly arranged by competent men, fully conversant with such subjects. The earnings per ton per mile should be fixed as high as possible, and never allowed to be less than what steam lines earn. Short mileage allows fair revenue, such as our earnings being not less than 25 per cent minimum of through rates, and upon extension of line minimums could be increased correspondingly. Conditions of traffic in Canada differ, however, from those in the United States in many respects. For instance, we have in large centers cartage to perform which is forced upon us by an old existing arrangement made by the Grand Trunk Railway when it was practically the only line in Canada, and which was inaugurated by it to take care of friends. This is a burden, because the expense is not covered by extra charge made above freight rates, part being absorbed in the rate. Another factor of expense in handling is the freight car equipment, which costs interurban lines a per diem rate of twenty cents for every calendar day if foreign lines permit the use of cars. No line should be dependent upon equipment belonging to others, nor should they undertake to do more than deliver on cars at convenient points, unless the circumstances are very exceptional, as every transfer or movement necessarily costs money and increases the operating expenses materially. Rates should be maintained, and although steam roads are liable to cut with a view of forcing the business from electric roads, the public soon find that the competitor is being neighborly enough to try such tactics to force the electric road out of business and then put up its rates with all the old disadvantages of slow time and poor service, that they will not patronize the line adopting such practice. Another commanding advantage to interurban lines is that their business is done on main roads in a number of cases where there are no terminal expenses, unless they endeavor to enter into active competition with steam lines, when terminals must be provided.

The handling of fruit is an important item in our season's business, Toronto being the central market. To handle our heavy freight traffic with the quickest dispatch at a minimum cost has brought us to a point of efficiency whereby we find it necessary to allow our boats only thirty minutes at terminal points to load and unload from five to seven carloads of freight. To meet the requirements of our traffic we built a number of four-wheeled platform trucks, the platform of which is similar to express trucks seen on steam lines, and capable of carrying two tons. On these we load all merchandise and package freight, ready to run aboard the boat on her arrival. The freight she brings in is run from the forward gangway, and the freight for her is run in the after gangway. To handle our fruit traffic with dispatch we have erected at points along the line fruit platforms, on which we keep a supply of these trucks. The farmer drives to this platform, loads his fruit on the trucks, and this is picked up by our fruit train, which consists of flat cars the same height as the platforms, and are run to make connections with each boat. This train is manned with three men who run the loaded trucks from the platform on the cars. At Port Dalhousie they are run directly from the cars on the boat. This prevents handling, which is very damaging to the fruit, and also permits the fruit grower to use a cheaper grade of baskets, thereby effecting a great saving for him.

On the whole, therefore, freight business of interurban lines will pay if confined to the higher class of traffic and particular attention is paid to dispatch and accommodation to the public.

The President I was to appoint a committee of three to act with the national underwriters and the Electric Light Association. I will appoint Messrs. S. R. Storer of Syracuse, W. F. Rockwell, and R. E. Danforth, as such committee.

Mr. Connette of the Committee on Rules I understand will report.

Report of Committee on Rules.

Mr. Connette: This Association adopted the report which was submitted at the last meeting of this Association at Lake George. Since that time the Standard Rules Committee of the American Street Railway Association has submitted a report at its meeting in Saratoga last month, and the report to a large extent was about

the same as was adopted by this Association, so far as the rules governing motormen and conductors are concerned. There were some minor changes made by that committee, but they were not essential. The committee of this New York State Association believe that it is a good idea to recommend to this Association to adopt the report that was adopted by the National Association, because it differed but very little from the one which is already in vogue. The committee would make that recommendation. Now as to rules governing interurban service, it was deemed by the A. S. R. A., we believe, that action upon it should be deferred. However, it will be submitted here, but we suggest that action be deferred until the State Board of Railroad Commissioners can have an opportunity to examine it and pass upon it. We would recommend, therefore, that the Association adopt the report so far as the rules governing conductors and motormen are concerned, and that the recommendations governing interurban service be postponed—that is, that action upon that portion of it be postponed until the State Board of Railroad Commissioners can have a chance to examine it and pass upon it, and that the committee make its final report on the interurban service rules at the next meeting.

Mr. Allen: I move that the report of the Committee on Rules be accepted, and that the committee be continued for another year. Carried.

The nomination committee reported as follows:

For President, G. Tracy Rogers, of Binghamton, N. Y.

For First Vice-president, E. G. Connette, of Syracuse, N. Y.

For Second Vice-president, Addison B. Colvin, of Glens Falls, N. Y.

For Secretary and Treasurer, W. W. Cole, of Elmira.

For Members of the Executive Committee, C. Loomis Allen, of Utica, B. B. Nostrand, jr., of Peekskill, and W. H. Pouch, of Newburg.

President Rogers then addressed the convention declining the reelection as president and stating that while he greatly valued the acquaintance and friends he had made during the nine years he had served as president of the Street Railway Association of the State of New York, as well as the cordial relations which had always existed between him and the other members of the executive committee of the Association, he felt that his personal interests required that he devote some of the time which, in recent years, had been given to the Association to looking after his own affairs.

Mr. W. Caryl Ely addressed the convention to move that Mr. Rogers' declination to be a candidate for president be accepted and took the occasion to pay a hearty tribute to Mr. Rogers and the work he had done for the Association, speaking of the high standard which the Association had reached, a result which he considered to be largely due to the efforts of Mr. Rogers. In making this motion Mr. Ely stated that he knew from personal conversation that Mr. Rogers felt that he should be released from the arduous duties which the presidency of the Association imposed upon him.

This motion having been carried, Mr. Ely nominated for the presidency Mr. E. G. Connette, of Syracuse.

Mr. Connette stated that he appreciated the honor it was proposed to confer upon him, but did not feel that he could, under present conditions, accept the office and if necessary would have to decline the nomination.

On motion the secretary was authorized to cast the ballot of the Association for Mr. Connette as president, which was accordingly done. The other offices were filled as follows:

First Vice-President, A. B. Colvin, of Glens Falls, N. Y.

Second Vice-President, John L. Heins, of the Coney Island & Brooklyn Rapid Transit Co.

Secretary and Treasurer, W. W. Cole of Elmira.

Members of the Executive Committee: C. Loomis Allen, of Utica, B. B. Nostrand, jr., of Peekskill, W. H. Pouch, of Newburg.

Mr. J. P. E. Clark, of Binghamton, moved that the thanks of the Association be extended to each member of the several committees, to the press of Syracuse and the city officials, all of whom had done so much to make the Twenty-first Convention of the Association so agreeable and so successful. This motion was unanimously carried.

Mr. Ely stated that for several years past the Association had had as secretary and treasurer Mr. Robinson, who was one of the

ablest street railway lawyers of the speaker's acquaintance, and that he desired at the proper time to move the appointment of a committee to provide resolutions expressing the appreciation of the Association for the work of Mr. Robinson. Mr. Clark moved that this committee be composed of Messrs. Ely, Cole and Allen, and the motion was carried unanimously. On the motion of Mr. Clark the convention then went into executive session, at the close of which it was announced that Utica had been chosen as the next meeting place.

Entertainments at the Syracuse Convention.

Never has the New York State Association been more royally entertained than it was during the two days' meeting at Syracuse.

The local committee of which Mr. E. G. Connette was chairman had prepared an unusually pleasing program of trips, excursions and entertainment, and each member of the general committee and of the several sub-committees seemed to feel a personal responsibility in the matter of making every visitor feel at home in Syracuse. The members of the local ladies' committee especially earned the thanks of the members and guests for the cordial reception and attention extended to the Association members, guests and ladies. All of the electric railway companies entering Syracuse united in entertaining the convention, those including the Syracuse Rapid Transit Co., the Syracuse, Lakeside & Baldwinsville Railway Co., the Syracuse & Suburban Railroad Co. and the Auburn & Syracuse Electric Railway Co. The convention badge was honored for transportation on the lines of all of these companies during the meeting.

At 10:30 on Tuesday morning a committee of ladies met the visiting ladies in the parlors of the Yates Hotel and accompanied them on a trolley ride in the parlor car "Syracuse" over the lines of the Syracuse Rapid Transit Railway Co., visiting points of interest. The ladies were then taken to Onondaga Valley, where luncheon was served.

In the afternoon the ladies were given a tally-ho ride to Onondaga Indian Reservation and Green Lake Park.

The annual dinner was held Tuesday evening at the Yates Hotel. The following toasts were spoken to: Introduction, G. Tracy Rogers; toastmaster, Charles L. Stone; "The City of Syracuse," Hon. Jay B. Kline, mayor of Syracuse; "The State of New York," Hon. Frank Hiscock, former United States Senator; "Electric Railways and Their Future," H. H. Vreeland, of New York City; "Useful Workers," Hon. Peter B. McLennan, Justice of the Supreme Court Appellate Division; "My Paradoxical Relations—Legislation vs. Street Railways," Hon. John T. Smith, Fishkill, N. Y.; "New York State Commerce," W. Caryl Ely, of Buffalo; "The Ladies," J. M. Wakeman, of New York City; "The Supply-man," E. J. Lawless, of New York City.

On Wednesday morning the ladies were given a trolley ride in special cars to Edwards' Falls over the line of the Syracuse & Suburban Railroad Co.

Wednesday afternoon the ladies, delegates and guests participated in a trip to Skaneateles on special cars over the line of the Auburn & Syracuse Electric Railway Co., a very picturesque and beautiful ride. On arrival at Skaneateles the party was taken on the steamboat "City of Syracuse" for a trip up and down Skaneateles Lake, one of the most beautiful lakes in central New York.

Immediately on arrival at Syracuse after the return trip the party was met by special cars and taken over the line of the Syracuse, Lakeside & Baldwinsville R. R. to Long Branch, where luncheon was served, after which music, dancing and bowling were enjoyed at the Long Branch Pavilion.

About 250 members, guests, ladies and visitors were in attendance during the convention.

Exhibitors and Supply Men Present at the New York State Convention.

The National Electric Co. exhibited a working model of the Christensen air brake. The company was represented by H. N. Ransom and Robert Long, of Cleveland, and J. Cunningham, of New York.

R. W. Conant, of Cambridge, Mass., exhibited the Conant bond tester.

The O. M. Edwards Co., of Syracuse, exhibited the Edwards automatic car windows, Edwards vestibule steps and a new disappearing window for convertible cars. The company was represented by O. M. Edwards, J. E. Simmons and G. G. Norris.

The exhibit of the Consolidated Car Heating Co., of Albany, comprised parlor car heaters, "subway" heaters, cross-seat and other heaters. The exhibit was in charge of C. S. Hawley and S. B. Keys.

One of the largest exhibits was that of the Crouse-Hinds Electric Co., of Syracuse, which showed a new combination arc and incandescent headlight which has just been placed upon the market. This headlight is intended for interurban cars and is designed so that within city limits the arc light may be cut out and the incandescent used instead. The well-known Syracuse changeable headlight was also among the specialties shown.

The Continuous Rail Joint Co. of America was represented by B. M. Barr, who exhibited samples of the continuous rail joint for which this company is favorably known.

The Curtain Supply Co., of Chicago, exhibited a line of car curtains, fixtures and materials under the direction of A. L. Whipple, the New York manager.

An exhibit which attracted considerable attention was that of the Cornell Manufacturing Co., of Syracuse, which is placing a new automatic trolley switch upon the market. The company's interests were in charge of C. P. Cornell, C. B. Forgham, Dr. F. E. Easton and John S. Burdick.

The Bemis Car Truck Co. showed a model of its new double truck No. 45, the company being represented by E. McKerman.

The Ohio Brass Co., of Mansfield, O., had a large exhibit of overhead material in charge of H. M. Garland, New York agent.

The Dearborn Drug & Chemical Works, of Chicago, made an interesting exhibit of several of its specialties. William B. McVicker, second vice president and eastern manager, had charge of the exhibit and was assisted by H. L. Chambers, of Buffalo.

The American Automatic Switch Co., of New York, showed a working model of its device, which was explained by H. N. Powers.

W. A. Dutton, of the Van Dorn & Dutton Co., of Cleveland, was among those present.

The Columbia Machine Works, Brooklyn, was represented by W. R. Kerschner.

The representatives of the American Brake Shoe & Foundry Co. who were in attendance are H. S. Bradfield and Louis Seibold.

T. W. Meachem, T. G. Meachem and A. C. Vosburgh were very active in the interests of the New Process Raw Hide Co., of Syracuse.

H. C. Evans, of the Lorain Steel Co., was in attendance in the interest of his company.

The John Stephenson Co.'s interests were well cared for by its general sales agent, Edward Lawless.

John High, general sales agent of the Pantasote Co., was kept busy greeting friends and booking orders.

Daniel M. Brady, president of the Brady Brass Co., of Jersey City, was an interested visitor.

The Peckham Manufacturing Co. was represented by E. G. Long.

James Perry represented the H. W. Johns-Manville Co.

The Ohmer Fare Register Co., of Dayton, O., was represented by J. H. Stedman, secretary, and C. W. Ketteiman.

C. D. Porterfield, of New York, looked after the interests of the Atlas Railway Supply Co.

National Car Wheel Co. representatives in attendance were E. H. Chapman, eastern sales agent, and Charles L. Jackson.

The Sherwin-Williams Co. was represented by F. A. Elmquist, of Cleveland.

The Taylor Truck Co. of Troy was represented by Frank M. Nicholl, general sales agent.

The J. G. Brill Co. was represented by George Haskell.

Edward P. Sharp was present representing the Lumen Bearing Co., of Buffalo.

Arthur R. Johnson represented Clarence Brooks & Co.

Representatives of the Westinghouse Traction Brake Co. who were in attendance are J. R. Ellicott, C. R. Ellicott, Frederick V. Green and George E. Baker.

The John A. Becking sons Co. was represented by M. R. Cockley and G. W. Swan.

The Westinghouse Electric & Manufacturing Co. was well represented by Paul T. Brady, S. B. Storer, George W. Pulver, F. B. Erwin and J. D. Mickle.

J. C. Calisch, Gibson Carey, Harry Grier, A. D. Babson, J. J. Mahony, H. H. Crowell and J. G. Barry were present in the interests of the Geneva Electric Co.

Berry Bros., the well-known varnish manufacturers, were represented by F. B. Archibald.

The Weber Railway Joint Manufacturing Co. was represented by James Barr.

Bertram Berry represented the Heywood Bros. & Wakefield Co.

D. W. Phelan, of New York City, dealer in poles and ties, was in attendance, also.

Regulating Newsboys.

Under date of September 18th, Mr. John Murphy, general superintendent of the Pittsburg Railways Co., issued general order No. 89 which reads as follows:

"To All Motormen and Conductors:

"On and after September 21st you will not allow any person to board your car for the purpose of selling newspapers within the limits of the cities of Pittsburg or Allegheny, unless he wear a cap as shown in photograph attached. The cap is made of black



REGULATION CAP FOR NEWSBOYS.

leather, with gold letters sewn in the band, and is, after above date, the only badge of authority recognized by this company for the newspaper privilege on its cars in the limits mentioned.

"This cap entitles the wearer to board cars only for the purpose of selling newspapers, and to remain on car only long enough to supply the wants of passengers; it does not allow wearer to ride free from point to point at any time, except as stated."

The accompanying illustration shows a view of the cap referred to in the article.

This action on the part of the Pittsburg Railways Co. will, we believe, prove to be most effective in protecting the company against damage claims arising from accidents to boys on the cars.

Green Bay-Kaukauna Interurban Line.

The Knox Construction Co., which was incorporated to build an electric interurban line between Green Bay and Kaukauna, Wis., by way of De Pere, will build its power house and car barn at Green Bay on property owned by the Fox River Electric Railway & Power Co., and on adjoining property which it recently purchased. The power house will be 90 x 155 ft., with a 10-ft. basement. It will be equipped with two Corliss engines and two Westinghouse a. c. generators. At Wrightstown there will be a one-story substation, 35 x 45 ft.

The car barn will be 60 x 200 ft., and will be located 66 ft. from the power house. Track construction has begun and it is expected that the line will be in operation by next spring.

The Brooklyn Rapid Transit Co. has been experimenting with electric time clocks at terminals and crossings to check the actual running time of cars, with a view of making it a permanent feature of the operating department if its value is sufficiently proven.

The Electric Tramways of Kalgoorlie, Western Australia.

BY S. W. CHILDS, FORMERLY GENERAL MANAGER OF THE KALGOORLIE ELECTRIC TRAMWAYS CO.

In many respects, the continent of Australia offers opportunities for the investment of American capital, energy and brains unsurpassed by but few other countries in the world. This is particularly true of the state of Western Australia, occupying the western portion of the island continent. This section comprises an area of

may possibly be of interest to readers of the "Street Railway Review."

Kalgoorlie has a population of about 30,000 people and the tramway lines were laid out to furnish transportation within the city itself and to the gold fields lying in the outskirts of the city. The



BIRDSEYE VIEW OF KALGOORLIE, AUSTRALIA.

nearly a million square miles, much of which is yet undeveloped, but which has large mining, agricultural and industrial possibilities.

A description of the Kalgoorlie Electric Tramways will suffice to show, as a single instance, what has been and what can be accomplished in the transportation line alone. Although Kalgoorlie is

heaviest business handled by the tramway comes from the miners, who flock to the city in large crowds, particularly on Saturdays and Sundays. The tramway system comprises 16 miles of track, of which 10 miles are double track and 6 miles are single track lines. The fares are collected on the "flat" system, that is, the



POWER PLANT SUPPLYING CURRENT TO KALGOORLIE ELECTRIC TRAMWAYS CO.

situated 400 miles inland from Perth, the nearest seacoast town, this city now enjoys the facilities of an electric tramway system, built and operated according to the latest American practice, and not surpassed as far as engineering features are concerned by any city of similar size in the old or new world. Incidentally, a statement of some of the difficulties encountered in building the system

fare is 3 pence or 6 cents for a ride within the municipal boundaries, and 6 pence or 12 cents to any point outside the city or into the Roadboard district, as the suburbs are called. Cash fares are collected and registered as in the United States.

The tracks are laid in a soil which is practically a good natural cement of ironstone composition, which, though hard to work,



OPENING DAY KALGOORLIE ELECTRIC TRAMWAYS, MAY 20, 1912.



SCENES DURING CONSTRUCTION OF KALGOORLIE ELECTRIC TRAMWAYS.

forms a very good and permanent roadbed. In some cases, excavations for track were made by native laborers with pick and shovel, and in some cases with horse drawn plows. The rail is a 90-lb. girder supplied partly by a Belgian house and partly by the Lorain Steel Co., of the United States. For ballast and road making, residue from the gold mines known as "live metal" was used to good advantage. This is harder than granite and when broken into sizes ranging from $1\frac{1}{2}$ to $2\frac{1}{2}$ in. in diameter and laid to a depth of 6 in. under the ties forms a very hard and firm, yet elastic, roadbed. The rails are laid on ties of "Jarrah" wood, a native wood as hard and fine as American mahogany. This wood is practically indestructible and is absolutely proof against the attacks of the white ants and is impervious to moisture. This is the wood that is now being used with great success as block paving in the streets of London. The ties are 6 x 8 in. x 7 ft 6 in., laid 2 ft. between centers. The rails are joined with six-bolt fish plates with tie rods every 6 ft. The track is bonded with Mayer & Englund double bonds under the fish plates. It is interesting to know that during the track excavation work, gold nuggets were



ALIGNING AND SURFACING TRACK—KALGOORLIE.



INTERIOR OF CAR HOUSE, SHOWING CEMENT TANKS FOR COLLECTING RAIN WATER FROM ROOF.

and taken under the cars to any part of the workshops on the bogie trucks. The workmen stand on the bogies when doing the truck and motor repair work.

Owing to the scarcity of fresh water in this locality, there have been constructed at the car barn two concrete cement tanks running the full width of the building and into which is drained all the rain water falling upon the roof. These tanks are 60 ft. long, 8 ft. deep and 5 ft. wide, and each year they catch and render available about \$5,000 worth of water, which is used for washing the cars and for fire protection. The car house is equipped with a complete system of automatic sprinklers in the roof, the water for the sprinkling system being drawn from the cement storage tanks by a pump and forced to an elevated tank near the car house by which means adequate pressure is maintained on the sprinkling system.

The company own ten double road cars and 13 single truck cars, all of which are of the closed end type, some purchased by the F. G. Brill Co. of Philadelphia. The cars are mounted on Brill trucks and in the case of the single truck bodies they are equipped with two G. E. 28 motors. The double

frequently turned to the surface by the plow—unfortunately, however, not in paying quantities.

For double track lines, the double bracket style of overhead construction was employed with a single line of 35-ft. poles of "Jarrah" wood between the tracks. The overhead brackets were supplied by the Mayer & Englund Co. of Philadelphia. On single track lines single bracket construction was used.

The car house measures 300 x 60 ft. and is equal to anything to be found of similar size in the United States. It is built of steel throughout and covered with galvanized iron. The steel for the building was furnished by the American Bridge Co. The pit arrangement at the car house is novel and is applicable to American conditions. The track rails upon which the cars rest in the car house are carried on cast iron columns 5 in. in diameter resting upon concrete cement piers. There is no flooring, strictly speaking, in the car barn, but all the work is done from the ground level, as will be understood from the illustrations. To expedite repair work, a bogie truck with flat tired wheels is used, which can be moved about at will over the ground level. At the back of the barn on the lower level is a set of cross tracks so that armatures and truck and motor parts can be dropped to this level



CAR HOUSE PIT CONSTRUCTION

truck cars have four G. E. 58 motors to each car, following accepted American practice.

Power is furnished by the Kalgoorlie Electric Power & Lighting Corporation, Limited, which also supplies electric power to the

& Co., of London and Glasgow, and direct connected to a 500-kw. General Electric alternator. These units supply two cycle alternating currents at 600 volts, which for tramway purposes is changed to 550 direct current in two G. E. rotary converters, located at the power house. Steam is furnished by a battery of Babcock & Wilcox boilers using "Australian gum" wood as fuel.

Up to a short time ago practically the only water available for power house purposes was a brackish water obtained from the low levels of the mines, and to fit this for boiler purposes it was necessary to maintain large evaporating and condensing plants. Lately, however, the Kalgoorlie water system has been completed, which is now pumping fresh river water from the coast 400 miles away.

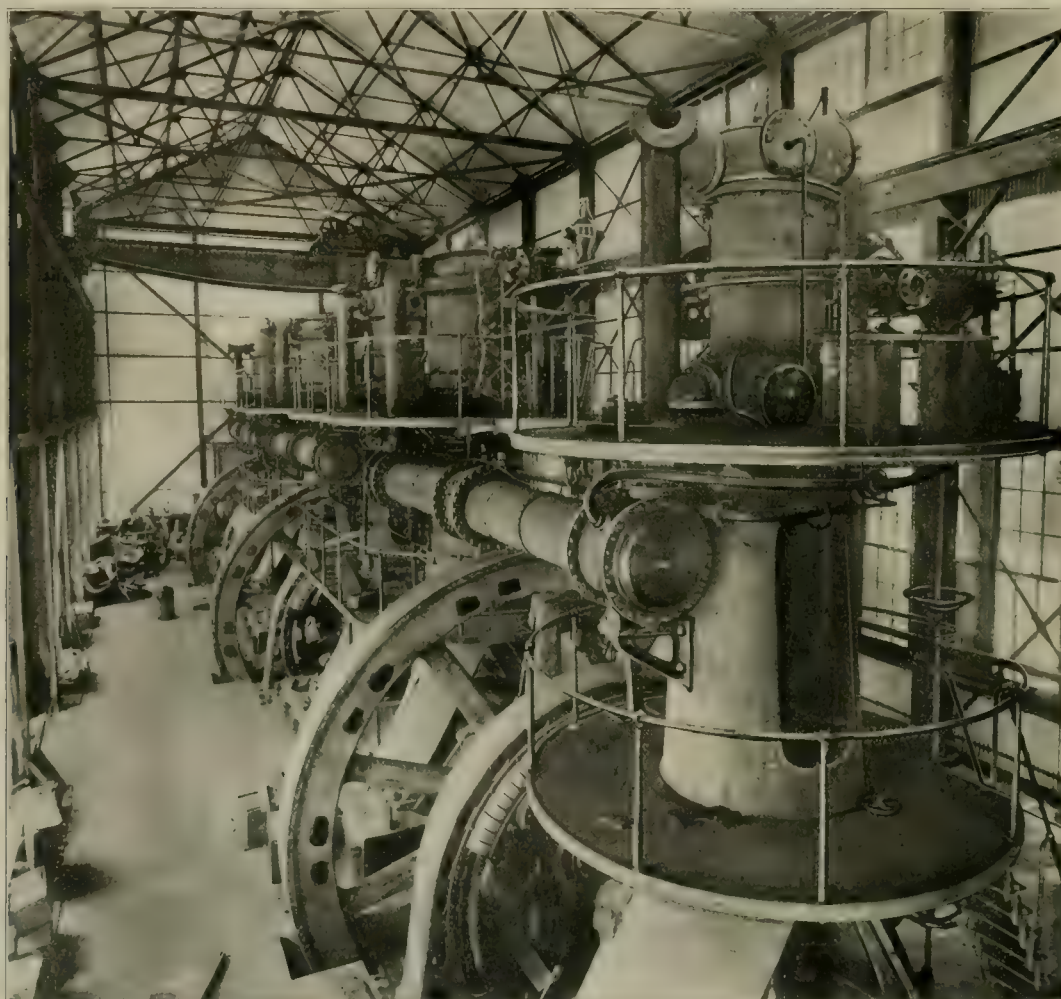
The Kalgoorlie Electric Tramways are owned by a London syndicate, but were built by J. G. White & Co., of New York and London. The tramways were opened to the public May 20, 1902, and on the opening day souvenir tickets were sold for 50 cents each, at which price over 10,000 tickets were sold to the people who were anxious to commemorate the event by riding on the opening day.

One of the difficulties in the way of economical operation is the climate, which is very dry for nine months in the year, these conditions giving rise to severe dust storms, the dust in the air at times becoming as thick as the proverbial London fog. Under these conditions it is difficult to maintain the exterior



CAR HOUSE IN COURSE OF CONSTRUCTION.

neighboring gold mines. This power plant is capable of producing power economically, using during dry seasons water which is practically a saturated solution of ordinary and other salts. The entire plant was designed by J. G. White & Co., Limited, of London, and



INTERIOR OF POWER HOUSE—KALGOORLIE TRAMWAYS CO.

this company later secured the contract for its complete construction, and built a plant which is generally recognized as being unusually well designed. The power house contains three vertical units, each consisting of an 800-h. p. Stewart engine made by D. Stewart

and interior finish of the cars in good condition, and the dust also hinders operation by filling in the groove of the rail. The only way of freeing the groove from this accumulation of dust is to force it out by a stream of water, fed under pressure to nozzles attached



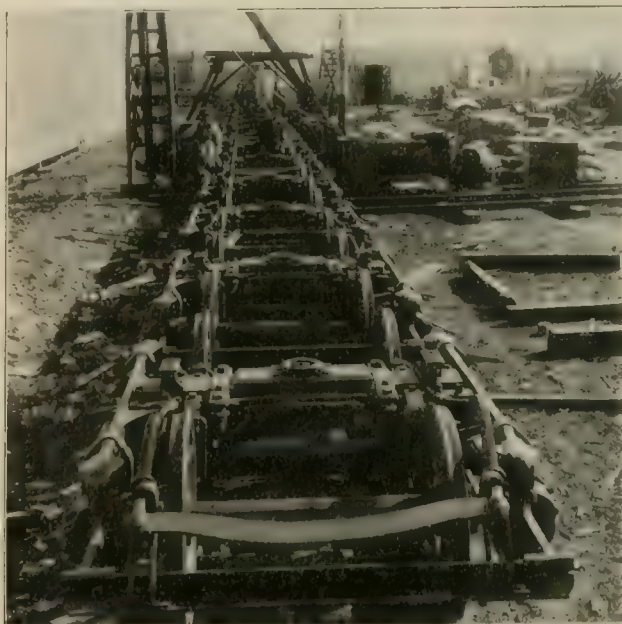
OVERHEAD CROSSING.



GENERAL OFFICES, KALGOORLIE ELECTRIC TRAMWAYS.



ELEVATED TANK FOR SPRINKLER SYSTEM.



FITTING UP TRUCKS KALGOORLIE.



STANDARD SINGLE AND DOUBLE TRUCK CARS KALGOORLIE TRAMWAYS.

to the sprinkling cars. As before stated, the water contains a large percentage of salt, and this is not conducive to long life of rails or motor equipments. The top soil is also saline and very hard on the rails.

Although the cost of building these tramways was very high, due to the transportation and tariff charges, it is interesting to know that the road was built at a cost of \$5,000 per mile less than the original estimate. The cost of living in Australia is high, and



DECORATED CAR—KALGOORLIE—JUNE 27, 1902.

labor is able to demand high wages. Ordinary laborers on the track receive one shilling three pence or 30 cents an hour, and conductors and motormen are paid \$3 a day of eight hours.

Another example of the application of American ideas in the operation of the road is given in the running of decorated cars to commemorate special events. One of these cars, which was beautifully arranged with red, white and blue bunting, is illustrated herewith, and the idea was also carried out by decorating the company's hurry-up tower wagon.

The grade crossing elimination idea has reached into the center of Australia, and one of the views illustrates the "Golden Gate Crossing" at Kalgoorlie, where a crossing at grade was overcome by building an overhead bridge, consisting of steel girder floor beams, resting upon concrete cement abutments.

[Mr. S. W. Childs, former general manager of the Kalgoorlie Electric Tramways of Kalgoorlie, Western Australia, has just returned to this country after an absence of several years. Mr. Childs started in the electric railway business on the old Watervliet Turnpike R. R. at Albany, N. Y. He went to Boston in 1890 and remained in the employ of the West End Street Railway Co. for two years. He then went to Lincoln, Neb., where he was engaged in construction work. He went to Brooklyn in 1892, and was employed with the Atlantic Avenue R. R. under the late Deacon Richardson, well known to many electric railway men of this country. Mr. Childs left Brooklyn to enter the employ of J. G. White & Co., and was assigned to Baltimore, Md., where he had charge of track and overhead construction work. He next went to Columbus, O., and was superintendent of construction for the Columbus Central Railway Co., for which he laid out the entire track, overhead and pleasure park system. He left Columbus in 1896 to take charge of construction work at Fort Wayne, Ind., for the Degnon Construction Co., and in 1898 went to Charleston, S. C., where he had charge of construction work on the electric railways in that city. In the fall of 1898 he went to Australia for the first time and became assistant engineer for J. G. White & Co. in connection with the electric tramways at Perth, Western Australia. He returned to America in 1901 and had charge of construction for the Toledo & Monroe Electric Ry. He left this position to return to Australia as manager of the Kalgoorlie Electric Tramways. Mr. Childs on his recent return trip to America made an extensive tour of New Zealand, the Philippine Islands and a few cities in China and Japan where electric tramways are contemplated or are being built. At each of these places Mr. Childs has added to his large list of friends and at the same time added substantially to his enviable record for carrying out work on a broad

scale with unusual efficiency and energy and with uniformly good results.—Ed.]

When Mr. Childs left Kalgoorlie he was presented an illuminated address signed by officials of the city of Kalgoorlie and Boulder City and representatives of leading interests there. The address read as follows:

"Dear Sir: On the eve of your departure from Kalgoorlie we feel



S. W. CHILDS.

it incumbent upon us to express our sincere appreciation of your undoubted abilities as an engineer, and of the splendid work achieved in the construction of the tramway service in the municipality, and of that connecting this center, Kalgoorlie, with the mines and Boulder City.

"Your untiring energy and genial disposition have won the esteem and regard of all with whom you have come in contact, and the citizens, as a small memento of your stay amongst them, beg your acceptance of the accompanying bag of sovereigns.

"With best wishes for your future success and welfare, we remain, on behalf of the citizens, yours faithfully."

Interurban Advertising in Southern California.

We have received from Mr. H. F. Stewart, assistant general manager of the Pacific Electric Railway Co., of Los Angeles, specimen copies of advertising matter issued by the company to set forth the attractions of its interurban service. The company does a great deal of advertising; in fact, it is believed that no other company does as much display advertising for excursions and visitors as is done by this interurban system in southern California. Folders printed in different colors and illustrated with half-tones are issued frequently, treating of the scenic Mt. Lowe route, "a trip of surpassing grandeur"; Monrovia and Baldwin's Ranch, "the orange grove route"; San Gabriel, "where the Mission bells chime the 'Angelus'"; and Long Beach, "the Atlantic City of the West". These folders describe the trips and picture the scenes en route most alluringly. For the most part the views are tinted, rendering them doubly attractive. For special occasions, such as G. A. R. and other large gatherings, souvenir folders are issued, resplendent with vari-colored lettering and photographs. For Grand Army excursions a red, white and blue scheme is always adopted. The folders vary in size, folded, from $3\frac{1}{4} \times 6\frac{1}{4}$ in. to $3\frac{1}{2} \times 8\frac{1}{2}$ in., either being a convenient pocket size, and each has six pages. On some of them is printed a map showing the Pacific Electric Railway Co.'s lines. From time to time cards are issued containing brief data about the different routes. During a recent gathering of Grand Army veterans in Los Angeles white cards, $3\frac{1}{2} \times 5\frac{3}{4}$ in., printed in red and blue, were distributed and became quite popular.

One of the best things the company has published is a 30-page pamphlet, $4\frac{1}{4} \times 6\frac{1}{2}$ in., containing a rambling description of a jaunt over the company's system, which has Mt. Lowe for one terminus and Long Beach for the other with a side trip to San Gabriel. Each point of interest is seductively outlined in romantic language.

The Pennsylvania Street Railway Association.

Proceedings of the Twelfth Annual Convention Held at Williamsport, Pennsylvania, September 23-24, 1904.

The twelfth annual convention of the Pennsylvania State Street Railway Association was held at Williamsport, Pa., September 23d and 24th. About 65 members, associate members and guests were in attendance and all present were enthusiastic in their expressions of appreciation of the success of the meeting and particularly of the hospitality extended by the Williamsport Passenger Railway Co.—the host of the occasion. Wednesday, the first day of the convention, was devoted to a morning and afternoon business session, and in the evening the attendants enjoyed a "Dutch lunch" at the Park Hotel, provided by the Williamsport Passenger Railway Co. During the evening an entertainment and cake walk was given by a local colored troupe.

Thursday was spent at Eagle's Mere, the party leaving Williamsport at 10 o'clock in the morning by special coaches over the Reading railroad. After a boat ride on the lake dinner was served at Cresmont Inn, and a short business session was then held at which F. B. Musser, general manager of the Harrisburg Traction Co.,

with the demands of the public, much yet remains to be done in providing interurban facilities, especially in localities not now adequately served by the steam railroads. While the present state laws are to a large extent unduly restrictive as to the construction and operation of interurban lines, it would be well for the association to strain every effort to increase its membership and scope of influence, so that when the opportunity is ripe for the passage of revised legislation, our forces will be combined and in shape to take advantage of such opportunity.

As a means of increasing the importance of the association to its members, and to the street railway interests, every possible effort should be put forth to make the membership attractive. If through the efforts of the association, information as to details of operation and management, useful to managers, but not easily accessible—especially to the smaller companies—could be collected and put in shape for ready use, a great step will have been made. Accordingly at this meeting, a Question Box has been started, the



FRANK B. MUSSER.
President Pennsylvania Street Railway Association.

was elected president for the ensuing year. The rest of the afternoon was given over to driving, an impromptu base ball game and other sports, and singing by the "Dolly Gray" brigade. In some unaccountable way the party became confused with the Williamsport Y. M. C. A., which fact gave rise to a musical program which had to be heard to be appreciated.

The first session on Wednesday was called to order at 11 o'clock with President Davis in the chair. An address of welcome was made by John F. Laedlein, mayor of Williamsport, and then followed the president's annual address in which he urged the necessity for every electric railway company in the state of Pennsylvania joining the association and co-operating in its work.

The address in full was as follows:

Address of President Davis.

On behalf of the association, I desire to express our appreciation of the hearty welcome extended to us in the name of this beautiful city, we are all so proud of. Through the energetic efforts of its public spirited citizens, it now ranks among the most progressive of our inland cities.

The object of the association is the promotion of the street railway interests of Pennsylvania. While the development of our street railways in cities—the larger ones particularly—has kept pace



E. H. DAVIS.

results of which will, I am sure, demonstrate its value. Great interest has been manifested, especially on the part of our associate members, to whom the thanks of the association are due. It is strongly urged that our active members take a hearty interest in the discussions which will form part of the proceedings of this meeting, and which to a large extent will be based upon the topics suggested by the answers already received.

The questions, answers and discussions therein are expected to be incorporated in a book, which I am sure will be of great value to the association and its members. More time, however, should be given to this subject than has been possible, and I leave to my successor the duty and pleasure of improving upon the subject, if the same shall be considered by the association of sufficient value to warrant its further consideration.

The meeting adjourned for lunch and reconvened at 2:30 p. m. for the consideration of papers and questions. A paper was presented by John F. Ohmer, of the Ohmer Fare Register Co., on "Fares and Fare Protection".

An interesting feature of this session was a very complete and valuable "Question Box", which was planned and prepared largely by the outgoing president, Mr. E. H. Davis, general manager of the Williamsport Passenger Railway Co., ably assisted by Mr. G.

E. Wendle electrical engineer for the same company. The questions presented covered a wide range of topics pertaining to electric railway construction and operation and the answers brought out constitute a very valuable contribution to the general fund of knowledge concerning the industry.

Fares and Fare Protection.²

By John F. Ohmer.

In opening his paper the author recounted the conditions which have led to the use of the modern fare registers and showed their value both to the public, the street railway companies and the conductors. In the old horse car days a conductor was placed in charge of his car with the understanding that he was to collect as many fares as possible and to return to the company all collections made. He was solely upon his honor and there was no connecting link between the hands of the conductor and the cashier of the company. Because of the lack of some connecting link it was always an open question whether conductors were turning in to the company all the fares collected, and the honest conductor was confronted with the fact that although he might turn in absolutely every fare collected there was always liable to exist some doubt as to his integrity, because of the absence of the missing link referred to. The introduction of the bell punch taught conductors to settle upon the basis of fares registered and it was soon discovered by unscrupulous conductors that to give a fare for each fare registered meant to retain a fare for each fare not registered, and with the portable machine it was found easy to avoid registration.

To provide some evidence to the passenger that a fare was paid the stationary clock register was introduced, but the system upon which it operates remained unchanged. The introduction of tickets and transfers subsequently added complications and increased the opportunities of dishonest conductors. If the conductor registers cash, tickets or transfers together, or collects two denominations of cash fares, it is left for him to determine how many of either kind have been collected. The double register was next introduced, but being practically two single registers enclosed in one case it is operated upon the same principle as the single register, and the conductor is educated in the same way to settle upon the basis of fares registered instead of turning over all collections. The author then illustrated in the case of roads having different rates of fare and various kinds of tickets how several denominations of fares may be turned in so as to correspond with the register reading and at the same time considerable of the actual collections may be retained.

We have consumed what may seem an unnecessary time in reviewing existing conditions of which many or all of you are aware, but this review when brought into contact with what the Ohmer register and system really mean can only bring to you the better realization of what has been solved in working out this perplexing problem. Aside from the Ohmer register and system little or no improvement has been made in 30 years and railway companies are today using practically the same style of "counting machines" which were used when only a five-cent fare was collected. This system was created to meet existing conditions both in city and country lines and it enables the companies to abandon the inaccurate system of bookkeeping on the cars by the conductors, as well as the conductor's reports. The register now makes the report. In addition to this it accomplishes the following objects:

It makes a separate registration for each fare collected, the different kinds of fares being registered separately.

It keeps a separate printed record of the collections of each conductor.

It shows a separate indicator for each kind of fares registered. The fares registered are simultaneously indicated at various places about the car; as the platform, on the inside of the partitions, in special compartments of the interurban cars, etc.

It makes a total registration of all fares, irrespective of the class.

It is easily and rapidly operated.

It indicates the direction in which the car is moving.

It prints the number of fares in each class for each half trip.

It prints the trip number.

It prints the month and day.

It prints the number of the register.

It prints the number of each conductor (and motorman if desired) and shows the platform time he takes and leaves the car.

It fixes the work and responsibility of each conductor, and removes all occasion for disputes. From the register records it shows the various fares in detail which are collected upon interurban cars running over city lines.

It prints a duplicate or triplicate record, showing a summary of the day's business for each car, irrespective of the number of conductors who operate it. The duplicate or triplicate copies may go direct to the treasurer and auditor of the company.

With all this, it is so ingeniously contrived that it is always locked when not in service, and cannot be put into service until the conductor's badge number is first printed upon the statement enclosed in the register. It does the work of an adding machine, a printing press, a time clock and a cash register. It is as valuable and indispensable for street car service as is the cash register for certain commercial enterprises.

In studying out the solution of this problem we did not lose sight of the fact that three interests must be considered: First, the company's interests; second, the public, and, third, the interests of the conductor who is the instrument between the company and the riding public. No system could succeed which in its operation was antagonistic to the public, and the system which affords more or less protection to the public must naturally be in favor and grow in popularity. The indicator is to the passenger a visible receipt for the fare paid, and assures to him his right to destination. It insures to the passenger on an interurban line that he has not been charged in excess of the regular rates. If, however, a passenger should pay a 15-cent fare, and the conductor should register and indicate for a 10-cent payment, the passenger can have his alternative of two conclusions, either the conductor has charged in excess of the regular rate, or has charged the regular rate and receipted for a less amount, by which action it is implied that 5 cents of the 15-cent collection has been appropriated to himself. The moral force supporting the visible indicator for each fare paid will prevent conductors from registering inaccurately just as much as the indicator to a cash register compels the clerk to register the amount received.

Our system is devised to teach and educate conductors to act in the capacity of agent for the company, and as he formerly did before the advent of "counting machines," or registers of any kind. We tell him to count his cash before taking the car, and at the finish of his run to first take out the amount of money he had when taking the car, and turn over the balance to the company. In so doing he can point with pride to the register record (over which he has no control) to back up his integrity. The honest conductor is pleased with the system which protects his own interests.

We contend that every man, woman and child should pass some medium of exchange to the conductor for the ride and that there should be a separate accounting made for each at the time. This is what we do. With our system we teach the conductor to turn in all fares of every denomination he has collected, and having given him mechanical means for keeping a record of all fares his competency will be measured by the accuracy with which his record of fares is kept.

It has been the custom with manufacturers of registers to send them on trial whenever requested, and we have had a few demands from managers for machines on trial. With one exception since we have been in business we have refused to send registers out on trial for the reason that without proper knowledge of how the machine should be operated mechanically and systematically, there would be little hope for success. We consider the mechanical operation of our registers next in importance to the system which it precedes, and it would be difficult to put in successful operation a system by those who have not given the subject sufficient study.

There has been some objection to our manner of putting out machines upon a rental basis, but it is apparent that this register is very expensive to manufacture and market and that if sold the price must be put at a figure which might be considered prohibitive. The rent charged by us has proved to be very inconsiderable compared to the advantages obtained, and the question of costs should only be considered in connection with what one receives for the outlay. The rental charge we make is but a fraction of a cent per hour for

²Abstract from a paper read before the 12th Annual Convention of the Pennsylvania Street Railway Association.

work you could not possibly buy in any other way for 20 times this cost.

The complete "Question Box" with the questions and answers was as follows:

Question Box*

Power House Department.

1. In boiler feed pumps for handling hot water, 200° F. and hotter, what results have been obtained by using ball valves instead of usual flat valves, composition or otherwise?

It is my experience that any pump, handling hot water 200° F. or higher, can be profitably changed over to use ball valves throughout on the water end. The space available for valves may make such change impossible, but in the Dean pump, which is used in our Edison plant, complete equipment of ball valves, with necessary cages, replaced the regular spring controlled disk valves. With the old disk valves, there was always more or less hammering and valves were refaced or renewed regularly every few months. Since ball valves are used, the action of the pump is smooth and there is no evidence of wear on either ball or seat. The balls and seats, ground to fit, were purchased from a local firm. These with a brass casting for cage and a cast iron bushing for old valve seat, represented our entire bill of material. The fitting and lathe work was done by the power house employees. The cost for material was approximately \$1.25 per valve for 2-in. ball system.—Paul A. Hess.

Have always used flat valves, which have given satisfaction.—H. Use bronze flat valves and find same satisfactory.—A.

The Draper Manufacturing Co., Port Huron, Mich., has made a specialty for some years of adapting various appliances to use its line of turned solid and hollow balls. To my inquiry, Mr. Draper writes: "There is no question that pumps of all sizes can be adapted to use ball valves with entire satisfaction, provided these are properly constructed. In making such change, it is absolutely essential that balls be absolutely true and balanced, and of ample weight to keep their shape under heavy service. Above 2-in., hollow brass balls are recommended. With a properly proportioned and balanced ball, it is only necessary to provide a seat ground to fit the ball, and some sort of cage over the ball, rounded up inside at top to the same as the seat below, so that ball in rising will meet with a surface similar to its own shape, and of height sufficient to give proper lift to ball."—Editor.

2. What type of boiler feed pumps have given satisfactory service with water 200 to 210° F.? What is the minimum head of hot water supply above pump suction for reliable pumping service?

Our experience has been that the Knowles double pump works very satisfactorily with water up to 200 to 210° F. Three feet head meets all requirements for hot water.—F. B. Musser.

Knowles and Blake pumps.—H.

Brass lined outside packed, plunger type of pumps. A head of 4 or 5 feet is desirable.—M.

The Worthington Admiralty type. Three feet of head with a short and direct connection of ample size; but with a long pipe or several bends in run, the head should be greater.—A.

3. What is the most economical and reliable method for handling drips and condensation from various classes of steam piping?

The steam loop and Holly gravity return system will accomplish this with the minimum operating and maintenance costs. This system, modified to suit special plant conditions, has been installed in practically all modern, high grade plants.—E. H. Sniffin.

Have used Holly gravity system with satisfactory results.—H.

Either the Holly system, or have drips conducted to a closed tank from which they are returned to boiler by pump, controlled by a float in tank.—A.

Holly gravity return system. In a recent complete efficiency test of a 1,000-kw. modern plant, in which almost exactly 200,000 lb. were evaporated in 24 hours, the Holly system required 2,400 lb. of steam in 24 hours, slightly over 1 per cent of steam generated.—Editor.

4. Is there any type of steam trap which can be depended on for high pressure steam lines?

I understand the Bliss mechanical trap works very satisfactorily on high pressure lines.—F. B. Musser.

Answers signed E. d. for are by the Editor of the Question Box.

The T. K. Kiely trap gives reliable service.—F. B. Musser.

Not only has my experience with steam traps been bad, but I can find practically no engineers who have obtained satisfactory results with reasonable care.—J. O'Toole.

We have found none entirely reliable or satisfactory.—H.

The Pennsylvania R. R. reports reliable service from a special open pan float trap built and guaranteed by one of its steam piping contractors. This trap does not return condensation to boilers, but is generally discharged into an open heater.—Editor.

5. What are relative merits of extra heavy iron and brass for hot feed water piping?

Iron and steel pipe on hot water feed piping is very unreliable, as the hot water corrodes and eats through the pipe from the inside, and also clogs up the feed pipe entering boiler. Brass, on the other hand, is not affected by hot water.—F. B. Musser.

Brass is, in our experience, best for permanent construction.—H.

Brass is preferable where condensed water is used (as iron will pit in a few years); and where there is considerable expansion in short connections.—A.

6. What advantage or economy is obtained by the use of automatic boiler feeding devices?

The use of automatic boiler feeding devices secures a uniform level of water in boiler, thereby preventing uneven expansion and contraction. Such device also makes the boiler steam more uniformly.—F. B. Musser.

We find it best to use regular water tenders to better provide for emergencies.—H.

Inquiry among plants which have used such devices for some years brought out the following statements:

"No trouble, better quality of steam, and saving in fuel over our previous results of 5 to 10 per cent."

"A good investment, absolutely reliable, and practically no repairs necessary. Stops the fireman from filling up the boiler every time steam pressure raises up or blows off. Makes the fireman coal more carefully and watch the draft in order to maintain even steam line."—J. O'Toole.

No economy in labor except in a very large boiler room, but better regulation. They are also advantageous provided with a high and low water alarm to give notice of danger.—A.

7. Is there any damper regulator which will control steam pressure within two or three per cent of normal under railway load conditions?

The reliable makes of regulators will regulate within 3 per cent upon lighting loads; but on rapidly fluctuating railway load, percentage variation will likely be higher.—A.

After thorough trial of several well-known damper regulators, we found none that would control steam pressure closer than five pounds on either side of normal. The damper regulator which gave the closest regulation was one which either entirely closed or opened damper when steam pressure run above or below normal.—J. O'Toole.

Any of the well-known standard makes will accomplish this result, provided fluctuations are reasonable in extent.—H.

Locke damper regulator controls within 2 or 3 per cent under ordinary conditions.—F. B. Musser.

8. What is the best arrangement of valves on individual boiler feed lines in order to regulate water supply, and to permit independent separation of any boiler feed from main supply lines?

Taking valves in order from main feed water line, and assuming 2-in. line to each boiler:

(a) Globe or gate valve, (b) globe valve, metal seat, for regulating supply, (c) ball check, and (d) globe or gate valve. With this combination the only valve subjected to cutting or serious wear can be repaired or replaced without affecting other boilers.—Paul A. Hess.

Loop feeder water mains, with valves in same to cut out individual boilers.—H.

Duplicate mains provided so that sections of mains and pipes to individual boilers can be cut out.—A.

9. What is the smallest size of boiler plant, or minimum coal consumption, which warrants the use of automatic stokers?

From the labor-saving side of the question, a boiler plant will warrant the use of stokers as soon as it reaches a size requiring the attention of more than one fireman. The fuel saving by the use of a good stoker will be a certain percentage over hand-firing; consequently the size of the boiler plant has little bearing on the question

of fuel economy. The labor required for operating the boiler plant is therefore the most important question in determining how small a plant will warrant the use of mechanical stokers, and I would say as soon as the plant reaches a size requiring more than one man for hand-firing, stokers would then be a profitable investment.—E. H. Sniffin.

When the plant requires 1,600 h. p. in boilers for regular service, corresponding to an annual consumption approximating 16,000 tons.

11

A plant using about 40 tons of coal on a single 10-hour shift is the dividing line.—A.

The statement of a number of the large lighting stations, using both automatic stoking and hand-firing, is that automatic stokers offer no especial advantage where plants are burning less than 1½ tons of coal per hour and able to obtain fair steam coal at a reasonable price. The handling of 1½ tons of coal per hour seems to be regarded as the limit for one fireman with hand-firing furnaces, and it would require one fireman to look after a stoker.—Editor.

10. What is the comparative economy, including operation and maintenance, of automatic stokers and hand-firing?

The comparative economy of automatic stokers and hand-firing will be so much affected by local conditions, such as size of plant, kind of fuel, hours per day under full service, etc., that it is difficult to make a definite statement. It is, however, a fair estimate that, under average street railway conditions, with the average size of boiler plant, a properly designed and operated stoker should show an economy, including operation and maintenance, of 10 per cent. and upwards over average hand-firing.—E. H. Sniffin.

Last week we made tests in our boiler house which will interest you. As you know, we have put on one of our boilers — — — stoker, and these people guaranteed us a saving in coal of 10 per cent. against the best hand-firing. At first we made a test of eight hours, the stoker people getting a saving in coal of a little more than 5 per cent. When we stated then to the representative that he had several advantages against our hand-feeding at this test, he requested to have another test of 24 hours. We allowed this, after he had signed an agreement in which we gave our conditions. And one of them was that this test should be considered final. After this test was finished, we saw that we not only worked with the same success with our hand-firing, but had saved 1 per cent. more than the stoker man. The man left my office with the words, "I am a sad buried man." As a reason for his defeat, he claims that besides the good fireman we placed against him, our chimney draft was too good. He stated then that with their stoker they got good results only by using western coal, and where the chimney draft was not so good.—M. E.

The cost of firing boilers by hand or by automatic stokers will at the end of the year be practically equal when the cost of maintenance plus labor is equated for the stokers against the cost of labor plus maintenance of hand-fired grates.—H. S. N. Y.

Practically no difference in total costs, when all repairs, etc., are included.—H.

In one instance, the boiler room cost for hand-firing, including unloading coal, handling ashes, firing and tending water, was 35 cents per ton; and with stokers, 17 cents per ton. The additional cost for repairs to stokers over hand-fired furnaces was 3 cents per ton.—A.

The figures furnished by a number of the Edison stations, in the matter of hand-firing versus automatic stoking, are as follows:

Hand-fired furnaces, 25 to 32 cents a ton to charge the coal under the boilers. Automatic stokers, in connection with overhead coal bins, 6 to 7 cents a ton to charge the furnaces. Repairs are reported from 25 cents to \$1 per h. p. per annum more with automatic stokers than with hand-fired furnaces.

In addition to the above data, the following was submitted by Mr. G. B. Leland: Plant consisting of four 250-h. p. Babcock & Wilcox boilers equipped with American stokers, with induced draft, we found the saving over hand-firing to be approximately 30 per cent, using run of mine coal which cost \$2.35 in the bin, from which we were enabled to obtain the equivalent of 11.25 lb. from and at 212°. The cost of renewals and repairs to the stoker was equal to 25.8 lb. of castings per h. p. per year. The stokers consumed approximately 2 per cent of the steam generated to operate them. On an overload test they would run up to 100 per cent over their rated loads without unsatisfactory results. The stokers cost approximately \$3.50 per b. h. p. installed.—Editor.

11. Are there any automatic stokers which are equally adapted for burning bituminous and small sizes of anthracite coal?

The Roney mechanical stoker has been in operation for the past 5 years at the power station of the Metropolitan Street Railway Co., in New York City, and in other street railway power houses burning both bituminous and anthracite coal.—E. H. Sniffin.

No.—H.

12. Can a boiler be forced as hard with automatic stokers as with hand-firing?

With suitable draft and fuel, it is possible with a mechanical stoker to maintain a higher percentage of overload capacity than with the average hand-firing. Boilers have been fired with the Roney mechanical stoker 200 per cent, or three times their rated capacity, and it is a common occurrence for boilers fitted with this stoker to run as high as 70 per cent above rating continuously for 24 hours with good bituminous coal.—E. H. Sniffin.

No.—H.

No. The fireman is unable to work his fires with an automatic stoker.—F. B. Musser.

Yes, if forced draft is used.—A.

13. Is there any rapid, simple and easily manipulated apparatus for testing flue gases?

Either the Econometer or the Orsatt apparatus.—A.

The only direct reading apparatus which has been tested in power house service and reasonable in cost is a modified balance type, the Arndt "Econometer." This instrument has been tested in power house service by the Chicago Edison Co. and the reports indicate a sufficient commercial accuracy for station purposes. As arranged by this company, samples of flue gases can be taken from any boiler during operation by pipe connecting each uptake with test room, and the efficiency of the firing is continuously shown by the position of the balance pointer on the attached scale showing the per cent of carbonic acid gas present.

This same instrument was carefully examined into on behalf of the Steam Users' Association by Mr. R. S. Hale and his tests and report on this instrument show it to be reliable and a valuable adjunct to the testing equipment of any power house.—Editor.

14. Is there any hot water meter which can be run continuously and maintain reasonable accuracy?

Our experience with hot water meters in the high pressure feed line has been unsatisfactory. The meter seemed to be subject to variable errors and it was impossible to depend on it for continuous records. The meters we tested were run at low loads, but there were frequent breakages of parts and the meters were thrown out of service.—J. O'Toole.

Some impulse meters, similar to the Pittsburg, have given fairly good results.—A.

Meter manufacturers generally decline to make any guarantees as to continued accuracy of their hot water meters when operated continuously on high pressure boiler feed lines. Their advice is to arrange by-pass and only cut in meter for periodical test runs. If so used, the accuracy claimed is within five per cent. This applies to meters of both the displacement and impulse types and is in harmony with the observations of Mr. R. S. Hale on European hot water meters.—Editor.

15. Has the Venturi meter been applied to measuring feed supply to boiler? If so, what results have been obtained?

The Venturi meter has been used on boilers and the results are expected to be satisfactory.—A.

16. Is it easier for the firemen to handle coal from the floor with a long-handled shovel or from a charging car with a short-handled shovel?

From the floor with a long-handled shovel.—H.

The fireman can handle coal from the floor with a long-handled shovel easier, because he can put his weight on the shovel more advantageously.—F. B. Musser.

The practice in the matter seems to be largely one of local customs. The firemen in a plant where method of handling coal was changed from floor dump to charging car state that at first it was much harder to work the short-handled shovel in connection with charging car; but after a little practice this opinion changed. The knack of swinging the shovel secured, the convenience of having all coal grouped in cars in front of furnaces at a distance requiring practically no additional work beyond filling the shovel and throwing into the fire, made this arrangement preferable to the men.—J. O'Toole.

17. What is the boiler room labor cost per ton fired, to cover coal and ash handling?

57.2 cents per ton of coal used.—F. B. Musser.

About 40.9 cents per net ton.—H.

Total labor cost, including dumping from cars, firing into furnaces, and wheeling out ashes, 21 cents per short ton. Coal—run-of-mine bituminous and high in ash.—J. O'Toole.

Our coal, anthracite No. 3 buckwheat, is delivered by carts close to the fire-room. Average cost per long ton for firing and wheeling ashes about 150 ft. is 37 cents.—Paul A. Hess.

18. Which is the better or more economical method of increasing boiler capacity during heavy peak loads—forced or induced draft?

This question must be determined largely by the question of the coal used. With the smallest size of anthracite coal, the best results can be obtained by maintaining a reasonable pressure in the ash pit; while with bituminous coal, induced draft is the more economical method of increasing boiler capacity under heavy peak loads. The combination of induced and forced draft with small anthracite coal has been found very effective. There are some large street railway power plants provided with chimneys of sufficient heights to carry the average load and fitted with induced draft fans, arranged by means of dampers, to take care of the peak of the load, and in effect increase the height of the chimney in accordance with the demands for steam. These fans act as boosters for the draft and are very effective when thus used.—E. H. Sniffin.

Forced draft, because induced draft increases leakage through the setting.—A.

19. Under what conditions is it more advisable to use mechanical instead of natural draft in the regular operation of a plant?

Experience thus far has shown that small or moderate sized boiler plants are benefited by the use of mechanical draft, for the reason that their economy is more affected by a fluctuating load than are large plants where the variations in the load are distributed over a large number of boilers. It is also advisable to use mechanical induced draft in the place of natural draft when economizers are used, to overcome the loss in draft both by the cooling of the gases and by the mechanical interference with their flow. If natural draft is used, a very tall chimney is required, whereas induced draft will overcome the effect of the economizers and at the same time take care of the peak of the load by increasing the speed of the fans at the time of the greatest demand for steam. There are many railroad plants equipped with economizers and induced draft, where the engines operating the fans are fitted with automatic valve on the steam line, which regulates the speed of the fans according to the boiler pressure and the demand for steam. This is accomplished without any increase of attention by the fireman.—E. H. Sniffin

Natural draft is preferable.—H.

A large western street railway company recently substituted natural for induced draft, as it was found that the coal required to drive the fan engines for the latter system would pay for the chimney in a short time.—W.

The plant should have sufficient natural draft for ordinary conditions, and supplemented by forced draft for emergencies.—A.

20. Is there any financial economy in lining steel stacks with brick? If so, to what height should lining be carried and what kind of brick used?

The Bethlehem Steel Co. is reported as having a steel stack, completely lined with fire brick and yet corroded badly.—M. E.

21. What is relative cost of regular brick, special radial brick and self-supporting brick-lined steel stacks from 100 to 200 feet high?

In competition we find Custodis chimneys are about 10 per cent cheaper than well designed common brick chimneys, besides being lighter and requiring less costly foundations. As compared with lined steel stacks, Custodis type is generally cheaper, but there is no way of giving average comparison.—William L. Greeley.

22. Is there any way to protect the interior of brick stacks against cracking and disintegration when boilers are forced and stack temperature approximately 650° F.?

We presume this refers to the cracking noticeable in the inner core of common brick chimneys as ordinarily designed, and where the core usually has a thin wall of considerable height with consequent pressure. The material used in the Custodis chimneys is specially prepared for the purpose and will not crack at temperatures

up to 650° F. Where the temperatures are likely to be much higher and where explosions occur, a sectional lining is used. By so dividing the lining, the expansion is similarly reduced, preventing the lining from cracking. In case lower sections of lining are burned out, these can be replaced without disturbing the upper.—William L. Greeley.

We have experienced no trouble with cracking at 650° F.—H.

- Should not crack under much higher temperature than 650° F.—A.

23. Is there any reliable method of testing soils in order to ensure brick chimney against cracks and other defects, due to irregular settling of foundation?

The most reliable method of testing soil to ascertain its carrying capacity is to impose loads on it, either with dead weight or by a system of levers, and observing the actual settlement. In case foundation is liable to settlement, it should be built of concrete with a grill work of iron rails or expanded metal.—William L. Greeley.

The best plan is to consult and contract with experienced chimney constructing firms, who will examine soil and erect chimney under suitable guarantees covering settling, etc.—H.

24. What difficulties have been experienced with superheaters?

With highly superheated steam, the difficulties are liability of superheater tubes to burn out, and engine lubrication, unless special valve system, like poppet type, is used. Inquiry concerning superheater at a large mill in Philadelphia developed the fact that superheater had been burned out after comparative short service.—M. E.

Experience with superheaters, heating steam up to 800° F., and in service for considerable period of time, indicates that no troubles are experienced other than those due to gross carelessness in management, and the ordinary wear and tear of settings and furnaces. In one case a superheater was damaged by building a fierce fire under it and subjecting it to this severe heat for several hours with no steam passing through. This same superheater has repeatedly had the flow of steam stopped for half an hour at a time, with no damage whatever. With ordinary care, the superheater is easier to handle than a boiler, and fully as durable. I have seen temperatures of 940° and over realized in a separate superheater, for short periods, without damage to engine or superheater.—Richard H. Rice.

With reasonable care, there is no difficulty with gridiron valves, using steam superheated 100 to 105° F., and steam pressure 160 lb.—H.

25. With moderate superheating, not over 150° F., in plant of 1,000 b. h. p., is it more economical or advantageous to install one separately fired superheater or an individual superheater for each boiler?

It is probably more advantageous to install individual superheaters for each boiler within the setting because of the greater economy of burning fuel in large quantities and also in the diminished radiation.—E. H. Foster.

Separately fired.—H.

With moderate superheating, up to 150° F., it is desirable to install a separately fired superheater, because with the individual superheater connected with each boiler the temperature of the steam is highest when the boilers are being forced and load is heaviest, and least when the load is lightest—exactly the reverse of the conditions called for by the engine when operating under the safest and most economical conditions. When an engine is operating with early cut-off and light load the tendency to cylinder condensation is greatest and consequently a high degree of superheating is advisable to overcome this tendency. On the other hand, at late cut-off, a high degree of superheat would be liable to cause damage to the engine, since on account of the diminished tendency to cylinder condensation at the late cut-off, less superheat is used up in overcoming such tendency, and the mean temperature in the cylinder during admission and expansion is therefore higher. For best economy, the temperature of the steam should vary inversely as the load; while the boiler superheater varies it directly as the load. This latter condition forces the use of a lower average temperature than is possible with the independent superheater and therefore makes it impossible to secure the maximum benefit from superheating.

The independent superheater also permits the temperature to be exactly regulated at will, involves less complications of piping and valves and can be more readily repaired and kept in order.—Richard H. Rice.

26. To what extent can superheating be carried safely in plants operating engines with corliss, gridiron, or usual types of valves?

To a temperature of 500° F., corresponding to a superheat of about 150° above the normal temperature of steam at usual pressures.—E. H. Foster.

The Boston Edison Co. uses Babcock & Wilcox superheater and with 100° superheat, and experiences no difficulty in the operation of gridiron valves. Practically all first-class engine builders will guarantee the operation of their valve system and engines to be entirely satisfactory using steam up to 500° F. With steam temperature in excess of 500° F., poppet valves are recommended.—P.

With 160 lb. steam pressure, superheating 100° F. is safe.—H.

Not over 50° F. with corliss or other unbalanced valves.—A.

The extent to which superheating can be safely carried with usual types of valves depends somewhat upon the nature of the service as to variability of load, and upon the type of superheater. With cut-off at about one-fourth stroke and a steady load, 480°-500° temperature of steam at the cylinder is permissible; but if the cut-off goes to one-half stroke, a reduction of temperature is necessary. With the varying loads of street railway service and boiler superheaters, 450°-460° is the highest safe average temperature of steam.

If, however, compound engines, fitted with ordinary types of valves, are supplied with a Schmidt reheater receiver, 500°-600° steam can be safely utilized. The function of this device is to reduce the temperature of the steam passing into the high-pressure cylinder when the load on the engine increases, and to increase the temperature when the load falls off. This is performed by using more or less of the steam in the main steam pipe to superheat to a greater or less degree the steam entering the low pressure cylinder. The heat abstracted from the steam entering the high pressure cylinder is therefore not lost, but used to increase the efficiency of the low pressure cylinder; and the action of the apparatus is to preserve the best conditions in each cylinder for all conditions of load, and to maintain the cylinder temperature within safe limits. This permits of the use of a maximum temperature of superheat at all times.—Richard H. Rice.

27. What is net gain in coal economy by the use of either moderately or highly superheated steam?

Net gain in coal economy has been frequently reported at from 8 to 40 per cent. The more wasteful steam engines show the greater percentage of saving. With an ordinary cross-compound corliss engine, it is safe to count on a coal saving from 8 to 15 per cent, steam superheated 150° F.—E. H. Foster.

A conservative estimate of the saving due to moderate superheating is 10 per cent.—H.

Compared with engines using saturated steam, the use of 150 degrees superheat will save roughly 12 to 14 per cent of steam, and 8 to 9 per cent of fuel; while 300 degrees superheat means a saving of 25 to 30 per cent of steam and 16 to 20 per cent of fuel. These figures are based on actual results. The use of superheat renders beneficial also the use of a high vacuum, the increase of temperature range in the cylinder with superheated steam not involving any increase in cylinder condensation. Curves of steam and heat consumption obtained from various types of engines tested under varying degrees of superheating show that the gain due to the superheat increases more rapidly than the temperature; and it is therefore advisable to carry superheating as high as possible without appearance of superheat in the exhaust. With 140 to 150 pounds boiler pressure, engines of the Schmidt system can use steam at a temperature of 750 to 800 degrees with safety and without superheating the exhaust; and under these conditions and a vacuum of 27 to 28 inches these engines develop a horse power from 8.9 to 9 pounds steam, at rated load; while the variation of economy is less than with saturated steam, under varying load.—Richard H. Rice.

The following data were obtained concerning the economy of the steam plant of Milbourne mills, Philadelphia, Pa., equipped with separately fired Schmidt superheater and Rice & Sargent engines:

Temperature of steam, approximately, 700° F.

Coal consumption per day, using steam at above temperature, 23,000 lb.

Coal consumption per day, using saturated steam, superheater cut out, 32,000 lb.

Approximate net saving due to the use of highly superheated steam, 9,000 lb. coal, or 28 per cent.—Editor.

28. What precautions are necessary to avoid trouble with cylinder and valve lubrication with superheated steam?

Use ordinarily good oil and lubricate positively, or, in obstinate cases, lubricate the cylinder direct.—E. H. Foster.

No trouble if good grade cylinder oil is used and positive feed be used, as with Rochester automatic cylinder lubricator or similar type.—H.

The best quality cylinder oil must be used, and fed positively as by Richardson, Rochester or similar type oil pump.—A.

The only precautions necessary to avoid trouble with cylinder and valve lubrication with superheated steam, are, first, to use oil having a very small percentage of animal or vegetable constituents; that is, to have the oil as nearly as possible as a pure mineral oil, and to have the flash point of the oil regulated in proportion to the amount of superheat which is being used. The higher superheats requiring a flash point of 600 to 650 degrees in air, corresponding to about 700 or 750 degrees under pressure of 140 pounds per square inch. It is also necessary to avoid the use of springs in the piston packing and to arrange the stuffing boxes with cast iron rings, instead of bronze or soft metal. With highly superheated steam it is necessary to keep the stuffing boxes well away from the high temperatures existing in the cylinders, and in some cases to water-jacket the packings to protect them from the superheat.

With this steam it is also necessary to use poppet or piston valves, and to design the cylinder so that the barrel is free from ribs or passages. Lubrication should be by positive oil pumps, rather than displacement cups; and brass, bronze, composition, copper or other similar materials should be kept away from the action of the steam, under which they rapidly deteriorate. All pipes and cylinders should be covered with not less than three inches thickness of non-conducting material of the best quality; and it may not be out of place to mention that recent experiments indicate that this same thickness is economical for saturated steam and pays a handsome return on the investment.—Richard H. Rice.

The Standard Oil Co. recommends Hecla brand of cylinder oil, made, we understand, by the Vacuum Oil Co.—Editor.

29. Does the use of superheated steam require a different ratio of high and low pressure cylinders than for saturated steam?

With superheated steam, a higher ratio between the two cylinders may be used because of the elimination of cylinder condensation.—E. H. Foster.

No. Same engines have been used with saturated and superheated system.—H.

With highly superheated steam, a low ratio of high and low pressure cylinders is necessary, in order to utilize as much as possible the superheat in the high pressure cylinder, and give in this cylinder as great a range of pressure as possible. The use of moderate superheat would involve an intermediate condition; that is, where a ratio of 2.7 or 3.1 would be right for high superheat, and a ratio of 3¼ or 3½ would be proper for moderate superheat.—Richard H. Rice.

30. What type of gasket is best to use in superheated steam mains?

Corrugated brass gaskets have been found to give excellent results. Also woven wire and asbestos gaskets.—E. H. Foster.

Corrugated copper gaskets.—H.

Either ground joints or copper gaskets. No rubber or fibre.—A.

The best gasket for use in superheated steam mains is an asbestos gasket made as thin as possible, and with just sufficient rubber or other binding material to hold the asbestos together and prevent access of moisture to the fibres during the time when saturated steam is passing through the mains.—Richard H. Rice.

We are using corrugated copper gaskets in one of our plants, equipped for moderately superheated steam. This choice was largely due to the experience of the Boston Edison Co. with similar gaskets on its superheated steam lines.—Editor.

Discussion on Questions 24 to 30 Inclusive of Superheated Steam.

President Davis: As I understand the superheated steam question, the claim is made that with a comparatively small investment and using our present apparatus a saving of approximately 10 per cent can be obtained by the use of moderately superheated steam. If that be so, then this subject is one which merits very careful consideration. We are especially favored in having with us Mr. Rice of the Rice-Sargent Engine Company, who has kindly furnished considerable data to our Question Box and is particularly fitted to discuss this subject. It is desired that our members ask such ques-

tions as they may wish, and I would ask Mr. Rice to address himself to the practical man.

Mr. Wendle: What changes, if any, are necessary in the present piping systems in the smaller stations?

Mr. Rice: It would likely be necessary to change gaskets and put on a greater thickness of covering. The flanges should be covered after it is certain that the joints are tight. Precautions would have to be taken in regard to increased expansion in the steam lines.

President Davis: Within your own experience, what has been the effect of 100 degrees superheat in old plants?

Mr. Rice: Where plants have been adapted to the new conditions, no trouble has been experienced.

President Davis: Does the saving amount to 10 per cent under ordinary commercial conditions?

Mr. Rice: I do not think there is any question about it—the actual percentage depends on the degree of superheat.

President Davis: I think this is a most important subject. It is new to me and probably to some of the gentlemen here, and it is desired that no one hesitate to ask questions. Mr. Rice has come a long distance, and I know will be pleased to furnish all the information possible.

Mr. Fairchild: In using superheated steam, is it necessary to make any changes in the valves? Mr. Rice has said there is practically no change necessary in the piping system, except gaskets and pipe covering.

Mr. Rice: I think it would be necessary to remove all the brass or bronze rods. We find a rapid deterioration of such rods takes place.

President Davis: What is the dividing line between moderate and high superheating?

Mr. Rice: Moderate covers temperatures from 400 to 500 degrees Fahrenheit; beyond 500, we call it high superheat. Usually when speaking of high superheat, we mean 700 to 800 degrees Fahrenheit.

Mr. Wendle: We looked up, in this connection, the Milbourne Mills in Philadelphia. Our information was that they had experienced trouble with their superheater. This information made us feel that a small station, considering the grade of help available in the fire room, was trying a dubious experiment in superheating up to 700 degrees.

At Lancaster, I understand, this system is installed complete. We tried to obtain some data from this plant, but they seem either unable or unwilling to furnish any information. I would ask whether any difficulties have been experienced at Lancaster; also to what extent the burnout at the Milbourne Mills was due to defects in the system; and finally whether ordinary help can operate without difficulty a boiler plant which includes superheating up to 700 degrees? Whether any automatic devices are arranged to control the heating and prevent damage to superheater tubes?

Mr. Rice: I referred to the Milbourne Mills in my answer to question 24. In that case the superheater operated some six months and gave absolutely no trouble with temperatures of steam up to 940 to 950 degrees at times. In several instances, the flow of steam was entirely stopped with the fire under the superheater, and the tubes were not damaged. One night a green fireman came on, built a fire under the superheater and finding no indication on the gage, increased his fire. In the morning, when the engineer came in, everything was red hot and the tubes were damaged. Exactly the same thing would happen with a boiler if you started it without water—the tubes would be burned out.

I think a talk with the Millbourne Mills people will convince any one that they are satisfied with the superheater and find it easier to run than a boiler. The only thing you have to watch is the gage showing the temperature of the steam. Automatic devices are provided which open up cold air bars in case temperature runs too high; but if a man chooses he can throw the device out of service and depend on hand regulation.

At Lancaster there has been considerable delay, due to the necessity of removing old apparatus and moving station. After the engines were in service some time, it was necessary to wait until the boilers were removed in order to install superheaters. As a result, they have practically had no continuous operation with superheated steam. On the short runs so far made, the data obtained were entirely insufficient to determine accurately the saving due to superheating.

Mr. Wendle: In your Schmidt system, I understand that you use seamless steel tubes. Mannesman? Another manufacturer uses

thick cast iron, constructed on what is known as the Schwoerer system. In view of the strong claims made for each type, will Mr. Rice state what are their relative merits as to safety, reliability and durability, with special reference to the engineering ability usually found in the smaller stations?

Mr. Rice: On general principles, it is advisable to keep the joints entirely away from the action of the gases. This condition is obtained with the Schmidt superheater, and not generally with the cast iron type. Further, where you expose hot pipes to steam pressure, safety demands that only the best possible material be used. Modern steam pipe practice has settled this question in favor of seamless steel.

Mr. Wendle: In connection with an engine proposition, where the guarantees covered saturated and highly superheated steam, there was a difference of three pounds of steam per i. h. p. per hour. The question then was, how much coal per i. h. p. was required to operate the superheater, not only under full load, but under average load conditions obtaining in railway service? Can Mr. Rice state how much this amounts to—banking and all other items included?

Mr. Rice: That is a difficult question to answer. We have made some tests, but, owing to the illness of Professor Jacobus, we have not received the final results. In general, about .15 pound of coal is required to superheat one pound of steam 250 degrees. This would cover full load conditions and our experience is that superheater efficiency is fairly maintained through a wide range.

Mr. Wendle: If the superheater furnace is operated similarly to boiler fires; then as the load varied or fell off, the superheater fire required would not fall off in proportion. Suppose the average load on a railway engine is 30 per cent of the full load, and that the superheating requires .15 pound of coal per i. h. p. at full load, amounting to say 14 per cent of coal consumption of engine; what variation would there be in the .15 pound and in the percentage of coal required by superheater, as compared to total engine consumption, under average load conditions?

Mr. Rice: It would be a smaller percentage of the actual coal used with light load than with full load; because your engine economy is decreasing with decreased load and the superheater economy remains more nearly constant.

31. In 500-kw. units, what are the relative merits of steam turbines and modern compound condensing engines in total first cost and operating economy?

The steam turbine is less in original cost than the corresponding size of steam engine when the latter is put upon the same basis of economy and capacity. Aside from being lower in first cost, it requires a comparatively inexpensive foundation, and there is also frequently much saved in the way of space that would be valuable for other purposes.—E. H. Sniffin.

Actual results with modern compound condensing engines, 160 lb. steam pressure and 26 in. vacuum:

One-half load—14.25 lb. steam per i. h. p.

Three-fourths load—13.4 lb. steam per i. h. p.

Full load—12.5 to 12.75 lb. steam per i. h. p.—H.

Comparison between the 500-kw. turbo-generator set, running at 1,800 revolutions per minute, and a modern compound condensing 500-kw. engine unit, running at 125 revolutions per minute, shows a saving in first cost of about 25 to 30 per cent. This comparison covers the steam prime mover, the electric generator, and all auxiliary machinery, with the exception of the condensing apparatus. In addition, there will be a large saving in first cost for—(a) real estate, (b) buildings, (c) foundations, and (d) smaller items due to decrease in floor space needed, weight, and to the steady revolving motion of turbine. The operating economy will also be better for the turbine, on account of—(a) higher thermal efficiency of the turbine, (b) reduction in cost of maintenance, due to simplicity of turbine construction, (c) reduction in cost for attendance (all oiling being automatic), (d) saving in oil, and (e) saving in boiler feed water by use of surface condensers.

The lubrication is done by a circulating oil pump and one-half barrel of oil is about sufficient for a 500-kw. set. This oil can be used over and over again until deteriorated. As oil cannot come in contact with steam, no precautions are required in using condensing water for boiler supply.—R. E. Moore.

The initial expense of the turbine unit, erected ready for piping, is given unofficially to the editor as practically 10 per cent less than a high grade compound condensing Corliss engine.

The operating economy of the turbine unit, considered by itself, is better than the compound condensing corliss unit; but where direct current is the entire output, and direct distribution is possible, there is considerable doubt whether the generating cost, including fixed charges, is not more with the turbine unit and necessary rotaries, etc., than with compound condensing corliss engines.

32. What overload can be carried by a steam turbine under the control of the governor and without opening by-pass or turning on additional nozzles by hand?

The steam turbine should be rated at its greatest capacity, for at that point it gives its best efficiency, and then by means of a by-pass it is able to carry 50 per cent overload; or it would give the full rating non-condensing.—E. H. Sniffin.

The DeLaval practically limits the economical range under governor control to 10 per cent above rating.

The Parsons to about 25 per cent, as per tests.

The Curtis does not furnish this information.

On any of these turbines, extreme overloads up to 50 per cent are taken care of by opening additional nozzles or a by-pass.—W.

We build our steam turbines to stand, as a whole, a somewhat larger overload than first-class reciprocating engines. Generally the overload capacity will be determined by the generator capacity, which will usually allow 50 per cent overload for two hours. Our turbine has no by-passes.—R. E. Moore.

33. Does a steam turbine require a special or more expensive condensing equipment than reciprocating engines?

The steam turbine does not require a more expensive condensing equipment than reciprocating engines. To obtain high vacuum, like 27 in. or 28 in., of course requires more expensive condensing apparatus than the lower vacuums, but it requires simply to capitalize the difference in efficiency to prove or disprove the desirability of the extra expense. Usually, high vacuum will be found to pay.—E. H. Sniffin.

From statements of turbine and condenser manufacturers, the general demand is for 28 in. vacuum, using surface condensers, with two stage air pumps, and every refinement to increase this performance. The condenser manufacturers seem unwilling to furnish any actual figures, but advise that the cost of high vacuum equipment is considerably in excess of that usually supplied for reciprocating engines and giving 26 in. to 27 in. vacuum.—J. O'Toole.

It does not require a more expensive equipment; but a high vacuum gives a better efficiency in a turbine than in a reciprocating engine.—A.

An examination of curves, deduced by Mr. Emmett, shows clearly the rapid increase in efficiency of the turbine with high vacuum and therefore the advisability, in most cases, of the best possible condensing equipment.—R. E. Moore.

34. What is the best type of condensing equipment for steam turbines?

There is no particular type of condenser equipment specially adapted to the steam turbine. The type of condenser depends upon the conditions, and in steam turbine practice there are no characteristic limitations.—E. H. Sniffin.

It is our standard practice to use surface condensing equipments, the reasons being—higher vacuum and possibility of re-using boiler feed water.—R. E. Moore.

An examination of a number of the latest steam turbine installations indicates a special preference for—(a) surface condensers, placed as close to the turbine as permissible; (b) centrifugal circulating pumps, operating in connection with a syphon system of water piping; and (c) air pumps of either the Edwards or two stage dry air type. An equipment of this type, with the amount of piping required, was estimated, by a large steam piping and plant contractor, to cost not less than four times as much as a modern central condensing system suitable for a first-class reciprocating engine plant.—Editor.

35. What vacuum is regularly obtained at the engine cylinder in plants equipped with central condensing system?

Twenty-five and one-half inches with central condensing system and 26½ in. with surface condenser near engines.—H.

Twenty-five inches is good.—A.

36. What is the relative cost of fan and natural draft cooling towers for condensing systems? What vacuum can be obtained with their use?

Cooling towers cost about \$6 per h. p., basing h. p. rating on

corliss engine performance. Vacuum obtainable 24 to 26 inches, depending on atmospheric conditions.—H. C. Reagan.

37. What is best form of automatic atmospheric exhaust valve for use in condensing plants?

Schutte automatic exhaust valve is entirely reliable.—F. B. Musser.

W. H. Gullison Co. of Boston, Mass., makes a satisfactory one. II

38. What is relative value of run-of-mine bituminous and the small sizes of anthracite coal in regular plant service, including banking, etc.?

With the grades of bituminous and anthracite coal furnished in our market, we can afford to pay 15 per cent more for a short ton of run-of-mine bituminous coal than for a long ton of anthracite coal No. 3 buckwheat.—Paul A. Hess.

If both coals are clean, there is little difference in the heating power. Any difference in results is due to the method of firing.—A.

39. What is the cost per ton, exclusive of fixed charges on equipment, for handling coal from car to boiler room bins with modern coal and ash conveying machinery, assuming an annual coal consumption of 6,000 to 10,000 tons?

With such a small annual consumption, it is questionable whether the maintenance and fixed charges on any conveying system would not amount to more than cartage. A modern coal and ash conveying equipment, suitable for handling coal for storage, conveying to boiler room bins and for taking out ashes, would probably cost \$15,000 to \$20,000 and the relatively low interest and depreciation charge of 10 per cent would make the costs of any such system prohibitive, even if the actual operating cost nothing.—W.

Shoveling coal off car, 5 cents a ton; conveying, 1 cent a ton; and handling ashes, 2 cents per ton of coal.—A.

40. What is the cheapest method for handling ashes in plants of 1,000 to 1,500 h. p.?

Dump directly into the conveyor.—A.

Ash cars or barrows would probably be the only method at a reasonable cost.—W.

41. Are economizers a profitable investment in a 1,000-h. p. condensing plant?

We consider they are decidedly. In a plant of 1,000 h. p. we would very conservatively say an economizer will save 10 per cent in fuel. Records show over this. The cost of such an economizer installed and bricked in ready for work would be about \$5,200. Taking 3.70 lb. of coal burned per h. p. on boilers for 365 days in the year, and coal at \$3 on the grates, an electric plant would consume about \$18,000 of coal per annum. Ten per cent of this would make a saving of \$1,800.

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| Allowing 5 per cent for borrowed money on \$5,200..... | \$ 260.00 |
| Allowing 6 per cent for depreciation on \$5,200..... | 312.00 |
| Allowing 1½ per cent for maintenance and repairs..... | 78.00 |
| Allowing 1½ per cent taxes and insurance..... | 78.00 |

| | |
|---------------------------------------|------------|
| Total charges against economizer..... | \$ 728.00 |
| Ten per cent saving..... | \$1,800.00 |

Net gain (20 per cent).....\$1,072.00

This, you will see, after borrowing money, will pay 20 per cent on the investment, making all fair allowances and being very conservative. In actual practice it would probably be larger. One of the great advantages of economizers on electrical plants is certainly the large reserve power when sudden demands are made for steam, which item is very difficult to get any figures on, as only those that have experience realize. The fireman will have no difficulty in keeping up steam during heavy peaks of the load when using the economizer, having about an hour's supply of hot feed water. They do not use this up before the peak of the load is off, and even what water is coming in to replace that which is used has the benefit of the gases when the boilers are being worked to their full capacity. Managers of electric power plants know how the steam begins to drop when very heavy loads suddenly come on the boilers, and during that period having to rush a lot of cool water into the boilers makes the work harder for the fireman. An economizer overcomes that. Then again, the depositing of sediment in the economizer and the saving in repairs to boilers, it is difficult to estimate or get figures on, but both are important advantages in addition to the saving in fuel. With an economizer of the capacity of your boiler plant, you

do not have to keep so many boilers partly banked ready for sudden emergencies, as the economizer increases the steam capacity of your plant 10 per cent. The fact also has to be realized that your men have 10 per cent less coal to handle and proportional amount of ash.—Green Fuel Economizer Co.

No.—H.

None, unless you have an excessively high temperature of flue gases.—A.

In answer to inquiries among plants about this size, using economizers, the consensus of opinion was as follows: In an existing boiler plant, the advisability of adding an economizer was entirely a question of finance and plant conditions, available draft, etc. The fuel saving against fixed charges and maintenance. If a new plant was proposed, then the almost unanimous opinion was the economizer should be considered in connection with boilers in distributing the heating surface to be provided. The general experience being that of the total heating surface required, 70 per cent should be boiler and 30 per cent economizer.—Editor.

42. What is the maintenance cost and a fair depreciation rate on economizers?

The maintenance cost of economizers in the last 15 to 20 years has been proved to be under 1 per cent of the original cost of the machine, and a fair depreciation we consider is 6 per cent, as a machine will last with ordinary attention over 20 years. We can show any number of records of machines that we sold over 20 years ago that are working today very satisfactorily.—Green Fuel Economizer Co.

43. Have any power houses been heated by hot water supplied from a special section of the economizer run at low pressure? If so, what difficulties have been experienced?

We do not know of any electric power houses that have been heated by hot water from our economizer, but we are heating a number of mills quite satisfactorily by this system, among which are the Queen City Cotton Co., Burlington, Vt.; West Boylston Manufacturing Co., Easthampton, Mass., and Pierce Manufacturing Co., New Bedford, Mass.

We have also recently sold economizers, part of which will be used for heating the power house, to the Canadian Pacific Railway Co. shops in Canada. There is no reason that we can see, if we can heat mills satisfactorily, which have to be kept at high temperature, why the hot water cannot be used for heating power houses. The way we do this is, we take the cool end of the economizer furthest away from the entering of the hot gases, and use a portion of that for heating the building, by making a constant circulation of the water through it. We have a contract at the present time with the Springfield Electric Light & Power Co., Springfield, Ill., for economizers, in which it is going to use the whole of the economizers for a heating system that is run in conjunction with the plant. The boiler capacity of this plant is 2,000 h. p. In regard to difficulties, so far no difficulties at all have been experienced. In fact, it is the ideal and most economical way of heating a power house.—Green Fuel Economizer Co.

44. What is the saving in coal when storage batteries are kept floating on the line?

The coal saving depends upon the class of service for which the battery is installed, and is brought about principally by shutting down engines and generators at the power house and improving the load factor. If a battery is installed on the line at a distance from the power house, for saving copper and improving voltage, it will generally affect only a very small portion of the total load, and may have but little effect on the power house operation and economy. If, however, the battery is installed at the power house and is adjusted to take the fluctuations of load off the machines so that the latter can be operated continuously under a steady load equal to their full rated capacity, instead of under a widely fluctuating load whose average is perhaps under 50 per cent of the rated capacity, about half of the machinery required before the battery was installed can be shut down, thus saving all the constant losses from friction and radiation involved in operating these machines, and the other half will be run at a point of maximum economy. The saving in fuel thus accomplished would probably range from 15 to 25 per cent. The saving will be greater where the units are few in number and the fluctuations excessive, and will be less where the fluctuations of load are small and the number and size of units such that they can be readily adapted to the load.—E. L. Reynolds.

About 15 per cent.—W. S. B.

45. Does the storage battery require any extra or special labor?

In the great majority of cases, the very reasonable amount of attention required to keep a battery in the best condition is secured without the necessity of employing additional or special labor. With a battery of ordinary size, the time that should be spent on it should not exceed four or five hours each week. It has very generally been found practicable to detail an employee who is in the service of the company for this battery work without materially interfering with his other duties.—E. L. Reynolds.

A man carefully selected and properly instructed should be placed in charge of battery, and the battery made his first and most important duty.—L.

A battery requires only a small amount of labor, but the work done should be done thoroughly, care being taken not to neglect even the smallest details. The most important point in the care of battery is that the man who is in charge of the battery must be able to discover and remedy the slightest trouble in the cells before it grows so large that it affects the good working condition of the battery.—G. G.

Yes, it requires an attendant to take gravity and temperature readings and to fill the cells to a uniform level as the water evaporates. This man is, however, able to perform other duties, as the battery only requires his attention about one-third of the day.—F. B. Musser.

46. What records are essential in order to obtain a low maintenance cost on batteries?

In order to keep a battery in the best condition and obtain a minimum maintenance cost, it should be looked after in the following manner:

In the daily workings of a battery, hydrometer readings of a single cell, usually termed the "pilot cell," should be taken hourly, or as frequently as possible, if the battery is so situated that it is impracticable to take the hourly readings (from one to two minutes only is required for taking these readings). When a battery is situated at or near a power house or rotary sub-station where an attendant is present, there should be no difficulty in arranging for the hourly readings to be taken. In the case of line batteries where there is no regular attendant, it can usually be found practicable to have at least four of these readings taken in each twenty-four hours. In any case, one reading a day must be taken. In addition to the pilot cell hydrometer readings, the recording voltmeter records must be carefully observed, and the working of the battery as indicated by these charts and pilot cell readings, kept in proper adjustment.

Once a week, when what is termed the "weekly overcharge" is given, a specific gravity reading of each cell in the battery should be taken just before the charge is started. If the charging current can be kept constant, a complete set of voltage readings should also be taken; these at the completion of the charge and just before the current is cut off. If the current cannot be kept constant during this part of the charge, then these voltage readings are not of sufficient value to warrant their being taken, and in their stead another set of gravity readings should be taken as a check on those taken before the charge is started. In all cases, pilot cell gravity readings should be taken at the end of this charge, as well as at the beginning, and as frequently during the charge as possible.—E. L. Reynolds.

There should be a recording voltmeter to record the hourly gravity readings.—F. B. Musser.

Accurate records covering—(a) specific gravity of acid, (b) recording voltmeter charts, and (c) input and output of battery. The first two are essential and should cover both charge and discharge.—L.

47. What is a fair maintenance and depreciation charge on batteries, under railway conditions and floating continually on the line?

The maintenance and depreciation charge of such batteries normally operated and properly looked after should not exceed 5 or 6 per cent annually of the original cost of the battery.

The amount of work that a battery does is a factor that should always be taken into consideration when the question of maintenance charge comes up.—E. L. Reynolds.

Based on the experience with large lighting batteries, which are completely charged and discharged regularly, and with which 7 to 7½ per cent of original cost of battery must be set aside for maintenance and renewals, the annual charge against railway batteries, constantly floating on line, should not exceed 5 per cent of original

cost, provided proper care is given battery, and sufficient capacity is provided.—E.

For floating batteries 4 to 5 per cent of the original cost should be set aside annually to cover renewal of plates and an additional amount to cover renewal of lead tanks in 10 years.—G. G.

No definite knowledge—varies from 3 years, in case of abuse, to 7 years, with care and under favorable conditions of operation.—L. 48. Is the differential booster system the best mode of controlling charge and discharge in railway service?

This depends also on the character of service in question. In a small plant where the fluctuations of load are rapid and the battery is installed at the power house, the differential booster is the best method of automatic control that has yet been put into practical service. Where the total output of the plant is large and the battery is used principally for peak work, a compound booster is often more satisfactory and less expensive. Where a battery is installed on a line at a distance from the power house, a plain shunt booster at the power house is preferable.—E. L. Reynolds.

Yes, the differential booster is considered the best mode of control for the charge and discharge for railway service.—F. B. Musser. Yes.—L.

49. What precautions are necessary in cutting out batteries and dynamos in case of line troubles or excessive overloads; and also in cutting in batteries and dynamos after disconnection?

In the case of excessive overloads the circuit breakers on the battery and dynamos should open simultaneously if properly adjusted. It is preferable, of course, to have the feeder circuit open rather than throw the entire plant out, but this is not always possible. Where a booster is in operation with a battery, an interlocking device is installed between the circuit breakers of the battery and the booster motor, so that in case the latter opens first, it will trip the former.

In cutting in batteries and dynamos after disconnection, no special precautions are necessary other than to see that the circuit breakers are operating properly and that the voltage is properly adjusted before throwing switches.—E. L. Reynolds.

When cutting out a battery try and get the battery at or as near zero as possible. When cutting in a battery get voltage equalized same as when cutting in a generator.—F. B. Musser.

50. How often must the acid be removed and renewed?

Unless some extraordinary impurity gets into the battery cells, it is not necessary to consider removing or renewing the battery acid or electrolyte. In the use of the battery, there is some slight loss of the acid in the electrolyte, but this is so slight that the cost of replacing is almost negligible.—E. L. Reynolds.

Not more than once a year and likely once in two years. Keep the specific gravity of the acid right.—L.

51. What is the best method of removing and replacing the acid in batteries?

As it is not necessary to remove the acid, means for doing this need not be considered. In replacing the slight loss of acid referred to in the answer to Question 50, this can be done without special cost by adding new acid to the cells at the usual time for replacing the evaporation by water.—E. L. Reynolds.

For batteries of fair size, either the syphoning or pumping method is generally the most satisfactory. If battery room has been properly designed, the syphoning method is most economical.—W. E.

Syphon with a rubber hose or pump out.—L.

52. Is there any method, within the resources of the ordinary central station, by which the condition of a battery can be determined accurately?

The condition of a battery can always be gaged by an observation of the cell readings and the physical condition of the plates.—E. L. Reynolds.

By keeping careful records of charges and discharges, in connection with the color of the plates and detailed tests.—L.

53. Is there any difficulty with overcharging a floating battery?

Overcharging is extremely bad in any kind of service, in that depreciation of the plates is increased much beyond what it would be if the battery were properly operated. Continually overcharging a battery, frequently overdischarging it or allowing it to stand for long periods completely discharged are very objectionable.—E. L. Reynolds.

Yes, and result is bad for the battery.—L.

Discussion on Questions 44 to 53 Inclusive on Storage Batteries.

President Davis: Mr. Reynolds, of the Electric Storage Battery Company, is with us, and will undoubtedly be pleased to answer any questions which may be asked. I trust our members, especially those who have had storage battery experience, will co-operate in making this discussion valuable. Mr. Musser, will you kindly give us your experience on the battery question?

Mr. Musser: We have an old time station, very much overloaded, which we expected to supersede with an entirely modern plant. Somewhat over a year ago, additional capacity had to be provided, and it was a question whether a new steam unit or a storage battery be selected to help us out. After going over the matter very carefully, we concluded to put in the battery, because we could install it more quickly and at less expense.

We have been running the battery about fifteen months successfully, and thus far with absolutely no expense except a part of the time of one man. The battery has worked regularly, and unless a good deal of deterioration takes place shortly, we do not expect to spend any money on it for some time to come.

We have never made any calculation as to just what the battery has saved us, as we are working at a disadvantage. So far it has met all our expectations, taking care of the peak of the load during the rush hours, with practically no care or expense.

President Davis: Captain Lanius, what has been your experience with the storage battery?

Captain Lanius: I have had some experience, but do not think that I could add anything about the actual working, except to state that the battery has been very satisfactory and has carried our load for a short time with the engines shut down.

President Davis: Are there any gentlemen who have had experience with the maintenance and deterioration cost on batteries?

Mr. Wendle: When we took up the question of labor costs with some of the large battery users, we were strongly advised that it was the best policy to have one man, carefully selected, whose business it was first, last and all the time to look after the battery properly. If, after giving the battery proper attention, he had time on his hands, put that time in on incidentals. This statement is the result of considerable experience in paying the maintenance expenses under different modes of caring for the battery, and indicates that saving in labor and inspection means increased maintenance costs, not necessarily at once, but ultimately.

From the answer made by Mr. Reynolds and the statement of Mr. Musser, the labor item is regarded as an incidental. Is this condition peculiar to a floating battery or railway conditions?

As to depreciation, the large users of lighting batteries have settled on 7 per cent of the total cost of the battery as the proper rate. Their experts reduce this to 5 per cent for a floating battery. Both of these figures are based on giving the best care possible to the battery. With improper attention or unskillful care, the actual maintenance costs have been much higher. In view of these facts, it would be advantageous to hear from any gentleman who has had a battery in service more than six or seven years, and given it the incidental attention implied by the answers received.

Mr. Reynolds: Most of the Edison Companies have very large batteries. In New York, there are 30 batteries distributed over the city. The aggregate amount of labor on these batteries is hardly to the point. Take the average street railway; they have one battery or two, one at each station along the line. You cannot keep a man busy watching these batteries. Half an hour during the day will easily cover the work; but it must be good, honest, intelligent attention. Where the battery is in the power station, the engineer generally looks after it. I will be pleased to refer to a large number of stations, operating their batteries in this way, which have had batteries in service five or six years.

Mr. Wendle: The Storage Battery Company has, by reason of supplying most of the repairs, etc., special facilities for learning the exact maintenance costs. Would it be a fair question to ask what in the experience of your company is a reasonable depreciation on floating batteries?

Mr. Reynolds: We consider that five per cent ought to be ample. It depends altogether upon the man who is running the plant; given the right sort of attention, there is no reason why the percentage should not be lower.

Mr. Wendle: All the percentages have been based on the total cost of battery. In order to put the matter clearly, what would be the percentage based on the cost of plates only?

Mr. Reynolds: I have never figured it out that way.

President Davis: Mr. Reynolds, will you explain how the acid is taken from the tanks in practice?

Mr. Reynolds: The acid is never removed from the battery unless you have a tank that leaks, or are taking a battery out of commission. The simplest method of removing acid is by a rubber hose syphon. It is not necessary to remove the acid in making repairs to plates. This is done while the battery is working. As a matter of fact, we could renew an entire battery, put in an entirely new set of plates, and keep the battery working all the time. If the number of tanks to be repaired is small, say 5 or 6, these batteries could be cut out and repairs made, without affecting the battery as a whole.

Mr. Wendle: In answering question 53, Mr. Reynolds states that overcharging is bad. The question is, is there any danger of overcharging, and how is that to be prevented? The overcharge is generally admitted to be bad; but does trouble of this kind occur?

Mr. Reynolds: There is liable to be trouble on this account through careless supervision; it should be easily determined and stopped. We recommend that every plant be equipped with a recording voltmeter, and it is a simple matter for any one, with proper instruction or experience, to determine the conditions of charge and discharge of the battery from the records. Further, we are desirous that operating companies send us these voltmeter records once or twice a week. This enables us to notice any overcharging and promptly advise the operating company.

The practical adjustment to prevent overcharging is simple. If your battery is on the line, say 7 or 8 miles from the power house, you adjust the shunt booster to give the proper increase of voltage on the feeder supplying battery; in case no booster is used, the main generator voltage is adjusted until overcharging stops. Where battery is at the power house, adjustment of the differential booster will stop trouble, or few cells may be added to bring up battery voltage.

President Davis: What provisions are necessary for ventilating and what kind of flooring do you recommend for battery rooms?

Mr. Reynolds: The best flooring is vitrified brick. It is slightly more expensive than cement, but is best for permanent construction.

For ventilation, we do not require any expensive or special methods; but simply want a good circulation. In some cases, ventilators are put in the roof; but if a room is well ventilated for ordinary purposes, it will generally meet all requirements. It is essential to guard against having the room temperature too high.

President Davis: What is the effect of too low a temperature?

Mr. Reynolds: A low temperature is better. With ordinary low temperatures the only effect is to lower the available capacity of the battery; but with a high temperature the deterioration of the plates increases.

President Davis: How about the side walls and roof construction in a battery room?

Mr. Reynolds: Iron should be kept out of it as much as possible, ordinary wood construction is satisfactory. If you must use iron on the sides or in the roof, be sure to have same well painted with acid-proof paint.

54 Where transmission lines run overhead through cities and towns, what precautions are necessary to insure reliable service and freedom from accidents?

55 Is there any legal method by which property owners can be compelled to allow trees to be trimmed in order to keep free of transmission lines?

56 What is the best and safest method of synchronizing alterations for multiple running?

The Lincoln synchronizers.—H.

57 What is the best practice in regard to circuit breakers on high potential generators?

Use oil switches.—H.

The General Electric Company has long advocated the use of oil break circuit breakers for opening or disrupting high potential power circuits. This type of circuit breaker is not only more positive and reliable in action than the air break switch, but the nature of the break is such as to produce much less resonance effect, with attendant decrease in strain upon the insulation. The oil switch is also

more compact in form and may be located at points most convenient and suitable for simplicity in wiring and control. In very large installations, the oil switch is the only safe and reliable means of disrupting the circuit.—R. E. Moore.

58 Are time limit circuit breakers satisfactory?

Yes.—H.

59 In railway sub-stations, is it advisable to connect both the a. c. and d. c. sides of rotaries in multiple?

Not in my judgment.—H.

When rotary converters are connected together at both the a. c. and d. c. sides, local interchange of current will take place between the machines unless the brushes of all the machines are set in exactly the same position. On high frequency rotary converters a variation of 1-16 inch in the setting of the brushes may set up local currents between the machines exceeding their rated capacity. The only effect of such local currents is to cause excessive heating. We have seen cases where the temperature had been more than doubled due to this cause, and of such degree as to seriously threaten the life of the insulation. It is a very simple matter to avoid metallic connections between collector rings, either by having a separate bank of transformers for each rotary converter, or else providing a separate secondary winding for each rotary in case a number of machines are run from a single group of transformers.—R. E. Moore.

60 In a complete transmission system, what is the best method for automatically disconnecting main generators, rotaries, etc., in case of line or apparatus trouble?

Oil switches in connection with circuit breakers.—H.

The General Electric Co.'s practice is to install automatic oil switches with instantaneous overload relay in the a. c. rotary converter circuits and incoming lines at the sub-stations. Time limit relays are placed on the automatic oil switches controlling the outgoing lines from the main station, and oil switches for generators are made non-automatic. With this arrangement a momentary short circuit will only disconnect the rotary converters in the sub-station affected. If the short circuit hangs for a length of time exceeding that for which the time limit relay is set, the line switches at the power station will open. If the trouble continues and is likely to injure the generators, the main generator switches may be opened by the attendant.—R. E. Moore.

61 For combined railway and lighting plants, using 60 cycles main generators, is it better to use rotaries or motor generators for the lighting service?

Use motor-generator sets, consisting of synchronous a. c. motor direct coupled to d. c. or a. c. generator. By this means voltage fluctuations in main generators, due to railway load, are not carried into the lighting system as with rotaries. With synchronous motor and d. c. generator, the fluctuations will be due to change of frequency, which can be kept within limits of good practice. There is also a great advantage in the independent regulation of lighting generators by simple field regulation.—W.

Our practice is to use 25 cycles for combined lighting and railway plants. This frequency is better suited to the design and operation of rotary converters. While 60-cycle rotaries may be built to give satisfactory shop tests and to even operate satisfactorily under service conditions favorable to their use, their necessarily high commutator speeds make them inherently more sensitive than 25-cycle rotaries. In practice, a 25-cycle rotary will respond successfully to demands considerably in excess of its guaranteed capacity without injury and with minimum attention, while a 60-cycle machine must be given skilled and careful attention if subject to heavy fluctuations; as railway loads are usually very fluctuating, it is advisable to use motor-generator sets for the lighting service in order to secure satisfactory regulation on the lights.—R. E. Moore.

62 Are 60 cycle double current generators commercially satisfactory for combined railway and lighting service?

It is doubtful whether the service is entirely satisfactory.—H.

We do not consider the 60-cycle double current generator satisfactory for this service, due to the impossibility of securing satisfactory regulation where the load is at all variable.—R. E. Moore.

63 In a 500 to 1,000 kw plant, using compound condensing corliss engines and direct connected generators, what is a good monthly average steam consumption or coal cost per kw. hour?

Large modern plants are operating on 24 lb. of steam per kw. hour, with total generating cost of .556 cent per kw. hour. In a comparatively small station, 500 to 1,000 kw., 30 to 32 lb. of steam

per kw. hour and a total cost of 8 cent per kw. hour would be good.—H.

Operation and Maintenance of Equipment.

101. With roads not larger than 25 cars, how extensive a machine shop is advisable and what machine tools should be included? If possible, state approximate cost.

We suggest a planer, a drill press, a lathe large enough to swing the largest motor armature, an emery wheel and a blacksmith's outfit. The approximate cost of which would be \$1,800.—A. F. Rexroth.

102. To what extent is compressed air used in cleaning and repair work? What equipment is necessary for and what is the approximate cost of a compressed air outfit suitable for small and moderate sized roads?

Compressed air has by no means been used to the extent justified by its special adaptability for certain classes of work—cleaning apparatus, etc., in power houses and car barns, operating machine tools, and in foundry work. For both of these latter uses the General Electric Co. uses compressed air extensively and with great economy and success.—R. E. Moore.

President Davis: This question is one that is of growing importance, and we would especially request that our members and others favor us with their experiences in the uses of compressed air. I would ask Mr. Ellicott to open the discussion on this subject.

Mr. Ellicott: For this service, we usually install either one of our small steam or motor driven compressors. In connection with the compressor, automatic devices are provided, which start or stop the compressor as the pressure falls or comes up in the reservoir. By a relatively small amount of piping, nozzles can be placed at various points in the plant for hose connection, making the air available for general service. For the special service around car barns and on the road, we have supplied a portable compressor. This consists of a small air compressor and two reservoirs approximately 14 inches by 48 inches with a capacity of about 80 cubic feet. This outfit is especially desirable where electric current is available and it is not desired to completely pipe the plant.

Among the special applications there is a device used by the Pennsylvania Railroad Company for cleaning the plush seats in the cars, consisting of a flat nozzle with a comb in front of a number of perforated holes. The teeth of the comb are pushed over the plush, loosening the dirt and raising the nap, and the air blows the dirt out thoroughly.

President Davis: Can you give some idea as to the average cost of a compressor outfit for car barns?

Mr. Ellicott: The cost of a stationary compressor and pipe within a radius of 30 or 40 feet would cost about \$375.00 for the electric outfit. If high pressure steam was available, the steam compressor would reduce the cost to about \$200.00.

Mr. Hammett: Where independent compressors are used on the cars in connection with the air brakes, a special hose connection is made so that by operating the compressor the necessary air for cleaning and other work about the car can be obtained.

Mr. Power: A number of companies using our equipments on their cars have an arrangement by which they attach a hose and clean their motors by means of the compressor in service on the car.

Mr. Wendle: I notice that Mr. O'Toole is here, and as he has had some experience in arranging our station equipment for compressed air, I believe his figures of cost would be of interest to our members.

Mr. O'Toole: Our equipment consists of a second-hand eight-inch standard Westinghouse compressor, such as is used on locomotives. We purchased our compressor from the Pennsylvania Railroad Company, which is discarding the 8-inch size and installing the 9-inch, for \$10.00. The total cost, including station piping, hose, regulating valve and reservoir, was just about \$25.00. From my experience, I consider compressed air one of the best and most convenient devices about the station. We use it for cleaning generators, switchboard, etc., and for work on our boilers with pneumatic tools.

Mr. Wendle: So far the services detailed have been largely cleaning. Are there any other services around the station or car barn in which compressed air can be used advantageously and cheaply?

Mr. Fairchild: Among the uses which I have seen in various parts of the country, the compressed air is used in connection with a sand blast for cleaning trucks for repainting. The apparatus necessary

consists of a pressure tank with a combination nozzle which injects a little jet of sand into the air, throwing it with considerable force against the truck. It is also used in connection with ordinary gas for burning off the paint from car bodies. The apparatus consists of a special nozzle, having one tube within the other. Into the smaller tube is admitted the gas and into the larger the air. The two coming out together, the effect is exactly the same as a strong blow torch. The use of this device has enabled one particular road to do away with the gasoline torch and has resulted in reducing their insurance rate appreciably. Another service is in lifting jacks and hoists.

In shops where compressed air is to be used extensively, it is the general practice to install air compressors of good operating economy, so that the cost per thousand feet is reduced to the minimum figure.

Mr. Stedman: One of the uses of compressed air is in white-washing or painting sheds or other large surfaces. With a comparatively simple outfit, one man will do as much work as five by the usual brush method.

103. What are the comparative maintenance costs of standard single, maximum traction, and standard double trucks?

104. With maximum traction trucks, what proportion of the weight should be put on the pony wheels to insure reliability in operation?

To insure good traction to the drivers, the pony wheels should have sufficient weight to keep them from mounting the rail; say, about 25 per cent.—Chas. H. Smith.

Various large users of these trucks advise percentages varying from 60 to 75 per cent of total weight placed on drivers. The mode of adjustment we follow is due to the Brill company, as follows: With the compression post at height to just touch compression plate, compress the spring $1\frac{1}{2}$ in. With $1\frac{1}{4}$ -in. compression, running is claimed to be reliable; but with the $1\frac{1}{2}$ -in. adjustment, it is dead sure.—C. T. Herrick.

Our experience has been to obtain the best results with a Brill maximum traction truck it was necessary to put 20 per cent of the total weight of the car on the pony wheels.—A. F. Rexroth.

105. With maximum traction trucks, what is the best method of placing brake shoes:—both inside, both outside, or alternated?

On the outside; more convenient for repairs.—Chas. H. Smith.

Our experience has been to place the brake shoes alternately on the outside of the driving wheel and on the inside of the pony wheel. This reduces the wearing parts to a minimum.—A. F. Rexroth.

106. What is the wheel expense of maximum traction and double trucks, as compared with single trucks?

107. What is the cause for wheels, apparently in first-class condition, breaking down or collapsing in service?

This has occurred with us several times and an examination of the wheels developed no apparent reason for breakage.—Chas. T. Herrick.

We have never had a wheel go to pieces on us. On several occasions we have had wheels crack through the spoke and through the tread of the wheel, but have never been able to find the cause.—A. F. Rexroth.

108. What has been the experience relative to wheels becoming loose on axles?

Think this is due to the fact that they were put on too loosely.—Chas. T. Herrick.

In the past ten years we have had perhaps one-half dozen wheels get loose on the axles and in each case we found it to be due to the fact that the wheels were not put on the axle with sufficient amount of press.—A. F. Rexroth.

109. What pressure is used in pressing wheels on axles?

We use from 35 to 45 tons.—Chas. T. Herrick.

110. Is there any form of wheel gage for use in accurately locating wheels on axles, and suitable for use in pressing on or subsequent inspection?

111. What are the specifications for car wheels for city and inter-urban systems?

We use a wheel with a $2\frac{1}{2}$ -in. tread and $\frac{5}{8}$ -in. flange. City service.—Chas. T. Herrick.

We use 33-inch wheels, $2\frac{1}{4}$ -inch tread and $\frac{3}{4}$ -inch flange.—A. F. Rexroth.

112. What grade and treatment of steel is the best for axles?

We use cold rolled steel.—Chas. T. Herrick.

113. Is it advisable to use a smaller axle than 3 3/4-in. diameter?

No—makes them too weak for the load and work they have to perform.—Chas. H. Smith.

I think not, for the reason that anything smaller has a tendency to bend or break under heavy service.—Chas. T. Herrick.

We have found it advisable to use nothing less than a 3 3/4-inch axle, with the journal as large as is possible to get in the journal box.—A. F. Rexroth.

114. Are any of the various types of brake shoes, using special inserted materials or pieces, more reliable or economical than solid brake shoes, taking into consideration both wheel and brake shoe wear?

We get the best results from a solid casting.

We find the cast iron shoe made from good material to give the best results.—Chas. H. Smith.

We have used a brake shoe with steel insertions, but we found it wore too much on the wheel to be an economical shoe.—C. T. Herrick.

Our experience has been that the most reliable shoe for all parts of the system has been the ordinary cast iron shoe, but that on hilly roads the expense of maintenance has been enormous, and after trying various shoes we have adopted the "Compo" for all suburban hilly roads, and the diamond "S" shoe for city work.—A. F. Rexroth.

115. What has been the experience with track brakes, either mechanical or magnetic?

Our experience has been they are not suited for making service stops. As an emergency device or for use on very long steep grades, there may be some small field.—R. E. Moore.

116. What results have been obtained in the use of the various types of emergency brakes?

The Bonta brake, as incorporated in our emergency reversing switch for controllers, fills the requirements for an emergency brake. It is simple, cannot get out of order, and positive in its action, carrying the braking effect fully up to the slipping point on the wheels.—R. E. Moore.

117. Above what speed and weight of car is it the best practice to use air brakes?

In my judgment, it is advisable to use the air brake on any cars over 18 feet in length, and making a speed of more than 10 miles an hour. We think the time saved in stopping and starting, and avoiding all accidents, will more than compensate for the cost of the air-brake equipment.—A. F. Rexroth.

We consider that air or some form of power brakes should be used on cars weighing 15 tons or more, and operating at speeds of 25 miles per hour or over; and on cars weighing 25 tons, operating at any speed.—R. E. Moore.

118. Are independently operated compressors necessary for reliability with air brakes?

We do not consider that independently operated air compressors are necessary for reliability of air brakes on single cars. The use of individual compressors depends upon the character of the service which the cars are required to perform.—R. E. Moore.

Discussion on Questions 116 to 118 Inclusive on Air Brakes.

Mr. Musser: We have about 24 equipments, which have been in operation various terms up to 3 years. Mr. Rexroth, our master mechanic, is here and he can give you more definite information as to the operation and maintenance costs.

Mr. Rexroth: Our early troubles were principally in connection with the brackets on the governor. The improved form now made has reduced this difficulty materially. We also had some trouble with water getting in the pipes and freezing. This we obviated by putting in drip cocks.

Mr. Herrick: Have your brakes ever failed? If so, why?

Mr. Rexroth: We have never had a case where the air brake failed. The only reason I have ever known for failure was where something went wrong with the governor and it failed to work.

Captain Lamm: We have experienced no trouble on the three suburban lines which are equipped with air brakes.

Mr. Faller: We have only two equipments. There have been in operation 3 years and have given us practically no trouble.

Mr. Power: We have furnished air brakes for both single and

double truck cars. The Lancaster system has been operating a number of single truck cars, equipped with our brakes, and informs me that they are entirely satisfactory. The majority of equipments are naturally installed on double truck cars; but it is my experience that regardless of the size of car, the air brake deserves careful consideration on the score of safety and reduction of accidents.

As to the merits of axle and independent driving, my advice is to stick to the independently driven compressor.

119. What is a reasonable power consumption per car-mile for 25 ft. closed cars mounted on maximum traction trucks and equipped with two motors about 40 h. p. each?

A 25-foot car body usually weighs about 8,400 pounds; weight of maximum traction truck about 1,350 pounds each; weight of double 40 H. P. equipment about 5,710 pounds; seating load of 36 passengers 4,900 pounds. This makes the total estimated weight of cars equipped and loaded 12.85 tons.

For a car of the dimensions given and in average service, the watt hours per car mile would probably average about 1,400.

In comparing wattmeter readings taken on cars operating on different roads, all of the factors such as number of stops per mile, coasting, schedule speeds, duration of stops, etc., should be taken into consideration.—R. E. Moore.

120. What is relative power consumption of double truck cars equipped with two and four motors respectively?

The power consumption with double truck cars equipped with four motors is about one-third higher than where the same trucks are equipped with two motors.—Chas. T. Herrick.

Regarding the relative power consumption of double truck cars equipped with two and four motors respectively, would state that with motors of equal efficiency geared to the same speeds and giving the same torque with the same total input to the car, the four-motor equipment should not take any more power when used in exactly the same service as the two-motor equipment except for the slight increase in weight of the four-motor over the two-motor equipment. This increase in weight is a very small proportion of the total weight of the car equipped and loaded. On account of the grinding of wheels on the track during acceleration and when ascending grades, it is quite likely that the power lost in this way with two-motor equipments more than offsets the increased power required due to the slight increase in weight of the four-motor equipment.—R. E. Moore.

121. With double truck cars, equipped with only two motors, on which axle should motors be mounted?

I would not suggest using two motors on double truck cars. Our experience has been that the best results have been obtained from using four motors of less horse power per motor; but if a double truck car is to be equipped with two motors, the best way would be to mount the motors on the outside axles.—A. F. Rexroth.

122. What special grade or quality of metal gives the lowest cost per car-mile for gears?

Steel gears when steel pinions are used.—Chas. H. Smith.

Our experience has been that the best results can be obtained by using steel gears and steel pinions, run in oil and in regular gear casing.—A. F. Rexroth.

123. What are the relative merits of 4 and 8-bolt gears?

We find that the 8-bolt gear is more satisfactory under very severe conditions; but for ordinary conditions 4 bolts answer very well.—Chas. T. Herrick.

Our experience has been that for all service it is best to use an eight bolt gear, as it is impossible to draw four bolt gear tight enough to stand a heavy strain. We have some four bolt gears in stock that we are having drilled for eight bolts, rather than take the chances of the four bolt gears giving way.—A. F. Rexroth.

124. What are the relative costs per car-mile for rawhide and steel pinions?

We find that the rawhide is the more expensive as regards price, but it gives results that we cannot get with steel, inasmuch as requiring no lubrication, grease is not distributed along streets.—Chas. T. Herrick.

125. What is a reasonable car mileage for motor bearings? What grade of babbitt is used?

We use Baker's best babbitt. Using two parts babbitt to one of tin, mileage approximately 15,000 for both armature and axles.—Chas. H. Smith.

We use genuine babbitt metal, or the same formula as used by the General Electric Co. We have been able to get 15,000 to 18,000 miles on armature and axle bearings on suburban lines, and from 18,000 to 20,000 miles on the city cars.—A. F. Rexroth.

15,000 miles.—Chas. T. Herrick.

126. What is the average mileage of armature bearings?

15,000 miles.—Chas. T. Herrick.

127. Has any road tried cutting the oil groove in the motor shaft instead of the babbitt lining? If so, what results have been obtained?

128. What is the best material for journal bearings?

Brass; gives longer life and requires very little attention.—Chas. H. Smith.

Brass or bronze.—Chas. T. Herrick.

We have used the Lumen bearing metal, brass and bronze, but our experience has been that the bronze gives the longest service.—A. F. Rexroth.

129. What convenient method has been found to accurately determine the wear in armature bearings of motors with small armature clearance, such as Westinghouse 68, etc.?

On the city cars we use grease entirely. On the long road cars, we use grease on the axle box; but on the armature bearings we fill the grease box with wool waste, and depend on the oil for lubrication. To use oil on the armature boxes requires no change. Our reason for using oil on this particular line is that the line is considerably overloaded, and the voltage very low at end of line, resulting in the motor heating up more or less, and thereby causing the grease to melt and run away.—A. F. Rexroth.

During the past several years the General Electric Co. have manufactured a large number of motors larger than 50 h. p. which use oil instead of grease for lubrication of both axle and armature journals. Motors of this class are in general use on elevated and suburban lines. More recently the General Electric Co. have manufactured the GE-74 motor rating 65 h. p. and the GE-70 rating 40 h. p., which have oil lubrications. The bearings in these motors are lubricated by means of oil and waste packed around the journal in a manner similar to that used in standard car journal boxes. This system of lubrication has given universally good results.

I would also state that there are several devices on the market whereby a motor designed for ordinary grease lubrications can be fitted for oil lubrications instead. These devices usually consist of a cast iron cap which is placed inside of the regular grease chamber and having some device for allowing the proper amount of oil to be fed to the journal. Reports from several roads indicate that the use of oil on these motors has given good results both as regards cost of lubrication and wear of the bearings.—R. E. Moore.

130. Are any roads using oil instead of grease for motor lubrication? If so, what changes were required and what results were obtained by use of oil?

131. What is the best method of lubricating motor bearings in Westinghouse No. 3 and similar type motors?

132. Is there any cheap and reliable outfit by which car motors can be tested in place during inspections, and which can be operated by regular repair men?

In a statement made by the repair department of one of the large western roads, which has tried the Conant motor tester, it is claimed that the great difficulty is in obtaining reliable results with the telephone method where such observations must be made in noisy places. They found it very difficult to determine the silence point accurately when tests were made in the car house because of the noises due to repair and other work.—C. H.

It is our experience that the testing of motors can be done rapidly and with ample accuracy by a system using an auxiliary trolley wire in connection with a regulating rheostat, ammeter and voltmeter. Our practice is to place the trolley of the car to be tested on the auxiliary wire. Cut out one motor entirely at the controller and short circuit either the armature or field of the remaining motor, depending on whether you desire to measure the field or armature resistance. With motors so arranged, the controller handle is moved to throw a notch on the motor to be tested and by means of a water rheostat the current which passes through this circuit is limited to 20 amperes approximately. The pit man then touches the ends of the field terminals or the armature terminals, as the case may be, with a cable which is connected to the voltmeter in the testing room. From the indication of the voltmeter in connec-

tion with the current passing, the resistance of either armature or fields is determined, and if the value so obtained is lower than the standard for that particular type of motor, the separate field coils are tested and the low resistance ones picked out. We have used this method, which is strictly a drop of potential method, for some years, and find that very little experience is necessary to manipulate the apparatus and to determine accurately the condition of field coils. This method, as practiced by us, does not take into consideration the varying temperatures of the motors tested, but with comparatively little experience any of our men will detect evidences of faulty field coils. The cost of the outfit complete, exclusive of the labor of installing and connecting up the wires, is not over \$60.—Chas. T. Herrick.

The Conant motor tester operates on the principle of separately comparing the individual motor field coils in the two motors ordinarily installed on the car. It picks out those which are the weakest in magnetic strength. The coils do not have to be disconnected nor the motor opened for the test, as the leads can be readily reached through the hand holes of the motor case.

Two of the prominent companies using them have in all 20 of these instruments in operation. Where proper instruction has been given the car house men there is no difficulty in their using the instruments. I have been personally told by representatives of the following companies that their men find no difficulty in using the instruments satisfactorily: Boston Elevated Ry., Union Railway Co., New Bedford, Mass.; Union Railway Co., Providence, R. I.; Holyoke Street Railway Co., Holyoke, Mass.; Norfolk & Newport News Co., Norfolk, Va.; Cleveland Electric Railway Co.—R. W. Conant.

It is our practice to test all motors in place, by disconnecting each motor, and forcing ten (10) amperes of current through the resistance, and measuring the fields and armature separately, with a low reading voltmeter. This mode of testing can be done by any shopman and in a few minutes' time.—A. F. Rexroth.

In the Harrisburg repair shops the following method for testing armatures for short circuits has been devised by Mr. Rexroth and has proved practically sure:

In making test, pass a current of about 10 amperes at 500 volts through it, with the aid of a yoke with adjusting contacts, so as to make connection on some bar on which the brushes should set. Use a voltmeter with low reading dial so that two volts will read 600. With the terminals from the voltmeter, test the adjoining bars from one contact to the other, and when one space is tested, move the yoke to the other part of the commutator, so as to test all bars. If bars are free from short circuit, they will read about eight points on the voltmeter, but if a drop of two or more points occurs on any bar you may look for a slight short circuit. If meter does not read any figure you will find a dead short circuit.

A coil of iron wire is used for resistance, or where this kind is not at hand, a water resistance can be used, as it only takes a few minutes to test an armature and the water will not have time to become hot.—Editor.

133. What is the average life of field coils and armatures in modern enclosed motors such as G. E. 57, Westinghouse 68, etc.?

We have never used the Westinghouse No. 68 motor, but have used some G. E. 57 motors for three or four years, and up to this time have not had occasion to replace either armature or field coils.—A. F. Rexroth.

It is a difficult matter to make a just comparison of the life of different field coils and armatures. In general the life of the windings of a railway motor depends upon the temperatures in service. The temperature of the winding depends upon many variable factors, such as schedule speed, weight of car, and other factors which vary power consumption as noted above. With a certain definite weight car and type of motor, making a certain definite schedule and stops per mile, the temperatures might vary greatly and hence the life of the windings by simply changing the gear ratio of the motors. Our experience has shown that in a great many instances the temperature of windings can and have been greatly decreased by a change in gear ratio, the same or practically the same schedule being maintained as before the change of gearing. It will therefore be seen that the conditions under which motors operate are so varied that it is almost impossible to make a statement as to the life of the windings which could be compared with the life of the windings on other motors operating under entirely different conditions.—R. E. Moore.

134. What is the average life of field coils and armatures in motors of the Westinghouse No. 3 class and size?

Two and one-half to three years.—Chas. T. Herrick.

From two (2) to three (3) years, averaging 160 car miles per day.—A. F. Rexroth.

135. Have any improvements been adopted in rewinding Westinghouse No. 3 armatures tending to diminish the trouble by grounding at the ends of the slots?

Mr. A. F. Rexroth, foreman of the repair department of the Harrisburg Traction Co., has devised an improvement in rewinding Westinghouse No. 3 armatures which has reduced their trouble account with this type armature about 40 per cent over the old style form wound coils. The difficulty with form wound coils is the liability of injuring the insulation in putting them in place, as it is impossible to put them on without using a hammer, and when armature is put under heavy load it is liable to ground at the defective point and burn out. The present plan obviates this difficulty entirely. In the new system of winding, one sheet of micanite and two sheets of brown paper are used in lining the slots of the core, making the insulation five-eighths of an inch longer than the core of the armature. The winding is the same as with the form coils from slot one to twenty-five. When the section is started put the left hand lead in slot twenty-six until the section is finished in one and twenty-five. Then put a piece of lead cover on both leads the length of the core so as to make a good insulation between the sections. This is done so as to bring both leads out at the top of the section. On the ends of the armature one thickness of muslin or linen is enough on each section. The time of winding armature in this way is somewhat longer than with form coils, but the greater durability warrants the expense. The armature connections are the same as with other winding. The ends of the armature are much smaller with this system.

136. Is there any brush holder for Westinghouse No. 3 motors, which overcomes the troubles with standard type brush holders, getting loose, damaging springs and causing sparking and heating of armatures?

We have had no experience with anything different from the original brush holder, furnished by the Westinghouse Company. Mr. Frank Wampler, master mechanic of the Union Traction Company, Philadelphia, at the Sixth street repair shops, has improved a brush holder, that, when used, will overcome the trouble referred to. This device is similar in construction to that brush holder and works similar to the brush holder on the G. E.-800 motor.—A. F. Rexroth.

137. Can a small road, not over 25 cars, save any money by re-winding all burned out armatures and field coils?

Yes, if done by one of the car house employes who should be familiar with this kind of work.—Chas. H. Smith.

We think not at the present time, but are willing to be convinced that we are wrong.—C. T. Herrick.

Yes, I would think it would repay any road of ten cars and over to do its own rewinding of both armatures and field coils.—A. F. Rexroth.

138. What is best method of connecting motor terminals to car cables on double truck cars?

Fasten your cables as near the kingbolt as possible and run from there to the motor.—Chas. T. Herrick.

We place lead wire from the main cable over to the motor, in the form of a cable, encased in cotton hose same as main cable, which is cleated to the floor of the car, leaving an end of about eight inches hang below the cleat. To this the leads from the motors are connected by means of a two-way connector. The wires from the motors are encased in a circular loom to prevent the insulation from wearing through on the truck.—A. F. Rexroth.

We consider the best mode of connecting motor terminals to car cables on double truck cars to be the use of a split connector, one-half of which is soldered to the motor lead and the other half to the lead from the car wiring cable. The connection between the two halves being made either by clamping screws or by clamping effect produced by turning the connector through an angle.—R. E. Moore.

139. What is a proper life for car cables on open cars?

140. What has been your experience with flexible, stranded and

solid wire for car cable? Also advantages of single, double and triple braiding?

We have used both stranded and solid wire for main cable in closed and open cars, and have found from experience that the cheapest and best is the stranded for the main cable, and the flexible for leads, using triple braided insulation in all cases.—A. F. Rexroth.

141. Is there any advantage in placing a hood switch at each end, and connecting so that throwing off hood switch cuts off trolley connection from controller at the end?

Yes, very useful in case of emergency; making repairs or examination of motors, controllers or other parts of the circuit.—Chas. H. Smith.

We think there is.—Chas. T. Herrick.

From our past experience we think it advisable to put a hood switch at each end of the car, connecting it independently, so that by throwing either of the switches the trolley wire is disconnected from the controller at that end of the car.—A. F. Rexroth.

We do not consider that there is any advantage in connecting hood switches at the two ends of a car in multiple so that throwing one switch cuts off the connection only from the controller at the same end of the car. Such an arrangement would either necessitate a considerable amount of extra wiring, or the use of separate fuses and lightning arresters for each controller, and there would be, in our opinion, no compensating gain. Where the hood switches are connected in series, throwing either switch cuts off both controllers.—R. E. Moore.

142. What are the weights and designs for trolley wheels for city and interurban service?

We use the standard 4½-lb. wheel.—Chas. T. Herrick.

We use the standard 3-pound trolley wheel for city work and for long time and suburban work we use the 6-inch trolley wheels, made by the Star Brass Co., Kalamazoo, Mich.—A. F. Rexroth.

143. What is most economical pressure of trolley wheel against the wire?

Depends upon the condition of the track and height of the trolley wire from the rail—usually 18 lb.—Chas. H. Smith.

From 16 to 20 lb., depending upon the style of the trolley.—Chas. T. Herrick.

From 18 to 20 pounds, depending upon the style of the trolley wheel.—A. F. Rexroth.

144. Do any of the roads use standard limit gages for determining maximum permissible wear on trolley wheels?

145. What average mileage is obtained from trolley wheels?

We think from 5,000 to 8,000 is a good average mileage.—Chas. T. Herrick.

From 5,000 to 8,000 is the average for the 3-lb. wheel; but on 6-in. wheels we have been getting from 12,000 to 15,000 miles.—A. F. Rexroth.

146. Do you consider any form of trolley catcher or retriever commercially successful?

We have used the Wilson trolley catcher with splendid results for about two years.—A. F. Rexroth.

We consider that some form of trolley retriever is of great value on high speed equipments. The retriever is much preferable to the trolley catcher, as it immediately pulls the trolley pole down as soon as the wheel leaves the wire, this insuring a minimum damage to the overhead construction.

147. What size and kind of trolley rope is best for general service?

Three-eighths of an inch. When trolley catchers are in use, one-fourth inch rope is the heaviest we can use.—Chas. H. Smith.

Three-eighths and ¼-inch Samson spot cord gives us the best results.—A. F. Rexroth.

148. How often should cars be completely repainted, assuming cars are varnished and retouched annually?

We have cars in service four years without repainting. We avoid this by giving them a coat of good varnish every year.—Chas. H. Smith.

We have found it advisable to varnish our cars at least once every year, and to completely repaint a car once every four years; but in repainting, where the coats are not cracked or grazed, we simply sandpaper the top coat off, leaving a smooth surface underneath, which saves the cost of a ground coat.—A. F. Rexroth.

Discussion on Question 148, Car Painting.

Mr. Rexroth: We try to varnish our cars once a year; and about every four years we burn the paint off and repaint from the wood.

In repainting we put on three priming coats of white lead, mixed with a little Tuscan red. Then we add a dead coat of color, stripe and letter, and put on one coat of rubbing varnish and two coats of finishing varnish. The filling coats are not rubbed down. The cost under this system is about \$40.00 per car.

Mr. Wendle: What make of finishing varnish do you use?

Mr. Rexroth: Flood & Conklin's body varnish.

Mr. Faller: We use Murphy varnish.

Mr. Wendle: We have been using Harland's finishing varnish, largely because of the special claims made for it by our painter. He claims to have tried a number of prominent American finishing varnishes, but the results were inferior to those obtained with the Harland goods. In view of the necessity of varnishing every year, it is a question whether it is worth our while to spend \$1.50 to \$2.00 more per gallon for varnish, especially as Harrisburg and Mt. Holly find the cheaper varnish entirely satisfactory.

Mr. Ohmer: In car painting, one of the troubles is surface cracking. This is attributable to two reasons—putting on the coats too rapidly, the foundation coat not having sufficient time to thoroughly dry, and the use of inferior varnish. If ample time is allowed for each coat to dry, and the best grades of finishing varnish used, there should be no necessity for burning off every four years, if cars are regularly varnished each year. The foundation painting should be good for seven or eight years.

Mr. Wendle: This repainting question is important, involving as it does a considerable annual expenditure. On our road, this work has been done by contract. The contract covered not only painting, but getting the car ready, dismantling, and other operations not strictly defined as painting. For this work our expense is about \$80.00 to \$85.00 per car.

When I compare this cost with what other roads are doing it seems exorbitant; but I have been unable to pick out just which of our operations was the luxury. In looking up the subject, I have received statements of labor costs alone, varying from \$24.00 to \$52.00 per car for burning off and complete repainting inside and out. This is a wide discrepancy for what is presumably a carefully conducted department of the business.

The question comes to what each of the roads are getting for their money and whether the requirements of street car service are as well met by the \$24.00 job as the \$52.00 one, and in order to place this matter on a more definite basis, I would suggest that our members keep a detailed record of what is actually done, how much time is required for each particular operation, and how much and the cost of each kind of material used in each coat. Such data, covering the roads controlled by our members, and others, would permit intelligent comparisons to be made and revision of methods adapted, if deemed advisable.

149. How many times is it advisable to varnish cars between complete repaintings?

150. What is the most economical and serviceable color for car bodies?

Chrome yellow.—C. T. Herrick.

Tuscan red.—S. W. Rhen.

Chrome yellow, with dark brown or green stripings and letterings.—A. F. Rexroth.

151. What make and grades of varnishes are best adapted for inside and outside service?

Outside—Harland's railway body varnish.

Inside—Parrott's inside finishing varnish.—S. W. Rhen.

152. Assuming an 18 or 20-ft. closed body, what is a fair cost for the following:—Burning off and repainting from the wood; re-touching and varnishing exterior.

Twenty to 25 feet closed car bodies—(a) to burn off old paint and glaze with white lead and varnish (including inside varnishing), and painting roof and floor, \$32.50 per car; (b) burn off old paint and use wood filler, primer, etc., approximately \$46.00 per car. As we find the first method very satisfactory, we have adopted it.—A. F. Rexroth.

153. Is it advisable from a business standpoint to liberally decorate and letter sides of cars, or simply stripe in color and number, omitting lettering and useless decorations?

I think not. It is useless expense and no profit gained. We use a plain stripe and number, omitting lettering and useless decorations.—Chas. H. Smith.

We have cut out all fancy gold scroll work and lettering; we do not think it necessary.—C. T. Herrick.

In our judgment the plainer the car can be made, the richer and better it will look, and the more serviceable it will be. Our system is to paint the car in plain colors, using a simple stripe, with number put on plainly, and small initials of the company painted in plain lettering at one end of the car.—A. F. Rexroth.

154. In a road where the amount of painting is not sufficient to keep one man regularly engaged, what is the best method of handling this work cheaply and properly?

We hire the services of a painter in our town as we need him, paying 20 cents per hour.—C. H. Smith.

155. On ordinary track construction laid some years, has the use of maximum traction and double trucks enabled a higher schedule speed to be maintained without discomforts to passengers or excessive maintenance costs?

156. Which is the better system of operating registers, rod or cord pull?

We consider the rod pull the best.—Chas. T. Herrick.

157. What is the best size and material for register strap?

Five-sixteenth inch tannite.—Chas. T. Herrick.

Five-sixteenth inch oak tanned leather cord, cut with edges chamfered off.—A. F. Rexroth.

158. What kind and size of signal rope is most satisfactory? What are relative merits of solid braided and steel cord ropes?

One-quarter inch with wire center.—Chas. T. Herrick.

We use the same rope for the signal bell as we do for the register cord.—A. F. Rexroth.

159. What is the most durable covering for upholstered seats?

I think rattan.—Chas. T. Herrick.

Rattan is cleaner, and I think more serviceable.—A. F. Rexroth.

160. How do you clean your closed bodies? Do you use hot or cold water? Do you use soap or any other special preparation in cleaning?

Warm water and soap.—Chas. H. Smith.

Cold water in summer and luke warm water in winter and a mild soap.—C. T. Herrick.

We use cold water in summer and luke-warm water in winter, without any kind of soap.—A. F. Rexroth.

Discussion on Question 160, Car Cleaning.

Mr. Herrick: At Saratoga the washing of cars was thoroughly discussed, and the use of linseed-oil soap was recommended by several members. Mr. Lake, of one of the western roads, stated that a little linseed-oil soap dissolved in the cleaning water was absolutely necessary to clean the oil and dirt from his cars. His road operates through an oil territory and the grease and grime collect on the cars so rapidly that daily cleaning is necessary. In spite of daily cleaning, he reported no evidence of damage to varnish by the linseed-oil soap. Other large companies reported a similar experience. On account of the importance of proper car cleaning, I would ask whether any of our members have had experience with this soap or can advise me where to get it.

Mr. Ohmer: From a long experience in wood finishing, let me advise you—"Don't ever use soap of any kind in car cleaning." The soap contains lye and disintegrates the varnish. If you cannot clean with plain water, put a little wood alcohol in the water. This will clean off the grease and dirt and at the same time will stiffen up, or rather support, the varnish, instead of cutting it away.

Mr. Wendle: While we are on the subject of car washing, will the members state the system they are using in car washing? How often are the cars gone over, and how many men are actually employed in washing cars exclusively?

Mr. Fairchild: On this line I would say that Mr. Baker, at Saratoga, stated that they allowed eight cars to a man a day. With this number of cars per man, the cleaning was done in fairly good shape.

Mr. Rexroth: We have some men who clean cars at night; they do some washing, but not very much. The main car washing, namely, from the windows down, is done in the day time by several special men. With this force, we generally get our 60 cars washed once a week.

161. Is there any tread for car steps which will prevent slipping in winter?

We cover our steps with a strip of corrugated rubber.—Chas. H. Smith.

Corrugated rubber, we think, is good, and there is a safety tread manufactured with lead inserted that is very good.—Chas. T. Herrick.

162. Are car circuit breakers preferable to enclosed fuses?

I think they are.—Chas. T. Herrick.

Car circuit breakers are more reliable and convenient than enclosed fuses.—A. F. Rexroth.

For all equipments with a total capacity of 90 h. p. or over, operated only as single cars, we consider that the use of circuit breakers is preferable to the use of fuses, as they are much quicker in their action and consequently minimize the damage in case of short circuits on the apparatus. Circuit breakers also accomplish the double purpose of an overload interrupting device and a hood switch; and the circuit is more easily and quickly re-established than where fuses are used. It must be considered, however, that the circuit breaker is necessarily a piece of apparatus that must be carefully inspected, in order to insure its properly accomplishing the results for which it is used. A fuse used in series with circuit breakers provides an additional factor of safety, but it is not necessary if the circuit breakers are carefully inspected and kept in proper operating condition.—R. E. Moore.

163. What type of headlight is best for city service?

Electric—Cleaner, and more economical.—Chas. H. Smith.

We think oil headlights, for the reason if anything gets loose or breaks in connection with the trucks, you can use headlight about the car.—C. T. Herrick.

Electric headlights, with 16 c. p. incandescent lamps, are more reliable and economical.

164. What has been your experience with fenders?

Our fenders have not been patronized.—Chas. H. Smith.

We think it economical to use fenders.—Chas. T. Herrick.

165. Do you have any system of reporting electrical and mechanical defects in cars by conductors, motormen or other employees, especially when defects are not serious enough to take car out of service? What method is used to check up such reports?

Our employees are instructed to report to the car house defects of any kind that come before their notice.—Chas. H. Smith.

We have a blank which we furnish each crew at the car house, when the cars are turned in for the day. Upon this blank the conductors and motormen are instructed to report any repairs necessary to the car, or any shortage of tools or equipment kept upon the car.—A. F. Rexroth.

Our system is as follows: Special report forms, bound cheaply in a manner similar to the Western Union books of telegraph blanks, are placed in each car by car repair department. These forms are ruled and printed to make two columns. In the first column, the various items which affect the safety or comfort of passengers are listed, and the conductor indicates and briefly explains nature of defect. In the second column, items affecting the equipment or operation of car are listed, and the motorman similarly marks and explains. This report is signed by both the conductor and motorman in their respective columns. At the time original report is made out, carbon paper is placed to give copy. The original copy of report is deposited with the repair department, and the carbon copy with the dispatcher. It is the motorman's special duty to see that these reports are properly made out and deposited before leaving the car barn after turning in the car.

On receipt of report the repair department is expected to remedy defect, if possible, before the car is again placed in service; and in order to check up whether repairs are promptly and properly made the dispatcher looks up all reported cars which are again placed in service and if defects still exist he reports such fact daily when his copies of reports are turned into the main office. This enables the management to keep close supervision on the condition of cars, and

the efficiency of the repair department is determined by comparison of these reports with the daily labor and material reports from the car repair department.—Editor.

166. What is the maximum length of closed body, mounted on single truck, seven feet wheel base, which will give satisfactory service to the public and reasonable maintenance cost on truck and body?

I think any car body over 18 feet in length too long to be mounted on a single truck.—A. F. Rexroth.

167. What has been the experience with convertible cars? Have there been any serious difficulties with the closing devices?

168. In city service, what is the relative loss of time due to passengers entering and leaving cars with cross seats as compared with longitudinal seats?

169. What popularity has the semi-convertible car as compared with regular cross bench open cars, especially with reference to pleasure riding?

The semi-convertible type has given general satisfaction.—A. F. Rexroth.

170. Are accidents less with cross seat cars of the semi-convertible type than with 12 or 15-bench open cars?

Very much less with the cross seat, semi-convertible type.—A. F. Rexroth.

171. What is the minimum satisfactory width over all for semi-convertible cars?

Our semi-convertible cars run from 8 ft. 2 in. to 8 ft. 4 in. wide over all, and give a satisfactory width of aisle.—A. F. Rexroth.

172. To what extent have track scrapers of the Van Dorn-Dutton, Root and similar type, been a commercial success?

Would not be without them. Excellent devices for removing snow and dirt from the rail.—Chas. H. Smith.

173. Is there any satisfactory device, attachable to each car, which will scrape packed snow from girder rails, especially along paved streets?

Discussion on Question 173.

Mr. Wendle: Where the scraper can be set on the top of the rail we find Dorner or Brill type very useful; but where the track is laid in asphalt streets with granite blocks inside and outside the rail and which stick above the top of the rail, this type of scraper is of practically no use for cleaning out snow and sleet from the tracks. Has any member found any device which is successful under these conditions?

Mr. Musser: We have the Dorner and Brill scrapers on a certain number of our cars on each street. We also have a device on our combined snow scraper and plow, made by the Thomson-Houston company a good many years ago, consisting of a spring track scraper which is kept sharpened and held against the rail by compression. This works very satisfactorily on a straight track as long as the joints are tight, but it would not be at all satisfactory for the entire service.

174. What substitute, if any, has been found for salt in removing snow and ice from track?

175. What has been the experience with crude oil in cleaning out and preventing the freezing up of special work?

Track and Roadway Department.

201. What are the practical advantages of "Trilby" girder rails in paved streets?

I think none. While we use "Trilby" and side bearing girder rails, the T rail of proper height is best for paved streets.—A. F. Rexroth.

Very little of the "Trilby" rail has been in service sufficiently long to develop its defects. One of the New England roads, in connection with the municipal officers, looked into this matter, and their report on New York city results was that the pavement was not especially preserved by this special form of rail. The modified form, used in Philadelphia, has not been reported on. From best information we can get, the advantages of the "Trilby" type are

largely theoretical. Practically it has the faults common to all grooved rails and is by no means the salvation of municipal pavements.—Editor.

202. What is the advantage in using girder rails higher than seven inches in streets paved with brick or asphalt?

If concrete foundation or beam construction is used, with welded joints, there is no advantage in using over 7-inch rails. On standard ballasted track, with mechanical joints, the 9-inch girder rail is most satisfactory.—T. J. King.

203. What has been the experience in using T rails in city streets?

204. Has any satisfactory method been devised for attaching metal pieces to existing girder rails to change the head to a shape similar to "Tribby" or grooved rails? Has such change of form been voluntary or because of conditions imposed by the municipality? What results have been obtained?

We have had some experience in the use of Buckland blocks which are intended to transform the ordinary tram head rail into a grooved head rail.

These blocks are made of short cast iron and when they are first placed in service seem to fill the bill quite nicely. They, however, wear out rapidly in the groove due to the abrasion caused by ordinary street traffic as well as that caused by full-flanged wheels.

In my opinion they are, at best, a makeshift, which may be used in order to tide over the necessity of replacing rails for a short period. The cost of these blocks is about 20 cents a foot of rail or 40 cents a foot of single track. To this expense must be added the cost of splicing the blocks.—Norman McD. Crawford.

205. What is the experience with special rail joints, such as the Weber, Continuous, Atlas, etc., in regard to reducing maintenance and depreciation charges on track?

We have had some old rails, with pounded joints, reclaimed to some extent by using Weber and Continuous rail joints.—A. F. Rexroth.

Discussion on Question 205.

Mr. Musser: We have used the Weber joints and some few Continuous. The track on which we used Weber joints had been worn considerably and the rails were pounded down some at the joints; after the new joints had been in service for some time we found that the ends of the rails had smoothed out to some extent. It was not expected that the pounding would be entirely removed, but the rails were very much improved. It is our experience that these joints are economical in fixing up old track, where you do not want to disturb the pavement for several years. We are now using these joints on a stretch of new work, but this has not been in service a sufficient time to determine results. On one street we used the Continuous joint and at the end of a year's service we find it very satisfactory.

206. Has the riveted fish plate joint, either with or without special riveted brace under joint, been successful? With joints of this type, how frequently must riveting be gone over? What is the cost per joint in place for six-hole plate?

207. In cast-weld joints of the type installed in Philadelphia, has there been any trouble with breakage or loosening of joint? Are separate copper bonds required? What is the cost of joint complete, including cleaning of rails, etc? How extensive a plant is required for this system?

208. Is there any way by which the hammered ends of the girder or T rails can be smoothed and trued up without taking up the rails?

By taking up sufficient pavement to permit sawing off the battered ends and then cast-welding in a short piece of good rail of same shape. By extending casting mold, it would be possible to complete the joint casting at one operation. In case work is to be done in connection with repaving, it is best to take up the rails, saw off the defective ends and use a mechanical joint of Continuous or Weber type. This was done on about one mile of badly battered rails; Continuous rail joints were used, and from present indications at least seven or eight years additional life will be obtained from rails. In three years the maintenance cost in this stretch has been very low and riding is reasonably smooth.—T. J. King.

209. In resurfacing old track on which double truck cars are run exclusively, how much above the general level of the rails can the joints be raised without making the riding rough or seriously hammering the rail ends?

In resurfacing old track, laid with even joints, the joint can be raised $\frac{3}{4}$ -inch above the general rail level. This elevation does not cause any annoyance to passengers or unusual wear on track or cars. If this work is done in connection with a general track repair, and joints thoroughly tamped, no attention should be required for three years, unless joint becomes loose.

With broken joints it is not advisable to raise joint very much above level.—T. J. King.

210. What is the proper safe distance between the inside rails on double track or in turnouts, to provide for passing of modern type of cars?

Sufficient to allow a space of one foot or more between the running boards of open cars.—Chas. H. Smith.

Not less than 5 ft. and if possible, 6 ft. between inside gage lines.—Meade Coulton.

Our gage is 5 feet $2\frac{1}{2}$ inches. We make all our double track to feet from center to center.—A. F. Rexroth.

211. Where girder rails are laid in dirt streets which are kept in repair by the company, what is the best method for preventing the continual cutting away of dirt immediately outside the rails, especially at curves, by wagon traffic?

We find it profitable to pave all track, and at places where the street is not paved we pave between the tracks and 9 inches outside of the rails with cobble stones. This preserves the ties and prevents water getting under, and at the same time avoids the continual expense of filling up with broken stone.—A. F. Rexroth.

Where girder rail is 6-in. or higher, or on chairs, we find paving with cobbles or roughly dressed stones along the outside of rail to be the most satisfactory and durable construction. By carrying paving out about 10 to 12 in. and ramming well, the stones remain in place even where the wagon traffic is heavy.

Where paving cannot be done, we have had good success with tamping in the cinders from our power houses. In a comparatively short time these form a hard, compact bed and raise very little objection from city authorities.—M. Coulton.

212. What satisfactory substitute has been found for planking inside and outside of the T rails laid in dirt streets?

We use stone macadam and find it more economical and better than planking. Not affected by frost.—Chas. H. Smith.

We use cinders wherever possible and where teaming is light, have been able to meet requirements of city and county supervisors.—M. Coulton.

213. What is the average life of modern hardened center special work?

Our experience is that this work will by no means last as long as the abutting rails. Examination of special work on our system, in use about three years, shows material signs of wear with an average of about 400 cars passing over it per day.—Meade Coulton.

214. What is the average life of steam railroad crossings, made according to the Pennsylvania or Reading Railroad standard? What improvements can you suggest that will tend to lengthen life?

215. What are the relative costs of the following track constructions: Broken stone foundation, wood cross ties 2 ft. centers, and 70-lb. girder rails; concrete foundation, wood cross ties 2 ft. centers, and 70 lb. girder rails; concrete beams, with track mounted thereon and bedded in concrete, and held to gage by iron tie rods, rail 70-lb. girder?

Basing costs on first-class construction, and calling this 1.00, the relative costs are approximately as follows: 2nd type, 1.4; 3rd type, if built in paved street, using no forms, 1.1, and 3rd type, new work, requiring forms, 1.25.—T. J. King.

216. What is the minimum depth of concrete or broken stone required for permanent track construction in paved streets?

Not less than 4 inches of concrete or broken stone.—A. F. Rexroth. Where city has compelled back filling of trenches, etc., with sand or gravel, and subsoil is gravelly or sandy, with natural drainage, 6 to 9 inches of concrete. If clay or poor subsoil, concrete should extend below the frost line.—T. J. King.

217. What is the experience in using the cheaper grades of cement for concrete foundation work?

We substituted rosendale for portland cement on about one-half mile of new track work, paved with brick. A year's service has developed no difficulty whatever.—M. Coulton.

Rosendale does not seem to set up in air as well as portland cement. For foundations of piers or abutments, below the water line, rosendale seems as good as portland. In paving, in order to obtain equal strengths of concrete, rosendale at 85 cents per 300 pound barrel is almost equal to portland at \$1.50 per 400 pound barrel.—T. J. King.

218. What precautions must be observed in laying track on concrete beams without the usual cross-ties, in order to secure satisfactory track construction?

Provisions should be made as follows:

1st. To actually clamp or tie rails to concrete beam and at the same time hold the rail to line and surface.

2nd. To prevent rails expanding or contracting widely during the setting up of the concrete, otherwise rails are apt to become loose in the concrete.

3rd. To be so placed that rails are butted for welding joints.

4th. To use welded joints so that wheels run perfectly smoothly over joints, as any type of mechanical joint leaves a ridge, which in rigid construction of this type will result in pounded rail ends.

The most important point is that concrete be brought up tightly against the bottom of rail. After concrete is properly tamped, it is advisable to pour a grouting of strong cement and fine stone. It is essential to use a good grade of portland cement in the construction of the beam.—A. F. Rexroth.

5th. To anchor each rail to concrete beam so that on grades there will be no creeping of rails, and rails will expand evenly in both directions and return to original position.—T. J. King.

219. In streets which are to be paved with asphalt, what is the most serviceable pavement to lay between the rails?

Brick. Can be opened and replaced without impairing pavement. Is not rotted by grease dropping from motors. Is relatively smooth for driving.—M. Coulton.

220. What form of cover plate and system of openings is best for track drains where wagon traffic is heavy?

We use cast iron plates of the plain convex pattern.—Chas. H. Smith.

We have tried various types of track drain covers with various widths and shapes of openings; narrow rectangular slots; raised ridge tops with slots between; and flat smooth top with a series of round holes, ½-in. diameter, distributed over same. With all forms except the last, we have had considerable trouble with the caulks on horses' shoes getting caught in openings, and injuring horse or pulling shoes loose.—M. Coulton.

One of the most successful track drains and covers is constructed as follows: On a brick basin is mounted a cast iron frame 12 inches wide, and 54 inches long over all. This frame is arranged to take a flat cast cover, divided into two equal sections, each 9¾ inches wide and 25½ inches long. The top openings are ½-inch wide and extend over 8 inches of the width of cover and at an angle of 45 degrees. The weight of cover and frame is about 244 pounds and costs approximately \$6.00. The brick basin underneath can be built for about \$4.00, making the complete cost of drain \$10.00. The use of two sections enables one man to handle cover easily.—C. B. Fairchild, jr.

Bonding Department.

250. In testing bonds against the connected rails with Conant or similar type of testing outfit, what length of rail is accepted as the equivalent of a first-class bond? What equivalent length of rail as read on the instrument is regarded sufficient to condemn the bond?

A bond resistance equal to 3 ft. of rail is usually considered very good. If equal to 4½ ft. of rail, it is fair. If it equals 6 ft. or more of rail, it ought to be condemned. If the rail is bonded to the full capacity, and bonds of such a character as will maintain their initial efficiency are used, the resistance of the bond should be the same as clear rail of a length occupied by the bonds, and should remain so.—A. H. Englund.

In testing a rail bond, several considerations are necessary in order that the work of repair may render the return circuit the most effective for the least expenditure of money, and consequently the resistance of a bond in terms of the length of the rail, which would be called good, bad or indifferent, will depend on what portion of the rail return system this bond occurs. The current density on the rail being the important factor in determining what will be the permissible drop and on this basis should the effectiveness of the individual bond be judged. Assuming what the maximum return drop that we wish to allow for a given stretch of road from the power station serving that road, we would just determine the current flow that the rails have to carry back to the power station. The voltage being taken by drop tests or computed for the maximum load of half the track distance. Assuming that for rails weighing over 40 lb. (60-lb. rail measures .0052 ohm per thousand feet) that their resistance is in proportion to their sectional area, this gives us the drop that will occur with the current flowing through the rails, considering it a continuous rail system, assuming the drop to be 20 volts. Subtract the drop thus found from 20 volts and divide this difference by the number of joints occurring to the points on the rails where we assume our drop, this will give the potential difference on the average joint and also give us the length of rail for the average bond, which will be required to be maintained in order to give the drop on the rail joint, which will bring us within the desired potential loss on the return system.

There are other considerations that cannot be neglected in this proposition, that is, where the equipment is large the acceleration of this equipment becomes an important factor in the copper overhead and the bonding of the rail return in order that the equipment may accelerate without undue heating and schedule may be maintained without over-speeding the equipment on high pressure portions of the system.

The above treatment of the bond question leads to a tapering bond as the power station is approached, and this is the correct method of placing for a given amount of money expended in bonding, bonding to give the least possible drop, and consequently it is impossible to arbitrarily fix any length of rail in terms of bond resistance without knowing the conditions under which the bond is to be used.—A. B. Herrick.

My opinion is that 3 ft. of rail and joint should be bonded so as to test equal to 6 ft. of rail and that any joint that tests over 12 ft. of rail should be re-bonded, this applies to moderately heavy conditions of traffic, but there are very few roads to which these conditions do not apply. Joints which test between these limits should not be allowed to pass if the traffic is extremely heavy, but may be if the traffic is light.—R. W. Conant.

We use a milli-voltmeter, with double needle and scale, and compare the drop between 3 feet of solid rail and 3 feet across the joint. When the joint reading is 10 milli-volts higher than the solid rail reading, we condemn bond and replace it.—P. F. Gerhart.

1st Question: three feet. 2nd Question: five feet.—R. E. Moore.

251. What is the best method of rebonding tracks in paved streets with the minimum disturbance of pavement, tracks consisting of 6-in., 7-in. and 9-in. girder rails? What is the total cost per joint for such re-bonding, exclusive of cost of removal and replacement of pavement?

We have perfected hydraulic punches and compressors for bonding girder rails in paved streets. The punch cuts a tapered hole in that part of the tram projecting beyond the edge of the joint plate. The compressor forces the bond terminal back into the hole against the taper. In asphalt streets, with the usual Belgium blocks against the inside of the rail, it is necessary to remove but two of the Belgium blocks to make room for the hydraulic tools. There are over 100,000 joints bonded in this manner in Philadelphia. Unofficial costs given us by the bonding department show that the Belgium blocks can be removed, two bond holes punched, the bond inserted and compressed, and the Belgium blocks properly replaced for about 18 cents per joint, exclusive of the cost of the bond. We make a standing offer to accept for our method 75 per cent of the cost of any other way of bonding girder rails in paved streets, giving equivalent results as to capacity and durability. This method of bonding has been employed also in Harrisburg, York, Norristown and Tacony, Pa.—A. H. Englund.

The method of re-bonding track in a paved street economically has not yet been proposed, but from my experience a radical de-

parture has to be made for this class of track work, and I think the solution is to be found along the following lines. Instead of removing the track, to use a cutter or pneumatic tool which will cut away the pavement for $\frac{3}{4}$ -in. from the ball of the rail and cut a slot in the pavement for about 6 in. long. Then a U-shaped bond made of ribbon, the edges of which are presented to the ball of the rail and electrically soldered to the rail, giving a U-shaped loop projecting into the slot cut in the pavement and bridging the joint of the rail. I am designing tools to produce this kind of a bonding arrangement and I believe that I can get the time necessary to put in a bond in less than two minutes and at a cost of less than 30 cents. The tools and soldering transformer are portions of the bonding car, so the work can be done most expeditiously, and after this bond is placed and connected, the slot is to be filled with asphalt or equivalent compound to restore the pavement to its original surface.

It is found that disturbing the pavement around a joint disturbs the track at its most critical point and a patch in the paving is never as strong as the original pavement.—A. B. Herrick.

We use a 6-inch tram bond, with a $\frac{3}{4}$ -inch terminal, made by the Protected Rail Bond Co., who furnish us with hydraulic punches

Wheel Co.; Charles T. Herrick, S. W. Rhen, A. M. Davis, Ernest H. Davis, G. E. Wendle, Williamsport Passenger Railway Co.; B. F. Swartz, Lehigh Car Wheel & Axle Works; R. E. Moore, General Electric Co.; John B. Embeck, Wendell & MacDuffie; W. A. Armstrong, J. F. McCarthy, Edward Hammett, Mayer & Englund Co.; Charles B. Cushing, Foster Ivins, John A. Roebbling's Sons Co.; Harry DeStees, Stuart-Howland Co.; C. B. Fairchild, jr., "Street Railway Review"; C. M. Maxwell, H. C. Roberts Electric Co.; Thomas Cooper, A. H. Allen, C. B. Fairbanks, George B. Dusenberre, Westinghouse Electric & Manufacturing Co.; Henry Beyer, Crocker-Wheeler Co.; L. H. Mountney, John P. Coonan, Lewisburg, Wilton & Watontown Passenger Railway Co.; F. Andes, Susquehanna Traction Co.; Jacob Scott, Susquehanna Traction Co.; E. McKernan, Bemis Car Truck Co.; C. A. Aller, Carlisle & Mt. Holly Railway; F. B. Musser, P. F. Gerhart, A. F. Rexroth, Central Pennsylvania Traction Co.; Hiram E. Ackerly, American Car Seat Co.; J. E. Stedman, Rochester, N. Y.; T. E. Hughes, Standard Underground Cable Co. and Manufacturers' Club of Philadelphia; H. E. Overstreet, Climax Supply Co.; W. H. Lanius, York Street Railway Co.; John H. Downs, Climax Fence Post Co.; Richard H. Rice, William Gibbs Bain, Providence Engi-



DELEGATES AND VISITORS AT THE PENNSYLVANIA STREET RAILWAY ASSOCIATION CONVENTION.

and compressors for putting them in place. By this system it is only necessary to open a space on the inside of the rail, 6 inches wide and 18 inches long; punch the two holes in the rail, insert the bond and compress it. We have only used this type of bond on 6-inch side bearing rails, on streets paved with cobble-stones. The cost of removing and replacing cobble, punching and inserting the bonds is 15 cents per joint. The bonds cost approximately 55 cents each.—P. F. Gerhart.

To be continued.

The convention adjourned Thursday night to meet at the call of the executive committee.

The following were in attendance:

Street Railway Members and Others in Attendance.

C. R. Ellicott, Westinghouse Traction Brake Co.; Howard M. Voorhis, H. W. Johns-Manville Co.; R. H. Harper, Fred C. Jaeger, Western Electric Co.; Hugh A. Siggins, Warren St. Railway Co.; W. W. Power, W. H. Gable, National Electric Co.; C. V. Funk, John F. Ohmer, Ohmer Fare Register Co.; Samuel Russell, jr., Crocker-Wheeler Co.; Julius Kretz, Walker & Kepler; Cornell S. Hawley, Consolidated Car Heating Co.; John A. McQuale, American Steel & Wire Co.; W. K. Beard, Street Railway Journal; Robert E. Hunt, E. L. Reynolds, Electric Storage Battery Co.; Frank C. Wright, Edison Electric Illuminating Co.; Charles H. Smith, Lebanon Valley Street Railway Co.; Bertram Berry, Heywood Brothers & Wakefield Co.; Frederic A. Lex, Lobdell Car

neering Works; H. F. Sanville, Albert & J. M. Anderson Manufacturing Co.; J. Clifford, Wilkesbarre & Wyoming Traction Co.; Benj. Smith, Camden Terminal, N. J.

During the convention the National Electric Co., of Milwaukee, exhibited a working model of the latest type of Christensen air brake.

The American Car Seat Co. showed a sample of its No. 7 "Push Over" type seat.

The Bemis Truck Co. exhibited a model of its new type of double truck.

The work of extending the platforms on the stations of the Union Elevated Railroad Chicago (the loop), will perhaps be delayed to some extent by the ruling of the corporation counsel that permission to do this work must come from the city council and not from the street commissioner.

The Chicago & Milwaukee Electric Railway Co.'s branch to Libertyville, Ill., was recently opened to traffic, making the total mileage in operation at the present time 69 miles of single track. When the present extensions are completed the system will comprise 80 miles of single track, being double tracked from Evanston to Waukegan, with six miles of double track in Waukegan, six miles just completed from Lake Bluff to Libertyville, and three miles of double track under construction between Lake Bluff and North Chicago on the west of the Chicago & Northwestern Ry.

Recent Street Railway Decisions.

EDITED BY J. L. ROSENBERGER, ATTORNEY AT LAW, CHICAGO.

DUTY AS TO RESTORING STREET CROSSED TO FORMER CONDITION AND OF KNOWING IT HAS BEEN DONE.

Union Traction Co. of Indiana vs. Barnett (Ind. App.), 67 N. E. Rep. 205. Apr. 28, 1903.

The company having constructed its road across a brick paved street, the appellate court of Indiana, division No. 1, holds that it was its duty to restore the street as nearly as practicable to its former condition, and that it was bound to know whether it had done so.

VILLAGE HAS POWER TO AUTHORIZE BUILDING OF TRESTLE IN STREET FOR VIADUCT—ORDINANCE THEREFORE NOT NECESSARY.

Village of Winnetka vs. Chicago & Milwaukee Electric Railway Co. (Ill. App.), 107 Ill. App. 117. Feb. 27, 1903.

The erection of a trestle in a street for a viaduct for an electric railway to cross another street, the branch appellate court of Illinois for the first district holds, is entirely within the power of a village to provide for, the trestle work not exclusively occupying the street in which built, but leaving over forty feet to be used as a highway for public travel. And the court holds that it was immaterial in this case whether the public authorities of the village succeeded in expressing their will with reference thereto in a written ordinance, properly passed, or whether by their conduct or acquiescence they did so.

EQUAL RIGHTS OF RAILWAY AND PEDESTRIANS AT STREET CROSSINGS—WHEN ONE MAY CROSS IN FRONT OF AN APPROACHING CAR.

Du France vs. Metropolitan Street Railway Co. (N. Y. Sup.), 82 N. Y. Supp. 1. May 8, 1903.

The rule is well settled, the first appellate division of the supreme court of New York says, that on a street crossing a street railway and pedestrians have equal rights; but, if either is negligent in exercising this right, he cannot recover any damages sustained, even if they might have been prevented by the exercise of ordinary care on the part of the other. If a pedestrian reaches the track in time to cross it in safety, provided the speed of an approaching car be not increased, he cannot be said to be negligent in proceeding; but if it is apparent to him, or would be to a person of ordinary prudence, exercising ordinary care, that the car will inevitably overtake him unless the speed is slackened, then it is not a prudent act for him to assert his rights and proceed, even though it be the duty of the motorman to slow down to enable him to cross.

POWER OF MUNICIPALITY TO PROVIDE FOR RAILS TO BE LAID WITHIN A SPECIFIED TIME—LIABILITY OF SURETY ON BOND FOR FAILURE TO LAY THEM WITHIN SUCH TIME.

Mayor, etc., of Borough of Carlstadt vs. City Trust & Surety Co. of Philadelphia (N. J. Sup.), 54 Atl. Rep. 815.

An ordinance of the borough provided that a traction company, in exercising the granted right to lay its rails in the public streets, should complete the work within a specified time. Thereupon a bond was given by the traction company, with the defendant as surety, conditioned to perform this obligation. The supreme court of New Jersey holds that it is the right and the duty of the governing body of such a municipal corporation to provide that companies, in exercising their right to lay rails upon the public streets, shall perform the work with such reasonable dispatch that travel shall not thereby be impeded or rendered less safe for an unreasonable length of time. This provision of the ordinance was a

reasonable exercise of the corporate power, and the failure of the traction company to comply with it constituted a breach of the bond, and would support a recovery.

DRIVING ON TO TRACK IMMEDIATELY IN FRONT OF MOVING CAR.

Chicago City Railway Co. vs. Ahler (Ill. App.), 107 Ill. App. 397. Mar. 31, 1903.

A driver of a wagon, the branch appellate court of Illinois for the first district holds, had no right to go on the company's track to make use of same as a driveway for his own convenience immediately in front of a moving car solely because it was easier to drive there, when by so doing he was interfering with the ordinary progress of the car. If he turned so suddenly upon the track in front of an electric car as to render striking his wagon unavoidable in the exercise of every reasonable precaution in operating the car, and an accident resulted in consequence, he was not entitled to recover. Until he started to get on the track there would apparently be no necessity for stopping the car, and if, while his conduct indicated no such intention, he changed his course and drove on the track so suddenly that the act could not be foreseen or guarded against by the motorman in time to prevent the accident, then the company was not liable for failing to stop the car in time to avoid a collision.

GRANTING OF FRANCHISES A LEGISLATIVE FUNCTION—SUFFICIENT NOTICE OF APPLICATION FOR FRANCHISE.

City of Benwood vs. Wheeling Railway Co. (W. Va.), 44 S. E. Rep. 271. May 2, 1903.

In granting a franchise or privilege, the council of a municipal corporation or a county court, the supreme court of appeals of West Virginia holds, performs a legislative, and not a judicial, function, and the notice required by section 1 of chapter 29 of the Acts of 1901, which provides that no franchise shall be granted where the application for such franchise has not been filed at least thirty days prior to the time when it is acted upon, and notice of such application, stating the object of such franchise, shall have been given by publication for thirty days, is provided merely in aid, protection, and extension of the right to be heard by petition, and need not set forth the day on which the application will be, or is expected to be, acted upon. As the act requires the application to be filed 30 days before action upon it, and forbids any action upon it until after 30 days' publication of notice, the notice is merely intended to apprise the public of its pendency. Moreover, the court holds that a statute requiring notice to be "given by publication for thirty days in some newspaper of general circulation" published in a county or city, is sufficiently complied with by publication in the successive issues of a weekly newspaper through the period of time named.

ADDITIONAL CARE REQUIRED WHEN CARS OVERCROWDED AND PASSENGERS ON PLATFORMS.

McCaw vs. Union Traction Co. (Pa.), 51 Atl. Rep. 803. Mar. 30, 1903.

It has not been declared negligence, the supreme court of Pennsylvania says, for a street railway company to permit its cars to be overcrowded, but when such a condition prevails additional care and precaution must be exercised by the conductor and motorman to protect the passengers against resultant danger. A street railway company cannot invite or permit passengers to board its cars beyond their normal capacity, and not be responsible for danger which necessarily results from their overcrowded condition. If a

passenger is permitted to enter a car having no vacant place except on the platforms, and the conductor accepts his fare, he is justified in standing on the platform, if he exercises proper care in doing so; and by receiving him the carrier undertakes and gives him assurance that it will take care of him, and guard him against accident, as far as the circumstances permit. And the court holds that where the number of passengers in a car was far in excess of its normal capacity this imposed upon the company's employees a very high degree of care in crossing railroad tracks and in descending a grade immediately thereafter. These were places of danger to persons on the overcrowded platform of the car, and the employees should have recognized the fact, and run the car accordingly.

PRESUMPTION AFTER MUNICIPAL ACTION THAT CONSENTS COVERED REQUISITE NUMBER OF FEET—CONSENTS REQUIRED TO BE SEALED AND ACKNOWLEDGED.

Mercer County Traction Co. vs. United New Jersey Railroad & Canal Co. (N. J. Ch.), 54 Atl. Rep. 819. Apr. 16, 1903.

Where it was contended that the legal existence of a company had not been proved because it did not appear that those purporting to give their consents, filed in the township clerk's office, owned the requisite number of lineal feet required by the statute, nothing appearing but the statement in the written consents of the number of feet owned by each consenting owner, the court of chancery of New Jersey thinks that, as the filing of the requisite consent was a condition precedent to the power of the township committee to pass the ordinance, the fact of the passage of the ordinance should be regarded as evidence that the committee found that the consents filed were, in this respect, in accordance with the statute. It says that the committee could resort to whatever evidence it wished to satisfy itself of that fact. It was true that the proceedings were of a statutory body with a limited power, yet, so long as nothing appeared in the record of their proceedings to exhibit an absence of power to act, and inasmuch as the statute required no record of the decision of the committee in respect to the fact that the owners of the required feet had consented, it might be assumed, until the contrary was shown, that this fact was satisfactorily proven to exist.

But where the statute required that the consents should be not merely acknowledged, but should be executed "as are deeds entitled to be recorded," and the consents were neither sealed nor acknowledged as sealed instruments, the court holds that the consents were not provable as such, and at the time of the passing of the ordinance granting permission to the company the condition was as if no legal consents had been filed with the clerk.

DUTY AS TO OBTAINING CONTROL OF CAR TO AVOID INJURING PEDESTRIAN—DUTY TO ABSENT-MINDED PERSONS—DEAFNESS NO EXCUSE FOR NOT TAKING CARE—PEDESTRIAN NOT TO BE EXPECTED TO STOP OR TURN AROUND ON TRACK—DEGREE OF CARE REQUIRED TO AVOID INJURING PEOPLE—THINGS A MOTORMAN MAY ASSUME.

Aldrich vs. St. Louis Transit Co. (Mo. App.), 74 S. W. Rep. 141. Apr. 14, 1903.

The motorman in this case, the court of appeals at St. Louis, Mo., says, was not bound to put the car under control at the first sight of the plaintiff, instead of relying on her observing it or being aroused by the bell. But she neither stopped nor noticed the car, but continued to go forward, apparently absorbed in the writing on a postal card, and unconscious of danger; and, as she was under the motorman's observation, this behavior ought to have warned him to get ready to avoid running against her. Her deafness by no means excused her from taking care, but imposed on her the duty of using her sight to learn whether she might safely proceed; and when she went on the track without looking for a car, as she admitted doing, she was negligent. But such an act of negligence does not defeat an injured plaintiff's action if the defendant could have prevented the injury by reasonable efforts and did not try to prevent it. When the behavior of a person clearly signifies before he goes on the track that he will go on it in unconsciousness of impending danger, it becomes the duty of the motorman to begin

to obtain control of his car before it is too late to avoid striking the person, if possible.

It is no duty of a carman to stop cars in anticipation that a passenger who is going over a street crossing, and has time to get over before the car reaches him, may stop to turn around on the track, and in consequence be run down. The degree of care one is required to take to avoid hurting another is proportioned to the likelihood of injury; or, to use another common and equivalent formula, is the care that men of ordinary prudence employ in similar circumstances. In ascertaining whether the proper caution was exercised by a defendant in a particular case, the habits and usual conduct of mankind are called to mind, since no one is required to, does, or can take precautions against sudden erratic acts. We must guard against events which, according to experience, may be expected to happen, but not those due to strange and abnormal behavior, or those which are possible, but quite improbable. Motormen have as much right to assume a traveler on a crossing will continue his progress as they have to assume that one whose manner shows he is conscious of his surroundings will not walk in front of a moving car.

FORM OF ACTION FOR WRONGFUL EJECTION FOR WRONGLY PUNCHED TRANSFER TICKET.

Perrine vs. North Jersey Street Railway Co. (N. J. Sup.), 54 Atl. Rep. 799. Apr. 9, 1903.

The rules of the company required that a conductor issuing a transfer ticket should punch upon it the time at which the passenger left the car, and that no other conductor should receive it in lieu of fare unless it was tendered within 10 minutes after the time punched upon it. The uncontradicted testimony of the plaintiff was that he boarded the second car not more than 2 or 3 minutes after leaving the first one, while the uncontradicted testimony of the conductor of the second car was that much more than 10 minutes had elapsed between the time punched on the transfer ticket tendered and the time when it was offered to and refused by him. The supreme court of New Jersey holds that an instruction was erroneous which charged the jury that if the difficulty was due wholly to the mistake of the conductor of the first car, and if the ten-minutes regulation was a reasonable one, then the verdict ought to be for the company, for in that case the plaintiff would have to sue the company under another form of action, in an action upon the contract, and not in this action, an action in tort, as it is called. The court says that if the plaintiff was, by his contract with the company, entitled to ride upon the second car without the payment of an additional fare, provided he boarded that car within 10 minutes after leaving the first car, and was entitled to proper transfer ticket as an evidence of his right to do so, then an action of tort would lie for his wrongful expulsion, unless by his own fault or carelessness he aided in producing the situation which led to that expulsion. If inquiry on his part would have informed him of the rule which made it necessary that the transfer ticket should be used within 10 minutes of the time punched upon it, and if due care on his part required that he should make such inquiry, then his failure to do so would have been a contributing cause to the injury which he complained of, and would be a bar to his right to recover for his alleged wrongful ejection from the second car.

CARE REQUIRED OF PEDESTRIAN IN CROSSING TRACKS—DUTY OF ONE SEEING LIGHTS IN THE DISTANCE.

Brown vs. Elizabeth, Plainfield & Central Jersey Railroad Co. (N. J.), 54 Atl. Rep. 824. Mar. 2, 1903.

The plaintiff attempted to cross, on foot, trolley tracks laid in the middle of an avenue with which he was familiar. The time was after 7 o'clock in the evening of February 12th. The night was very dark and rainy. He was struck and injured by a trolley car coming from the east. In that direction the avenue was straight for a long distance. The car carried a headlight at its top, and its interior was also lighted. From the configuration of the ground, all the lights of a car thus approaching could be seen for 650 or 700 feet, and the headlight for a much greater distance. He testified that when he started to cross he did not see the car, but before he succeeded in crossing he was struck, though he "stepped as quick as he could." The court of errors and appeals of

New Jersey holds that, upon the plaintiff's case, his negligence contributing to his injury so clearly appeared that it was error to submit the case to the jury.

In attempting to cross the tracks, a duty was imposed on the plaintiff, the court says, to take such care for his safety as reasonable prudence required under the peculiar circumstances. He was bound to use his powers of observation to discover the approaching car, and to exert his judgment how to avoid the danger of a collision. He admitted that when he started to cross the tracks he "saw lights way up on the hill," and did not know what lights they were. Prudence required him to wait a sufficient time to enable him to observe whether the lights which he saw were those of the street lamps on the side of the avenue, or were those of a car in the middle of the avenue. Without waiting, he proceeded to cross. When he said that at that time he could see no trolley car in sight, he conclusively established that he did not then make the observation which duty required of him, because, if he had done so, he would undoubtedly have discovered the approaching car, and have been able to avoid the collision.

APPLICATION OF DOCTRINE OF RES IPSA LOQUITUR TO FALL OF TROLLEY WIRES—THE FREQUENT SLIPPING OF TROLLEY POLES OFF WIRES NO DEFENSE.

Clancy vs. New York & Queens County Railway Co. (N. Y. Sup.), 81 N. Y. Supp. 875. Apr. 24, 1903.

The second appellate division of the supreme court of New York says that it sees no reason why the doctrine of *res ipsa loquitur* (the matter speaks for itself), so often held by the courts to apply to cases where trolley wires have fallen into the streets, or upon persons there, should not control here, where a woman, crossing at an intersection of streets, was injured by a fall of trolley wires. It was not clear whether she was injured by physical contact with the wire as it fell, or by one of the currents caused by circuits of electricity being completed by the wires coming in contact with the ground and with the rails, but the court holds that was not material, for, under the cases, the company was liable in either event. It says that it cannot be doubted that, had it not been sought to show the cause of the accident, a *prima facie* case would have been made out. Proof of the falling of the wires raised a presumption that the company was in some manner negligent, either in their construction or maintenance, and this presumption had the force to require the submission of the question of negligence to the jury until it was rebutted, or until evidence was adduced explaining away the apparent negligence.

It was contended that the slipping of a trolley pole off the trolley wire, and the striking of that pole against the cross-wires, was sufficient explanation; and the court was urged to take judicial notice of the fact that the slipping of trolley poles from trolley wires is a matter of hourly occurrence in the operation of street surface railways. The court states that it does not undertake to say that the court will take judicial notice of that fact, but, upon the company's solicitation, it is willing to consider it in the disposition of this appeal, and thinks that the fact completes the chain of circumstances so that the doctrine of *res ipsa loquitur* is, if possible, more truly applicable. If it is a fact that trolley poles slip off the wires so frequently, then the inference of the company's negligence, even in construction or maintenance, is to be drawn from the fact of several wires falling at the intersection of two lines of street railway, as a result of the mere release of the trolley pole and its coming in contact with two of the cross-wires. The negligence of the company did not consist in the escape of the trolley pole. There was a presumption of it from the fall of the wires.

DUTY OF PASSENGER AS TO STOPPING OF CAR TO PREVENT COLLISION—HIGHEST CARE NOT ALWAYS REQUIRED INSUFFICIENT SIGNALS OF DANGER.

Conway vs. Brooklyn Heights Railroad Co. (N. Y. Sup.), 81 N. Y. Supp. 878. Apr. 24, 1903.

A car slowly approached a bridge and a heavily loaded truck was descending the grade therefrom and the driver of the truck sought to turn out for the car the rear bags of cotton with which

the truck was loaded struck the wooden handles or stanchions at the middle of the car, shattering them so that a passenger on the car was injured by the flying splinters. The second appellate division of the supreme court of New York says that the actionable negligence of the railroad company turned upon the proposition whether it failed in its legal obligation when it did not arrest its car. If the motorman was apprised, or in the exercise of proper care should have been apprised, that his obligation to his passengers required him to stop the car in order to prevent the collision, and could, in the exercise of such care, have done so, and thereby avoided the collision, then liability for the injury consequent upon his omission might be cast upon the company. But the court thinks that there was error in charging the jury that the company was bound to "the highest degree of care and skill which human foresight could provide." It says there is such an obligation upon the common carrier of passengers as stated in the clause quoted. But the present application of the rule depended upon the circumstances of this case. The question was whether, under the evidence in this case, the accident resulted from a situation from which grave injury might have been expected, so as to impose the highest obligation short of insurance. And the court thinks that the circumstances did not require an exercise of the "highest degree of care and skill which human foresight could provide." Had the charge gone no further than that the company was bound to a high degree of care and skill in the operation of its car, or had even said that the degree should have been very high, then the charge, the court says, would have been unexceptionable under the circumstances of this case.

Furthermore, the court thinks that signals by "making of a shout" to the motorman to stop the car when the driver saw the car coming up towards the bridge and he was going down the grade, or by "just making a motion," or something more than a motion—"a motion with my hands"—when the heavy wagon was approaching at a regular gait, walking, was not sufficient to bring to the attention of the motorman, in his exercise of proper care, the fact that the continuance to drive the car slowly along its track would result in a situation from which grave injury might be expected, in view of the relative rights and duties of the two vehicles.

RIGHTS OF NEWSBOYS PERMITTED TO BOARD CARS—REQUIREMENTS OF CONDUCTOR ORDERING OR COMPELLING ONE TO GET OFF—UNLAWFUL EJECTION.

Indianapolis Street Railway Co. vs. Hockett (Ind.), 67 N. E. Rep. 106. Apr. 22, 1903.

This action was brought to recover for a newsboy damages for a personal injury alleged to have been caused by the wrongful acts and negligence of the company. The special findings of fact made by the jury left uncontradicted the allegations of the complaint that newsboys were permitted to come upon the company's cars upon signals from passengers to sell and deliver newspapers to such passengers, and that upon a signal of this kind this newsboy got upon its car. He was, therefore, the supreme court of Indiana says, not a trespasser in the first instance, and he did not become a trespasser afterwards, unless his right to remain upon the car for the purpose of selling newspapers was terminated by a reasonable notice to leave the car. Until his right to remain on the car for such purpose was terminated by a reasonable notice to get off the car at a time and place and under such circumstances, with respect to the speed at which the car was running, and the condition of the street at the time and place, as rendered it reasonably safe for him to do so, he could not be ejected as a trespasser.

According to the averments of the complaint, which the general verdict in his favor affirmed, the entry of the boy on the car was lawful. It had the approval of the company, and the sanction of a long-established custom known to the boy, and acquiesced in by the company. The boy, therefore, the court says, could not be regarded as a trespasser, unless it appeared from the answers of the jury to the questions of fact that the license by which he entered the car was subsequently revoked with his knowledge, and under such conditions as rendered it possible for him to withdraw from the car without risk of injury. If the conductor ordered him to get off before the car started, and also just after it started, yet, if the boy did not hear these orders, they did not operate to termi-

nate his right to be upon the car. If, after the car started, the conductor commanded the boy to leave the car while it was running at such a rate of speed as rendered it hazardous for him to obey, then the order was an unreasonable and an unlawful one; and, if, under the influence of fear, induced by the manner or words of the conductor, the boy, exercising such care as was reasonable under the circumstances, attempted to comply with the command, and to get off while the car was running at such dangerous rate of speed, and was injured without fault on his part, the company must be held liable for the injury.

The proper determination of the case, the court continues, depended upon the answer to a single inquiry: Had the conductor the right to compel a boy 12 years of age to get off an electric car while running at the rate of from four to five miles an hour, the boy having entered upon the car with the permission of the railway company? He had such right, provided it was safe for the boy to alight. If the boy could not get off without risk of injury, then the order was unreasonable, and, if unreasonable, unlawful. Whether it was safe for a boy of the size, age, activity, and intelligence of this one to alight from the car while it was running at a speed of from four to five miles an hour along one of the principal streets of Indianapolis, at 5 o'clock in the afternoon of July 28, 1899, was a question of fact for the jury. They decided that it was not safe, and that the expulsion of the newsboy from the car was wrongful; and the judgment entered in his favor is affirmed.

DUTY TO HAVE CAR UNDER CONTROL AND SLOW DOWN AT CROSSING — NOT NOTICE THAT CAR WILL STOP OR INVITATION TO BOARD IT—FAILURE TO STOP TO TAKE ON PASSENGERS NOT NEGLIGENCE—NEED NOT STOP AFTER BLOCKADE—SPEED AT CROSSINGS—NO OBLIGATION TO TAKE TESTIMONY OF FORMER EMPLOYEE OUT OF STATE.

Fremont vs. Metropolitan Street Railway Co. (N. Y. Sup.), 82 N. Y. Supp. 307. May 15, 1903.

In this case a man sustained fatal injuries in attempting to board a car as it was passing over a cross street, or just beyond it. The car was the second one after a blockade of about 20 minutes at the "rush hour." The first appellate division of the supreme court of New York says that it was the duty of the motorman to have his car under control as he approached this crossing, and to slow down while passing over it, if there were people crossing the track, as testified to by one of the witnesses. This, it says, is an important duty, which the company owes to the traveling public, and has been repeatedly announced and enforced by the courts. But the court goes on to say that it will not do to hold that, when the railroad company has its car under control, and slackens its speed, in obedience to his duty, this is notice to people anywhere in sight of the car that it is going to stop, or an invitation to people to run and attempt to board the car before it stops. Perhaps, under all the circumstances, and in view of the fact that others were boarding the car at this time, it might not be said that the man was guilty of contributory negligence as matter of law; but the court fails to discover any evidence of negligence on the part of the company. There was no invitation to him to board the car, and there was no evidence that the motorman or conductor knew that he was attempting to board the car at the time the speed was accelerated. The company could not be held negligent merely because the motorman did not stop to take on passengers at this crossing.

It is evident, the court says, that if, after cars have been delayed, every car in the vicinity of the blockade stopped to take on all passengers, the cars would become overcrowded, and unable to take on passengers at other crossings, and frequent and long stops by the first cars of the blockade would tend to prolong the effects of the blockade, and not relieve and equalize the traffic over the entire line. It is, therefore, necessary in some circumstances for the cars to pass streets without taking on passengers. The company should not be chargeable with negligence from the mere fact that the speed of the car passing over a crossing at the rate of four or more miles per hour is somewhat accelerated at the usual point of stopping to take on passengers, when the circumstances were such that it was not intended to stop at that point. Those who attempt to board a car under such circumstances going at a speed of four, five, or six miles an hour, in the absence of an invitation

by signal or otherwise from the conductor or motorman, assume the risk of the change of speed and of their ability to get on in safety. For these reasons the motion for a nonsuit and for dismissal should have been granted.

Counsel for the company requested the trial court to instruct the jury that no inference adverse to the company could be drawn from the absence of the conductor, who was no longer in its employ, was without the state, and refused to appear as a witness. The court said concerning this request: "I will charge it with this modification: that you have a right to consider the failure of the defendant to procure the testimony of the conductor by commission as a circumstance bearing upon the facts in the case." The company excepted to the refusal to charge as requested, and to the modification as charged. This exception, the appellate division holds, also presented a reversible error. The company was under no obligation to issue a commission to examine this witness, who was not in its employ, and was employed and sojourning, if not residing, in another state. Furthermore, it did not appear that he saw the accident, or could have given any material evidence.

CONSTRUCTION OF IOWA STATUTE AS TO TAXATION OF STREET RAILWAYS.

City Council of Marion vs. Cedar Rapids & M. C. Ry. Co. (Ia.), 94 N. W. Rep. 501. Apr. 11, 1903.

In section 1343 of the Iowa code it is provided that "the lands, buildings, machinery, poles, wires, overhead construction, tracks, conduits, and fixtures belonging to individuals or corporations operating railways by cable or electricity * * * shall be listed and assessed in the assessment district where the same are situated. But where any such property except the capital stock is situated partly within and partly without the limits of a city or town, such portions of the plant shall be assessed separately and the portion within said city or town shall be assessed as above provided and the portion without said city or town shall be assessed in the district or districts in which it is located."

A reading of the section, the supreme court of Iowa says, reveals that it was apparently drawn with care to exclude the idea of making the franchise a distinct item of valuation in an assessment of such property for taxation. Whatever may have been the occasion which inspired the provision, its effect is to declare that the entire physical property of the railway, except the public soil upon which it rests, shall bear its equal share of the burden of taxation. The thing to be taxed is an electric railway, or some specific portion thereof, and not the steel, iron, and wood which have been employed in its construction. True, the condition of these materials, whether new or old, sound or decayed, would be a proper matter to be looked into in fixing the value of the property; but it still remains the value of the organized whole—the thing, and not its ultimate component parts—which is to be assessed. The portions which are to be assessed separately are not the machinery, poles, wires, and other itemized elements in the construction of the road, but the portions or parts into which the railway is divided by the boundary lines of the taxing districts through which it passes.

It was shown that one mile of this particular railway, or about one-sixth of the entire line, was within the limits of Marion, and the court holds that, under the law as it has interpreted it, that city was entitled to have this part or portion of the property assessed at a fair and equitable valuation as a railway. This did not necessarily mean an equal one-sixth of the entire railway property, for such an apportionment might often work an injustice to the owners or to the other taxing districts. On the other hand, it did not mean the value this portion of the property would possess if wholly severed from the remainder of the railway of which it formed a part, or its value regarded as a mass of dead material. It was rather such value as fair and reasonable men, having knowledge of such matters, would place upon this mile of road as an integral part of the system to which it was attached; taking into due consideration its cost of construction, state of repair, and capacity and efficiency for the purposes for which it was created.

As already intimated, the court thinks that the value of the franchise held by the corporation—the right to occupy the streets—is not the subject of assessment under the statute as it exists; but it sees no reason why the fact that the railway is in successful operation, earning money for its owners, may not properly be considered by the assessor in estimating its value.

Fire Protection in Power Plants and Car Houses.

Of all the pressing questions which confront the modern engineer, the problem of protection against fire stands among the foremost in importance. Nearly \$150,000,000 worth of property is annually destroyed by fire in the United States alone, while it is impossible to estimate the damage entailed by the loss of time and inconvenience borne by sufferers from this fearful source of waste.

The fire risk is particularly serious in all electric plants which are improperly installed or carelessly operated, as well as in car houses of wooden construction. Unceasing vigilance is the price of security, and it is the purpose of this article to point out some of the special precautions which if overlooked may lead to disastrous consequences.

Automatic fire sprinklers, which have attained great perfection in manufacturing establishments, department stores, warehouses and mercantile buildings are unfortunately of little value if not, indeed, a positive detriment to electric plants and car houses. Electric fires and water agree far too well to be allowed to bear each other company, and in power houses and car barns dry sand is a much more effective fire destroyer. Buckets of sand, with scoops for throwing it should be kept in readiness for instant use adjacent to all parts of plants and car stations where wires run in proximity to metal or woodwork. If hydrants are installed in the yards for the protection of store houses, oil houses, etc., they should be provided with a valve below the frost line in the earth as well as an independent outside valve on each of the hose connections.

The automatic thermostat of the solder release type finds an excellent field for operation in power plants, car and store houses. It is simple and positive in action, the fusing of the solder rarely failing to close the electric circuit and ring the alarm in the earliest stages of the fire. For several years a special cable has been on the market, which contains wires so sensitive to heat that they short circuit on the approach of fire at any point in their length, and thus give immediate notice in case of trouble. The importance of grappling with a fire in its earliest stages is everywhere recognized by experts in fighting the flames, and money spent for thermostatic devices is generally very well invested. Even though a power plant may be constantly watched by the operating shift in charge, there is good sense in equipping out of the way corners with thermostats, if the main station be left to protection by observation.

Careful inspection and proper maintenance of all fire protection devices is as essential as their correct installation. Tanks and pails intended for fire extinguishing only are liable to become empty, electric batteries get out of order, and changes in partitions, shelves, racks, boxes, and the distribution of supplies are likely to interfere with the proper fighting of fires unless the subject is constantly kept in mind. While it is perhaps needless to detail a man in car houses and power plants to make a daily inspection of valves, tanks, pumps, pails, extinguishers, shutters and alarm systems, it is highly desirable that such an examination be made at least once a week by a competent and responsible employee. Written reports should be filed, mentioning all unusual conditions noted, the date of refilling pails, recharging batteries, etc. Loose wiring should be repaired as soon as discovered and frayed insulation ought not to be tolerated.

All officials and employees should make themselves familiar with the location of the nearest fire alarm, and in case of fire, no matter how small, should ring in the alarm promptly. The water supply and hose should always be ready for instant use, but, as stated above, fires started by electric arcs should be fought with sand or beaten out with coats and cloths unless they attain dimensions where water is the only available remedy. Thorough instruction should be given to car house and power station employees by an occasional fire drill to familiarize them in the handling of hose, turning on water and having everything in readiness for grappling with a fire, should one

In case of fire all transferway doors, pit doors and other doors dividing different parts of the building should be immediately closed to prevent draughts, and check the fire from spreading. All doors should be examined from time to time to see that they are in good working order, and should be kept closed as much as possible. If it is necessary to keep them open, they should be fastened back by a fusible link at least 5 feet from the base of the front edge of the door. A door should never

be held open either by leaning anything against it or by fastening it back in a way that would prevent it from closing automatically in case of fire.

When double doors are used for oil rooms the inner door when in constant use may best be kept open by a fusible link, but the outer door ought to be constantly kept closed, except when it is absolutely necessary to open it in getting out stock. Heavy transferway doors should be held open by substantial chains with hooks at the door fronts that can be instantly unhooked by one man. Considerable damage often results when very heavy doors close themselves.

In shops and car houses when it becomes necessary to turn the current on a car, the car should never be left alone with the current on, nor should workmen leave their work for lunch or other purposes and congregate in any place, leaving the rest of the property uncovered. Windows and doors in lofts or storage places should be closed at all times when no one is present. The danger of fire from spontaneous combustion, or from spreading flames in adjoining structures is greatly increased with open windows and doorways. Gasoline torches should not be left burning during the noon hour, while the men eat their lunch in a distant part of the building.

It is of the highest importance that all the premises should be kept clean and free from combustibles. Waste with any oil on it should be considered oily waste, and should invariably be kept in approved fire proof oil cans or boxes, the covers of which close automatically. Such cans should be kept either in oil rooms or places where, in case the oily waste should begin to burn, it would not set anything else afire. It is better to keep only a small amount of naphtha, turpentine, gasoline or other highly inflammable material in stock, and safety lies in taking only the quantity to be immediately used from the store room at any one time. A wise precaution is to keep a chemical extinguisher and half a bushel of dry sand in buckets, with scoops, within easy reach of the oil room.

Finally, all new construction work should be as nearly fire proof as the available appropriations will make it. The architects and builders ought to keep in close touch with the developments and experiments at the fire insurance laboratories in Chicago and Boston. Here tests are made on different forms of fire resisting materials, extinguishers, sprinklers, valves, alarms, paints, wire glass, fire doors, gasoline and acetylene lighting machines, electric switches, cutouts, fire resisting curtains, partitions, steel corrosion, etc. Information of the highest value is constantly being acquired by these organizations. With careful attention to the points above treated, coupled with a progressive willingness to take such new precautions as the circumstances of individual plants suggest, there is no doubt that the fire risk in electric power plants, car houses, and storage buildings can be greatly lessened. Even a modern storage warehouse recently caught fire by the falling of a derrick across some electric wires outside the building, which grounded the circuit through the steel work of the warehouse frame. The interest which has recently been aroused in the new profession of fire insurance engineering indicates a gratifying effort on the part of property owners to employ all the resources which modern science makes available for fire prevention, and upon the continuance of this interest depends to a large degree the future prosperity of many industrial undertakings. The part which electricity is to play in this work is constantly growing greater, and upon faithful attention to details rests the prospects of many fresh triumphs in the ceaseless war against the greatest friend and bitterest enemy that mankind knows—fire.

The Des Moines City Railway Co. is to extend and practically rebuild its Clark St. and Center St. lines. In all the extensions will be over a mile in length and a large population of northwest Des Moines will be benefited by the new service. The company has secured permission from the city to use brick pavement exclusively, even where the rest of the street has to be asphalted.

The survey for the proposed electric line from La Grange to Williamstown, Mo., by way of Monticello, has been completed by Z. T. Daniels, the engineer in charge. Three different routes into Monticello were laid out and from a few miles beyond Monticello to Williamstown the old railroad grade was followed. F. V. Crouch, of Iola, Kan., is to furnish an estimate of the cost of constructing and equipping the road. The surveyor states that the location is excellent and but little grading will be necessary. The line will traverse a well populated section.

Personal.

MR. J. W. SMITH has been appointed superintendent of the Schuylkill Traction Co., Girardville, Pa.

MR. GEORGE WHYSALL has been chosen to succeed Mr. H. A. Fisher as manager of the Columbus, Delaware & Marion Electric Railroad Co.

MR. W. H. MANSFIELD was, on August 4th, made general passenger agent of the Keeseville, Ausable Chasm & Lake Champlain Railroad Co.

MR. A. J. CASSATT, president of the Pennsylvania Railroad Co., on September 30th resigned as second vice-president of the Public Service Corporation of New Jersey.

MR. M. M. PHINNEY has assumed charge of the Dallas (Tex.) Street Railway Co., succeeding Mr. J. P. Clark, who has been transferred to other Stone & Webster properties.

MR. LEE D. FISHER has resigned as chief engineer of the Columbus, Delaware & Marion Electric Railroad Co., to assume the same position with the Fisher Construction Co., Joliet, Ill.

MR. W. W. SEYMOUR, formerly engineer of the Western Division drawing room of the American Bridge Co., is now associated with the Frederick Post Co., of Chicago and New York, as its western manager.

MR. M. M. PHINNEY, who has been manager of the Stone & Webster properties in the vicinity of Boston, Mass., has been appointed general manager of the Dallas (Tex.) Electric Corporation, which is controlled by the same interests.

MR. M. J. LOFTUS has been promoted from superintendent of the Columbus, Grove City & Southwestern Railway Co. to superintendent of both the Central Market Street Railway Co. and the Columbus, Grove City & Southwestern company.

MR. C. F. QUINCY was on October 7th chosen president of the Railway Appliances Co., of Chicago, succeeding Mr. H. K. Gilbert, resigned. Mr. George H. Sargent was chosen vice-president and Mr. Percival Manchester secretary and treasurer.

MR. J. E. CAIN has resigned as division superintendent of the Worcester & Connecticut Eastern Railway Co. to become assistant general superintendent of the Providence & Danielson Street Railway Co. His headquarters will be at Rockland, R. I.

MR. W. B. LONGYEAR on October 1 resigned as comptroller of the Brooklyn Rapid Transit Co. and was succeeded by Mr. Howard Abel, who was for several years prominently identified with several Chicago companies with which Mr. Yerkes was interested.

THE J. G. WHITE & CO., INCORPORATED, announces the removal of its offices to the 22d floor of the newly constructed Wall St. Exchange building, 41-43 Wall St. and 43-49 Exchange Pl., New York City, its address after October 5th being 43-49 Exchange Pl.

MR. J. P. CLARK has been appointed general manager of the Fort Wayne, Logansport, Lafayette & Lima Traction Co., with headquarters at Fort Wayne, Ind. He was formerly general manager for the Stone & Webster Co., of the Dallas (Tex.) Electric Corporation.

MR. H. A. FISHER has resigned as general manager of the Columbus, Delaware & Marion Electric Railroad Co. and will move to Joliet, Ill., where he has interests, being president and a large stockholder in the Fisher Construction Co., which is building the Joliet, Plainfield & Aurora R. R.

MR. RICHARD T. LAFFLIN has resigned as general manager of the Worcester Consolidated Street Railway Co. and accepted the position of general manager of the Manila Electric Railway, Light & Power Co., which has been organized to develop electric railway and lighting service in and around Manila, P. I.

MR. L. N. WHEELOCK, superintendent of the Amherst & Sunderland Street Railway Co., of Amherst, Mass., has been appointed general manager of the Claremont (N. H.) Railway & Lighting Co., retaining also his position with the Amherst & Sunderland road. It is his intention to spend one-half the time in each place.

MR. J. S. YOUNG has been appointed auditor of the United Railways, Light & Water Co., of Chattanooga. For two years past he has been general passenger agent and assistant superintendent of railways for the Toledo Railways & Light Co., and prior to that time was paymaster for the Northern Ohio Traction Co., of Akron.

MR. JAMES WILLIAMS has been appointed chief engineer of the Columbus, Delaware & Marion Electric Railroad Co., with headquarters at Prospect, O. Mr. Williams succeeds Mr. Lee Fisher,

who has been appointed to a similar position with the Joliet, Plainfield & Aurora Ry., of which his father, Mr. H. A. Fisher, is president.

THE ZANESVILLE RAILWAY, LIGHT & POWER CO. has elected officers as follows: President, F. A. Durbin; vice-president, H. M. Byllesby; secretary and treasurer, W. D. Breed; general manager, W. A. Gibbs. The directors include Messrs. Durbin, Byllesby and Breed, and R. Kleybolte, G. H. Warrington, George Clayton and John Hoge.

MR. ALBERT H. STANLEY has resigned as superintendent of the Detroit United Ry. to accept a permanent position with the Public Service Corporation of New Jersey, with headquarters at Newark. He assumed his new duties October 1st. Mr. Stanley entered the employ of the Detroit United Ry. as a clerk a number of years ago, when horse cars were in operation.

MR. J. H. MAYSILLES has been appointed master mechanic of the Cerro de Pasco Ry., with headquarters at Oroya, Peru. Mr. Maysilles is a graduate of Purdue University, and was formerly on the editorial staff of the "Street Railway Review," leaving that position in January, 1903, to go to South America as representative of the American Locomotive Works.

MR. E. W. GOSS has resigned as manager of the Milford & Uxbridge (Mass.) Street Railway Co. and will spend the winter in Florida with his family. His resignation took effect October 3d. Mr. Goss has had offers of several positions, but declined to consider any which contemplated immediate service, it being his intention to obtain a much-needed rest.

MR. H. A. NICHOLL has been appointed general manager of the Cleveland & Southwestern Traction Co., and Mr. F. T. Pomeroy, who has been filling the positions of president and general manager, will devote his entire attention to the former office after November 1st. Mr. Nicholl has been treasurer and general manager of the Ithaca (N. Y.) Street Railway Co. several years.

THE PITTSBURG, McKEESPORT & CONNELLSVILLE RAILWAY CO. has announced the following changes: Mr. Thomas Elliott, who has been general manager more than three years, has resigned and is succeeded by Mr. W. E. Moore, of Pittsburg. Mr. J. Wilbur Brown, who has been division superintendent of the McKeesport division, has been made general superintendent, with headquarters at Conneltsville.

MR. A. A. ANDERSON, who a few weeks ago resigned as general superintendent of the Indiana Union Traction Co., is interested in an interurban railway to be constructed in eastern Kansas. Franchises have been secured in Coffeyville, Independence, Cherryville and Parsons and the engineers are now engaged in making the surveys for a route between these cities. Mr. Anderson is making his headquarters at Independence, Kan.

THE FIRM OF KNOX, GEORGE & CO., New Orleans, which was recently incorporated, announces that its work as consulting, constructing and operating engineer will be carried on in the southern and southwestern states, Mexico, Central America and the West Indies. Mr. George W. Knox, president of the company, will retain his office in Chicago, while the principal offices of the company will be in New Orleans, under direction of Mr. James Z. George, the vice-president and general manager.

MR. HORACE H. ESSELSTYN, engineer for Westinghouse, Church, Kerr & Co., who had charge of building the Grand Rapids, Grand Haven & Muskegon Railway Co.'s line into Grand Haven, Mich., has gone to St. Louis to superintend the installation of the power plant in Machinery Hall of the Louisiana Purchase Exposition. The contract for this plant includes four 2,000 kw. units, besides various auxiliary engines, turbine pumps, etc., all of Westinghouse make. While in Michigan, in addition to building the interurban line to Grand Haven, Mr. Esselstyn built the new drawbridge across the Grand River at Grand Haven to accommodate both the interurban cars and the highway traffic, the contract for all of this work having been awarded to Westinghouse, Church, Kerr & Co.

Obituary.

MR. FREDERICK A. WRIGHT, an old street railway man, died at his home in Brooklyn, N. Y., recently. He was formerly superintendent of the Brooklyn City Railroad Co. and later claim agent for the same company.

MR. ALEXANDER CLARK, of Evanston, Ill., died suddenly

September 27th at Antioch, Ill. He was a lawyer and at the time of his death was one of the attorneys for the Chicago Union Traction Co., the Union Elevated Loop Co., the Chicago & Milwaukee Electric Railway Co. and the North Shore Electric Co., of Chicago. Mr. Clark was also president of the Chicago, Milwaukee & Kenosha Electric Railway Co., which was incorporated in Wisconsin in 1901, to complete an electric line from Waukegan to Kenosha, the new road to be operated by the Chicago & Milwaukee Electric Railway Co.

MR. MILLER ELLIOTT, who was superintendent of the Indianapolis Traction & Terminal Co. nearly eight years, died at Indianapolis October 4th, of congestion of the brain, after five days' illness. He was 53 years old and a native of Pennsylvania. Previous to going to Indianapolis Mr. Elliott resided in Pittsburg, where 30 years ago he entered street railway work as a horse car driver. He was afterward prominently identified with the Pittsburg & Birmingham Traction Co. The funeral took place in Pittsburg October 6th.

MR. RICHMOND O. SCALES, for several years associated with the Consolidated Car Heating Co., and for two years its general manager, died in Boston October 17th. Mr. Scales had been connected with the electric heating industry nearly 15 years and was well known to the electric railway trade, particularly in the West. He had charge of the Chicago office of the Consolidated Car Heating Co. for some time.

Handbook of the A. R. M. and E. A.

The American Railway Mechanical & Electrical Association is about to publish a vest-pocket handbook containing data relative to the organization, such as the constitution and by-laws; statement of the objects and a brief review of the Association's progress; list of members, names of officers, etc. The book is to be bound in the best calf, the name of the Association to be embossed on the cover in gold, and the paper will be of finest quality and gilt-edged. This manual is to be placed in the hands of general managers, master mechanics, chief engineers and chief electricians of electric railways throughout the United States and Canada, the object being to stimulate and cause to be retained an interest in the Association. The expense of publishing the manual will be borne by advertisements for which a section of the book will be reserved. Mr. Walter Mower, secretary and treasurer of the Association, has the matter in hand.

Accidents.

September 30th a Wisconsin Central Ry. limited train struck a Chicago Consolidated Traction Co. car at the 52d Ave. crossing at Hawthorne, Ill., killing 6 persons and injuring 11 others. All, except the conductor and motorman, who were among the injured, were racetrack employees.

September 24th a work train on the Indiana Union Traction Co.'s system ran into a passenger train on the Cincinnati, Richmond & Muncie R. R. at Marion, Ind., killing three persons and injuring two others.

Flood Damage in New Jersey.

An unusually heavy rainfall in New York and New Jersey October 8th and 9th caused enormous damage to street railway property, especially in New Jersey. It was worst in Bayonne, Hoboken, Paterson, North Hudson and Trenton, where power plants and tracks were flooded and the street car systems were tied up from one to three days. The Public Service Corporation and the Trenton Street Railway Co. were reported to be the heaviest sufferers.

Crawfordsville (Ind.) Interurban Case.

Judge Baker in the United States Circuit Court on September 26th decided the controversy between the Indianapolis & Northwestern Traction Co. and the Consolidated Traction Co. regarding the location of track in the streets of Crawfordsville, Ind., in favor of the Consolidated.

The court held that the Indianapolis & Northwestern Co. was in contempt in having laid its tracks in Crawfordsville and it was

ordered that its tracks be removed, but that the marshal was not to execute the order until the final determination of the original suit now pending in the federal court to determine which of the two franchise ordinances passed by the Crawfordsville council is effective. The Indianapolis & Northwestern company was ordered to pay the Consolidated \$200 for the expense incurred in bringing the contempt proceedings.

Half Fares.

The Rapid Ry. branch of the Interurban Railway & Terminal Co., of Cincinnati, has been completed to Lebanon, O. The road is in operation to Kings Mills, 22 miles, the distance between Kings Mills and Lebanon being 8 miles.

The Cleveland & Southwestern Traction Co. has completed its branch line from Creston to Wooster, O., 13 miles, this being the last step in the through route from Cleveland to Wooster, and it completes an arm of the system 57 miles in length. The through run is made in three hours. It was necessary to complete the new branch by October 1st to accommodate the heavy excursion business booked from the southern terminals.

The Milwaukee Electric Railway & Light Co.'s cable tunnel under the Milwaukee River, connecting East Water St. with Clinton St., has just been completed by the contractors, Richard Forestal, C. H. Sullivan and W. K. Downey. It is the only brick tunnel ever built under a river in Wisconsin. It is 25 ft. below the lowest depth of the river; its diameter is 5 ft. 6 in., and its length 530 ft., the shafts at each end being 65 ft. deep. It cost \$30,000.

The paint shops at East Bridgewater on the Brockton division, at West Roxbury on the Quincy division, and at Taunton on the Taunton division of the Old Colony system of the Massachusetts Electric Companies have been closed and all the paint shops are now consolidated at the Bridgewater barn. This makes the Bridgewater barn the largest paint shop on the system, as well as the principal one, and most of the cars for all these three divisions will be painted at this place. At the new paint shop there are accommodations for 25 cars at one time. Two new Sturtevant down-draft forges have been added to the equipment of the blacksmith's shop at the Campello car house.

The United Railroads of San Francisco has placed an order for 50 California type cars with the St. Louis Car Co. The cars are 39 ft. 6 in. long, the closed section in the middle being 14 ft. 8 in. long. The width of the car over the steps is 9 ft. The steps are placed against the closed section and are 32 in. wide. Inside are Hale & Kilburn rattan longitudinal seats and on the outside are wooden cross seats. The seating capacity of the entire car is for 44 persons. The cars are to be mounted on Peckham double trucks, style 14-B-35 with two G. E. 1,000 motors on each truck. The cars will have Christensen air brakes and also track brakes made by the United Railroads.

The Union Railway Co., of New York, is building three substations to be equipped with Westinghouse apparatus exclusively. That at West Farms will contain nine 375-kw. oil insulated static transformers for three 1,000-kw. rotary converters. The other substations will be at Mount Vernon and Yonkers and will be similarly equipped, except the capacity of each will be three 500-kw. units. The switchboards consist of high-tension a. c. receiving panels with electrically operated oil circuit breakers, low tension a. c. rotary panels and load panel, with direct-current rotary panels and load panel; also about 20 d. c. feeder panels. The power will come from the Interurban Street Railway Co.'s power house at Kingsbridge, built by Westinghouse, Church, Kerr & Co., and the Westinghouse Electric & Manufacturing Co.

The British Westinghouse Electric & Manufacturing Co., Ltd., has contracted to construct the buildings and equip the entire system for the Bath Electric Tramways, Ltd., of London. The generating equipment will consist of three 200-kw. Westinghouse generators, direct connected to Yates and Thorn horizontal, tandem, compound engines; one 75-kw. Westinghouse generator direct connected to a Westinghouse compound steam engine; two 15-kw. negative boosters, a 12-panel switchboard, etc. The boiler house will contain three 10,000 lb. Babcock & Wilcox straight tube water tube boilers and a Clay Cross economizer. There will be 40 cars, of Milnes make, equipped with Westinghouse 40 B 60 motors, and, at the outset, most of them will be equipped with the Westinghouse magnetic brake.

Handling Garbage in Savannah, Ga.

By courtesy of Mr. C. B. Kidder, manager of the Savannah (Ga.) Electric Co., we are enabled to illustrate and describe the system



FIG. 1.

of handling the city garbage that has been adopted with the co-operation of the street railway company. Mr. Kidder states that the plan is working very satisfactorily.



FIG. 2.

The Savannah Electric Co. has entered into a contract with the city of Savannah for hauling all of the garbage collected throughout the city of Savannah to a point on the County Farm about 4



FIG. 3.

miles from the city. Six cars have been provided for this purpose, each of 45 cu. yd. and 30,000 lb. capacity. These cars have

hatches in the roofs through which the material is loaded and "A" shaped floors and side dump doors.

The city has built a loading platform under which the company has built two side-tracks (see Fig. 1); the wagons used by the city are of the dumping type and are driven up an inclined grade (see Fig. 2) to the dumping platform, then dumped through openings in the platform (see Fig. 3) and through the hatches in the tops of the cars.

This work is all done during the day, the wagons making several trips each day. The hauling of the cars is all done between 12:00



FIG. 4.

o'clock midnight and 6:00 o'clock a. m., and after the regular passenger cars are off the lines. They are hauled to the County Farm, about 4 miles from the city, run up a 2 per cent grade to a dumping trestle, the county convicts dumping (see Fig. 4) and cleansing the cars and preparing them for the return to the city.

The inclined "A" floor has openings through which the moisture in the garbage percolates to the interior space below this floor, which is lined with galvanized iron, with three large valves for controlling the discharge. These valves are left open during the day while the cars are being loaded, allowing the garbage to become pretty thoroughly drained of all liquid matter. Just before hauling the cars through the streets, these drains are closed.

The side dump doors are of the Hart patent (see Fig. 5), being



FIG. 5.

closed by a crank rod on the side of the car operating the doors simultaneously. The doors are made practically water tight by rubber gaskets.

The Trenton Street Railway Co. has removed its offices from the building corner of Greenwood and S. Clinton Aves., Trenton, N. J., which it occupied many years, to the third floor of the Fischer Building on State St. The old building, which stands on land owned by the Pennsylvania R. R., is to be torn down.

Street Railway Legislation for 1903.

Arkansas.

REQUIRES SEPARATE ACCOMMODATIONS FOR WHITE AND COLORED PERSONS

No. 104 of the Acts of Arkansas of 1903 provides that all persons, companies or corporations operating any street car line in any city of the first class, in the state of Arkansas, shall be required to operate separate cars or to separate the white and colored passengers in the cars operated for both, and to set apart or designate in each car or coach so operated for both a portion thereof, or certain seats therein to be occupied by white passengers, and a portion thereof or certain seats therein to be occupied by colored passengers. No said persons, companies or corporations so operating street cars shall make any difference or discrimination in the quality or convenience of the accommodations provided for the two races under the provisions of this act.

The conductor or other person in charge of any car or coach so operated upon any street car line shall have the right at any time when in his judgment it may be necessary or proper for the comfort or convenience of passengers so to do, to change the said designation so as to increase or decrease the amount of space or seats set apart for either race; or he may require any passenger to change his seat when or so often as the change in the passengers may make such change necessary. All persons on any street car line shall be required to take the seat assigned to them, and any person refusing to do so shall leave the car, or remaining upon the car, shall be guilty of a misdemeanor, and upon conviction shall be fined in any sum not to exceed \$25.

Any person, company or corporation failing to operate separate cars, or to set apart or designate portions of the cars operated for the separate accommodation of the white and colored passengers as provided by this act, shall be guilty of a misdemeanor, and upon conviction shall be fined in any sum not to exceed \$25. But nothing in this act shall be construed to prevent the running of extra or special cars for the exclusive accommodation of either white or colored passengers, if the regular cars are operated as required by this act.

Kansas.

REQUIREMENTS AS TO HEIGHT OF WIRES AND STOPPING OF CARS AT RAILROAD CROSSING.

Chapter 488 of the Laws of Kansas of 1903 provides that all street railway companies or corporations operating cars by electricity or by overhead wires shall construct and maintain its wires at a height of not less than twenty-one feet above the top of the rail of the railroad track crossed by such street railway company.

It shall be the duty of every street railway company or corporation operating a street railway across the tracks of a railroad company to bring its cars to a full stop at least ten and not more than twenty feet before reaching the tracks of the railroad company, unless a flagman is kept at said crossing.

Michigan.

AUTHORITY TO CONSOLIDATE AND ACQUIRE CERTAIN POWERS

No. 24 of the Public Acts of Michigan of 1903, an act to authorize any gas light company and any consolidated company formed by the union of a street railway and electric light company, being corporations organized under the laws of this state [Michigan], and having their principal place of business in the same town, village or city, to unite and consolidate with any corporation organized under the laws of an adjoining state, and which, under and by virtue of the rights, powers and franchises possessed and enjoyed by the said corporations, shall be authorized to own and operate a street railway, electric and gas light system, produce, generate, sell and purchase gas, and construct, install, operate, maintain and repair gas, electric and street railway lines of the two corpora-

tions last mentioned shall form a connecting and continuous line of railway between this state and such adjoining state. Such consolidated company shall have and succeed to all the property, powers, rights, privileges, franchises and immunities possessed and enjoyed by the constituent corporations forming the same, which were organized under the laws of this state; and such new corporation shall be subject to all restrictions and perform all duties imposed upon it by the laws of this state, and shall be and constitute a body corporate, under and by virtue of the laws of the state of Michigan.

No. 61 of the Public Acts of Michigan of 1903 is an act to enable any consolidated company formed prior to June 1, 1899, by the union of a street railway company and an electric light company to acquire, possess and exercise all the rights, powers, privileges and franchises conferred upon electric light companies by section 10 of the act entitled "An act to authorize the formation of electric light companies," approved April 1, 1881, as amended by act No. 96 of the public acts of the legislature passed at the regular session of 1899.

EXTENSIVE POWERS CONFERRED ON COMMISSIONER OF RAILROADS.

No. 180 of the Public Acts of Michigan of 1903 provides that the police powers of the state over street railways, interurban railways and suburban street railways, whether operated by steam, electricity or other motive power, organized or doing business in the state of Michigan, shall be vested in the commissioner of railroads. Said commissioner shall examine into the condition and management of all matters concerning the business of electric railways in the state, so far as the same affect or relate to the interests of the public and to the accommodation and security of passengers or persons doing business therewith; and whether such railway companies, their officers, directors, lessees, agents and employees, comply with the laws of the state concerning them, and such other matters as he may deem important; and for such purpose said commissioner shall have the right to examine the books, papers, records and vouchers of any railway in the state, in his discretion; and he shall have power to examine, under oath or affirmation, any and all directors, officers, managers, lessees, employees or agents of any such railway, corporation and any other persons, concerning any matter relating to the condition and management of the business of such corporation.

Whenever the commissioner shall have reasonable grounds to believe, either on complaint or otherwise, that any of the equipment, cars, tracks, bridges or other structures of any railway corporation of the state are in a condition which renders any of them dangerous or unfit for the transportation of passengers, it shall be his duty to inspect and examine, or cause the same to be inspected, examined and tested, and to that end he shall have free access to the property of such company, and if, on such examination, in his opinion, any such equipment, cars, tracks, bridges or other structures or works, are unfit for the transportation of passengers, it shall be his duty to give to the superintendent, or other executive officer of the corporation, working or operating said defective track or bridge, or other structure, notice of the condition thereof, and of the repairs necessary to place the same in a reasonably safe condition. He may also order and direct the rate of speed of passing trains or cars over such dangerous or defective track, bridge or other structure, until the said repairs shall be made, and the time within which such repairs shall be made by the company.

Whenever, in the opinion of the commissioner, the safety of the public would be more efficiently secured by stationing a flagman to signal trains or cars where a highway or street is crossed by any street railway, or when any such street railway crosses or intersects another street railway, or any railroad, or by the building of a gate or bridge at such highway, street or railway crossing, or by the erection and maintenance of an electric alarm bell, he shall direct the corporation or corporations owning or operating any such street railway or street railways, to station a flagman or to erect and maintain a bridge or gate or electric alarm bell at such crossing, as the public safety may demand; and in case it is directed to be done where one street railway crosses and intersects another, or

intersects any steam railroad, the expense thereof shall be borne jointly, in such proportions as determined by the commissioner, by the companies owning and controlling such street railway and steam railroad.

Whenever it shall come to the knowledge of the commissioner, either upon complaint or otherwise, or he shall have reason to believe that any law or laws pertaining to street or electric railways have been or are being violated, he may, if he deem it expedient, prosecute or cause to be prosecuted, all corporations or persons guilty of such violation.

In order to enable the commissioner to perform his duties under this act, it is made his duty, at least once in each year, to visit each county in the state in which is or shall be located a surface street railway and personally examine into the management of the same.

The commissioner shall have power, and it shall be his duty, if he shall deem it practicable, in all cases to inspect and determine the necessity for and the sufficiency of all fences required to be constructed and maintained by street and electric railway companies, and he shall prescribe the manner of constructing, and the time within which it shall be done.

Authority is given to the commissioner, and it shall be his duty, if he shall deem it practicable, to prescribe the use of the interlocking switch and signal system, or some other system, that will secure equal safety of the operation of trains or cars at all crossings and junctions of railways in the state, and at all crossings of drawbridges; and the commissioner shall apportion the cost of construction of any such interlocking switch or signal system among the railroad companies affected thereby in such proportion as his judgment shall direct. The commissioner having determined such form of signals, shall immediately cause a description thereof, over his official signature, to be delivered to the general manager or superintendent of such street or electric railway that may be interested in such crossing, with notice that the same must be adopted and put into practical force within sixty days thereafter, or within such time as may be decided upon by the commissioner.

Nothing in this act contained shall be construed to take from any municipality the authority now vested in it, to regulate the operation of lines of street railway already in existence or hereafter built, under any by-laws, ordinances or regulation, in any township, city or village in the state. And this act shall not be construed so as to waive, or affect the right of any person injured by the violation of any law in regard to surface street railway corporations to sue or prosecute for his private damages in any manner allowed by law.

Illinois.

SCREENS OR VESTIBULES REQUIRED FOR MOTORMEN AND CONDUCTORS.

An Illinois act of 1903 provides that every cable, grip, electric, horse or other street car, other than trail cars, which are attached to motor cars, shall be provided during the months of November, December, January, February and March of each year, at both ends with a screen or vestibule constructed of glass or other material, which shall fully and completely protect the driver or motorman or gripman or conductor or other persons stationed on both ends and guiding or directing the motor power by which they are propelled from wind and storm.

Wisconsin.

AUTHORITY FOR CONSOLIDATION WITH CORPORATIONS OF ADJOINING STATES.

Chapter 347 of the Laws of Wisconsin of 1903 provides that any street or interurban railway company organized under the laws of the state of Wisconsin, which has its location or principal place of business in a county constituting one of the border counties of the state, and which possesses the functions and powers of building, running, operating or maintaining a street or interurban railway, or of manufacturing, generating, transmitting, furnishing or selling gas, electricity or steam for lighting, heating or power purposes; or which possesses any combination or union of any two or more of the functions and powers aforesaid, may, by an agreement of the directors, ratified by the stockholders and filed with the secretary

of state and register of deeds, unite or consolidate with any one or more corporations organized under the laws of any adjoining state, having its location or principal place of business in a county in such state adjoining such border county of the state of Wisconsin, and which, under the laws of such adjoining state possesses any one or more of the functions and powers aforesaid, or any combination or union thereof; provided, that no such consolidation shall be made or effected between corporations owning, maintaining or operating competing roads, lines, works, plants or business. Such consolidated company shall have and succeed to all the property, powers, rights, privileges, franchises and immunities possessed and enjoyed by the constituent corporations forming the same, which were organized under the laws of the state of Wisconsin; and shall be charged with all their liabilities; and such new corporation shall be subject to all restrictions and perform all duties imposed upon it by the laws of the state of Wisconsin, and shall be and constitute a body corporate, under and by virtue of the laws of the state of Wisconsin.

PROPERTY MADE SUBJECT TO SPECIAL ASSESSMENTS FOR LOCAL IMPROVEMENTS.

Chapter 425 of the Laws of Wisconsin of 1903 provides that the property of every corporation, company or individual operating any street railway, etc., shall be in all respects subject to all special assessments for local improvements in the same manner and to the same extent as the property of individuals. Provided, that such assessments shall not extend to the right, easement or franchise to operate or maintain street railways, etc., in streets, alleys, parks or highways.

DRINKING TANKS AND TOILET ROOMS REQUIRED ON INTERURBAN CLOSED CARS.

Chapter 74 of the Laws of Wisconsin of 1903 provides that every person, partnership or corporation owning or operating an interurban car line in the state, the cars upon which are propelled by steam, cable, electricity or horse-power, shall provide each closed car with a suitable drinking tank, and a toilet room composed of wood, iron or other material sufficient for the comfort and convenience of passengers upon such cars, and such drinking tank and toilet room shall be at all times maintained in a sanitary condition by such person, partnership or corporation, owning or operating such interurban railway, provided, that such toilet room may be closed or locked while such car is within the limits of a corporate city.

PROVISION FOR REFERENDUM.

Chapter 387 of the Laws of Wisconsin of 1903 provides that no ordinance for granting a street railroad, etc., franchise, or for the extension of the life of any such existing franchise shall be operative in any city in the state until after sixty days from the date of its passage, and if in any such case and during said period of sixty days a number of the qualified voters, equal to 20 per cent of the total number of votes cast at the last preceding election in such city, shall demand that the ordinance be submitted to a direct vote of all the voters therein, such ordinance shall not be valid or operative until it shall have been so submitted and approved by a majority of those having voted upon it. The above provisions shall not apply to the extension of any existing line or system upon any street or highway, if the term of such extension expires at the same time as the franchise of which it is a part. In every such case the papers containing the demand for such direct vote shall be filed with the city clerk within the time specified, and each signer shall write his occupation and residence after his signature and the genuineness of the signer of each paper must be affirmed by the affidavit of a qualified voter. Such submission of an ordinance shall be made at the next municipal election, or at a special election to be held within ninety days of the filing of the demand for a direct vote, as the common council may determine. In submitting such ordinance to a direct vote the common council shall have clearly printed upon the official ballot the title of the ordinance with the words "for" and "against" in capital letters, and each of the said two words shall be followed by a square, enclosed space for the voters' mark. Except as herein otherwise provided, every such election shall be governed by the general laws of the state.

Financial.

The gross earnings of the Brooklyn Rapid Transit Co. for the first 20 days of September were given as \$1,208,307, against \$1,042,944 last year.

The Indianapolis & Cincinnati Traction Co. recently recorded a mortgage for \$4,000,000 in favor of the Farmers Loan & Trust Co., of New York. The mortgage was given for the purpose of acquiring, constructing, completing and equipping the company's system.

The earnings of the Toronto Railway Co. for September were \$237,609, the largest on record, an increase of \$41,399 over September, 1902. During the Exhibition fortnight the road carried 3,512,418 passengers, not counting transfers, the increase in earnings for that period amounting to \$26,933.

The Fairmont & Clarksburg (W. Va.) Electric Railroad Co. has given a deed of trust to the Guarantee Trust Co., of New York, for \$2,500,000, and will issue 5 per cent first mortgage bonds. The money is to be used for improvements, extensions and additions.

Mr. Charles Henrotin, receiver for the Chicago Electric Traction Co., has issued a statement for the period April 1 to June 30 (inclusive), 1903, which shows a total net gain in operation account of \$7,503. April showed a deficit of \$274; May, a gain of \$4,525, and June a gain of \$3,252.

The gross earnings of the Jackson & Battle Creek Traction Co. for August were \$15,233; net earnings, \$8,363; for the first 12 days in September, \$7,685. The earnings for July amounted to \$14,232; net earnings, \$7,621. The operating ratio for July was .4633; for August, .45. This is considered an excellent showing for a new road.

The directors of the Scioto Valley Traction Co., of Columbus, decided unanimously not to place any stock or bonds of the company on the market this fall, but to supply the money necessary to complete the road. Contracts have been awarded for sub-stations at Canal Winchester, Hookers and Ashville, and for a power house and a car barn to be built at Reese's Station.

The Cleveland Electric Railway Co. has retired the \$300,000 6 per cent bonds of the South Side Street Railroad Co. and the \$600,000 6 per cent first mortgage bonds of the Brooklyn Street Railroad Co., which matured September 1st. Of the \$900,000 Cleveland Electric Consolidated 5s, held to retire these underlying bonds, \$342,000 were exchanged therefor at par and \$300,000 were sold, leaving \$258,000 on hand to provide for the floating debt, which was increased to pay the remainder of the maturing 6 per cent bonds. The refunding will save the company \$9,000 yearly.

AURORA, ELGIN & CHICAGO.

Following is the statement of earnings of the Aurora, Elgin & Chicago Railway Co. for the first three months that the Elgin branch has been in operation:

| | June. | July. | August. |
|-------------------------|----------|----------|----------|
| Earnings from operation | \$39,100 | \$53,855 | \$54,187 |
| Operating expenses | 18,081 | 19,726 | 22,208 |
| Net earnings | 21,018 | 34,128 | 31,979 |

CINCINNATI, DAYTON & TOLEDO.

Following is the comparative statement of the Cincinnati, Dayton & Toledo Traction Co. for August:

| | 1902. | 1903. | Increase. |
|-------------------------|----------|----------|-----------|
| Earnings from operation | \$49,301 | \$59,544 | \$ 7,243 |
| Operating expenses | 24,482 | 26,277 | 1,795 |
| Net earnings | 24,818 | 33,267 | 8,449 |
| Interest and taxes | 16,280 | 16,137 | * 143 |
| Net income | 8,538 | 17,130 | 8,592 |

*Decrease.

CHICAGO & MILWAUKEE ELECTRIC RY.

The earnings of the Chicago & Milwaukee Electric Railway Co. for September, compared with September, 1902, follow:

| | 1902. | 1903. | Increase. |
|-------------------------|-----------|-----------|-----------|
| Earnings from operation | \$ 19,347 | \$ 40,021 | \$ 21,574 |
| Operating expenses | 6,088 | 9,820 | 2,832 |
| Net earnings | 12,350 | 31,101 | 18,751 |

From Jan. 1 to Sept. 30:

| | 1902. | 1903. | Increase. |
|-------------------------|-----------|-----------|-----------|
| Earnings from operation | \$137,407 | \$194,636 | \$ 57,229 |
| Operating expenses | 50,847 | 60,935 | 7,088 |
| Net earnings | 87,550 | 127,700 | 40,101 |

ELGIN, AURORA & SOUTHERN.

Following is the comparative statement of the Elgin, Aurora & Southern Traction Co. for August:

| | 1902. | 1903. | Increase. |
|-------------------------|-----------|-----------|-----------|
| Earnings from operation | \$ 43,506 | \$ 47,423 | \$ 3,917 |
| Operating expenses | 22,128 | 23,927 | 1,799 |
| Net earnings | 21,378 | 23,496 | 2,118 |

For the eight months:

| | | | |
|-------------------------|-----------|-----------|-----------|
| Earnings from operation | \$270,435 | \$305,725 | \$ 35,290 |
| Operating expenses | 158,851 | 174,521 | 15,670 |
| Net earnings | 111,584 | 131,204 | 19,620 |

N. Y. & L. I. TRACTION CO.

The passenger earnings of the New York & Long Island Traction Co. for August compare with last year as follows:

| | 1902. | 1903. | Increase. |
|-------------------------|---------|---------|-----------|
| Earnings from operation | \$3,071 | \$5,473 | \$1,402 |
| Operating expenses | 2,271 | 3,334 | 1,062 |
| Net earnings | 804 | 2,139 | 1,370 |
| Fixed charges | | 37 | 37 |
| Net income | 804 | 2,146 | 1,342 |
| Operating ratio | .74 | .61 | *.13 |

*Decrease.

The number of passengers carried during August was 114,015, as against 61,262 for August, 1902.

NORTHERN TEXAS TRACTION CO.

Following are the earnings of the Northern Texas Traction Co. for September, 1903:

| | |
|-------------------------|-----------|
| Earnings from operation | \$ 41,049 |
| Operating expenses | 22,033 |
| Net earnings | 19,016 |
| Fixed charges | 9,673 |
| Net income | 10,242 |

Nine months to date:

| | |
|-------------------------|-----------|
| Earnings from operation | \$335,296 |
| Operating expenses | 178,167 |
| Net earnings | 157,128 |
| Fixed charges | 82,490 |
| Net income | 74,638 |

The earnings for September increased 30.3 per cent over September, 1902.

INTERNATIONAL TRACTION CO.

Following is the comparative statement of income account of the International Traction Co. system, of Buffalo, for August:

| | 1902. | 1903. | Increase. |
|---|-----------|-----------|-----------|
| Earnings from operation | \$369,564 | \$429,980 | \$ 60,415 |
| Operating expenses | 182,060 | 201,395 | 18,434 |
| Net earnings | 186,574 | 228,585 | 42,010 |
| Fixed charges, including interest, taxes, rentals, etc. | 127,918 | 136,535 | 8,617 |
| Net income | 58,656 | 92,049 | 33,393 |
| Operating ratio | .506 | .478 | *.028 |

*Decrease.

The net income July 1st to date was \$156,983, against \$97,712 in 1902, an increase of \$59,271.

SOUTH SIDE ELEVATED R. R.

According to the annual report of the South Side Elevated Railroad Co., Chicago, for the year ending June 30, 1903, the gain in traffic was 10.4 per cent, as against 5.9 the previous year and 8.9 for the fiscal year ending last December. Following is the income statement

| | 1902. | 1903. | Increase. |
|------------------------------|-------------|-------------|-----------|
| Earnings from operation..... | \$1,408,325 | \$1,555,044 | \$146,719 |
| Operating expenses | 700,212 | 850,127 | 95,915 |
| Net earnings | 648,113 | 608,916 | 50,803 |
| Fixed charges | 177,918 | 151,271 | *26,647 |
| Dividends | 412,952 | 412,952 | ..... |
| Surplus | 61,227 | 134,693 | 73,066 |
| Operating ratio | .540 | .569 | .029 |

*Decrease.

TWIN CITY RAPID TRANSIT CO.

The report of the Twin City Rapid Transit Co. for August is as follows:

| | 1903. | Increase. |
|------------------------------|------------|-----------|
| Earnings from operation..... | \$ 650,400 | \$ 41,933 |
| Operating expenses | 155,554 | 17,585 |
| Net earnings | 209,912 | 24,348 |
| Charges and pref. div..... | 78,427 | 694 |
| Surplus | 131,485 | 23,654 |

From January 1st:

| | | |
|------------------------------|-------------|-----------|
| Earnings from operation..... | \$2,648,590 | \$321,165 |
| Operating expenses | 1,341,963 | 181,254 |
| Net earnings | 1,406,627 | 130,911 |
| Charges and pref. div..... | 627,193 | 16,607 |
| Surplus | 779,434 | 123,218 |

Earnings for the second week of September were \$76,300, an increase of \$7,199. For the month of September earnings amounted to \$370,348, as against \$337,966 last year.

MONTREAL STREET RAILWAY CO.

The comparative statement of the Montreal Street Railway Co. for August follows:

| | 1902. | 1903. | Increase. |
|------------------------------|------------|------------|-----------|
| Earnings from operation..... | \$ 195,610 | \$ 208,586 | \$ 12,976 |
| Miscellaneous earnings | 3,794 | 3,229 | *565 |
| Total earnings | 199,404 | 211,815 | 12,410 |
| Operating expenses | 100,086 | 109,158 | 9,072 |
| Net earnings | 99,318 | 102,656 | 3,338 |
| Fixed charges | 22,950 | 21,415 | *1,535 |
| Net income | 16,368 | 21,415 | 4,873 |
| Operating ratio | .5117 | .5233 | .0116 |

October 1st to date:

| | 1902. | 1903. | Increase. |
|------------------------------|-------------|-------------|-----------|
| Earnings from operation..... | \$1,813,987 | \$1,967,448 | \$153,461 |
| Miscellaneous earnings | 29,254 | 32,544 | 3,290 |
| Total earnings | 1,843,241 | 1,999,993 | 156,752 |
| Operating expenses | 1,040,946 | 1,218,968 | 178,022 |
| Net earnings | 802,295 | 781,025 | *21,270 |
| Fixed charges | 187,178 | 210,778 | 23,599 |
| Net income | 615,116 | 570,246 | *44,860 |
| Operating ratio | .5738 | .6196 | .0458 |

*Decrease.

Interest on the Montreal Park & Island Ry. bonds owned by this company not included.

TOLEDO RAILWAYS & LIGHT CO.

The following is the financial statement of the Toledo Railways & Light Co. for August:

| | 1902. | 1903. | Increase. |
|------------------------------|------------|------------|-----------|
| Earnings from operation..... | \$ 138,642 | \$ 150,515 | \$ 11,873 |
| Operating expenses | 69,889 | 76,231 | 6,342 |
| Net earnings | 68,753 | 74,284 | 5,531 |
| Fixed charges | 38,899 | 41,571 | 2,672 |
| Surplus | 29,853 | 32,712 | 2,859 |
| Operating ratio | .5041 | .5065 | .0024 |

For the eight months:

| | 1902. | 1903. | Increase. |
|------------------------------|------------|-------------|-----------|
| Earnings from operation..... | \$ 941,419 | \$1,075,913 | \$134,494 |
| Operating expenses | 484,587 | 552,937 | 68,350 |
| Net earnings | 456,832 | 522,980 | 66,148 |
| Fixed charges | 303,787 | 325,432 | 21,645 |
| Surplus | 153,044 | 197,547 | 44,503 |
| Operating ratio | .5147 | .5139 | *.0008 |

*Decrease.

The earnings for the first 15 days in September were \$62,217, as compared with \$49,593 for the corresponding period of last year, a gain of \$12,713.

DETROIT UNITED RY.

Following is the comparative statement of the Detroit United Ry. for August:

| | 1902. | 1903. | Increase. |
|------------------------------|------------|------------|-----------|
| Earnings from operation..... | \$ 402,043 | \$ 430,350 | \$ 28,316 |
| Operating expenses | 212,112 | 245,180 | 33,068 |
| Net earnings | 189,931 | 185,179 | *4,752 |
| Interest | 79,583 | 84,167 | 4,584 |
| Net income—surplus | 110,347 | 101,012 | *9,335 |

*Decrease.

For the eight months:

| | 1902. | 1903. | Increase. |
|------------------------------|-------------|-------------|-----------|
| Earnings from operation..... | \$2,613,020 | \$2,919,981 | \$306,961 |
| Operating expenses | 1,463,754 | 1,713,881 | 250,127 |
| Net earnings | 1,149,266 | 1,206,100 | 56,834 |
| Interest | 621,960 | 659,554 | 37,594 |
| Net income—surplus | 527,306 | 546,546 | 19,240 |

For the first 14 days of September the Detroit United showed a gain of \$33,910; Rapid Ry., \$4,113; Sandwich, Windsor & Amherstburg, \$1,421, a total gain of \$39,444. For the third week of September the total earnings were \$87,423, a gain of \$2,917.

CINCINNATI, NEWPORT & COVINGTON.

The condensed statement of the Cincinnati, Newport & Covington Light & Traction Co. for August is as follows:

| | 1902. | 1903. | Increase. |
|--|-----------|------------|-----------|
| Earnings from operation | \$ 96,217 | \$ 112,576 | \$ 16,359 |
| Operating expenses | 40,416 | 44,987 | 4,571 |
| Damages, taxes, rents and tolls..... | 13,978 | 16,839 | 2,861 |
| Total expenses | 54,394 | 61,826 | 7,432 |
| Net earnings | 41,822 | 50,749 | 8,927 |
| Fixed charges | 21,113 | 21,350 | 237 |
| Net profit | 20,709 | 29,398 | 8,689 |
| Operating ratio, including damages, taxes, etc. | .5653 | .5491 | *.0162 |

For eight months:

| | 1902. | 1903. | Increase. |
|--|------------|------------|-----------|
| Earnings from operation..... | \$ 707,435 | \$ 794,967 | \$ 87,532 |
| Operating expenses | 292,041 | 326,596 | 34,555 |
| Damages, taxes, rents and tolls..... | 109,752 | 133,893 | 24,141 |
| Total expenses | 401,794 | 460,490 | 58,696 |
| Net earnings | 305,641 | 334,477 | 28,836 |
| Fixed charges | 168,749 | 168,534 | *215 |
| Net profit | 137,892 | 165,943 | 30,051 |
| Operating ratio, including damages, taxes, etc. | .5679 | .5792 | .0113 |

*Decrease.

NORTHERN OHIO TRACTION & LIGHT CO.

Following is a statement of the earnings of the Northern Ohio Traction & Light Co. for the 12 months ending July 31, 1903:

| | |
|--------------------------|-----------|
| Gross earnings | \$829,724 |
| Operating expenses | 454,606 |
| Net earnings | 375,117 |
| Interest | 270,000 |
| Surplus | 105,117 |

For the 12 months ending Dec. 31, 1900, the gross receipts were \$513,725; for the year ending Dec. 31, 1901, \$617,011; for the year ending Dec. 31, 1902, \$745,044.

For the first 8 months:

| | 1902. | 1903. | Increase. |
|--------------------------|------------|------------|-----------|
| Gross earnings | \$ 484,407 | \$ 582,286 | \$ 97,879 |
| Operating expenses | 268,141 | 318,131 | 49,990 |
| Net earnings | 216,266 | 264,254 | 47,988 |
| Interest | 136,224 | 176,957 | 40,733 |
| Surplus | 80,041 | 87,297 | 7,256 |
| Operating ratio | .5535 | .5462 | ..... |

The gross passenger earnings for September were \$70,496, a gain of \$14,127, or an average daily gain of \$470.

PHILADELPHIA CO. AND AFFILIATED CORPORATIONS.

Comparative statement of Philadelphia Co., Equitable Gas Co., Consolidated Gas Co. of the City of Pittsburg, the Allegheny County Light Co., and Pittsburg Railways Co. for August:

| | 1902. | 1903. | Increase. |
|------------------------------------|-------------|-------------|-----------|
| Earnings from operation..... | \$1,061,378 | \$1,177,759 | \$116,381 |
| Miscellaneous earnings..... | 10,295 | 35,070 | 15,781 |
| Operating expenses..... | 708,705 | 748,080 | 40,184 |
| Net earnings..... | 371,968 | 403,840 | 91,878 |
| Fixed charges..... | 307,045 | 310,070 | 12,025 |
| Accrued preferred dividend..... | 22,780 | 23,939 | 1,159 |
| Net income..... | 42,143 | 120,830 | 78,693 |
| Available for Philadelphia Co..... | 42,074 | 120,707 | 78,633 |

Total for eight months:

| | 1902. | 1903. | Increase. |
|-----------------------------------|-------------|--------------|-------------|
| Earnings from operation..... | \$9,023,183 | \$10,128,000 | \$1,105,723 |
| Miscellaneous earnings..... | 388,563 | 316,019 | *72,544 |
| Operating expenses..... | 5,101,491 | 5,820,144 | 718,653 |
| Net earnings..... | 4,310,255 | 4,624,781 | 314,526 |
| Fixed charges..... | 2,452,781 | 2,553,814 | 101,033 |
| Accrued preferred dividend..... | 192,358 | 191,483 | *875 |
| Net income..... | 1,665,115 | 1,879,484 | 214,369 |
| Available for Philadelphia Co.... | 1,662,899 | 1,877,393 | 214,494 |

*Decrease.

MANCHESTER STREET RAILWAY CO.

Following is the statement of the Manchester (N. H.) Street Railway Co. for the year ending June 30, 1903, as shown by the annual report:

| | |
|------------------------------|-----------|
| Earnings from operation..... | \$267,967 |
| Operating expenses..... | 214,375 |
| Net earnings..... | 53,342 |
| Fixed charges..... | 21,585 |
| Net income..... | 31,807 |
| Dividend..... | 31,230 |
| Surplus..... | 577 |

The expenses were divided as follows: Electric motive power, \$61,502; wages, \$62,000; salaries and office expenses, \$13,966; fuel and water, \$17,729; parks, \$8,416; maintenance of tracks and line, \$17,000; repairs of cars \$19,000. During this year the company collected 5,231,277 five-cent fares, received for advertising in the cars \$1,000, and from park entertainments \$5,189.

The length of the road is 28.375 miles and it has 5,305 miles of double and 2,425 miles of side tracks. At the date of the report it had 30 closed cars and 56 open cars equipped for electricity and 163 motors. It has since bought 14 cars, which are being delivered. The company's capital stock is \$520,500, its bonded debt \$250,000, and its floating debt \$237,652. The stock is owned by the Manchester Traction, Light & Power Co.

MERIDEN ELECTRIC R. R. CO.

The annual report of the Meriden (Conn.) Electric Railroad Co. for the year ending June 30, 1903, shows the following:

Net earnings per mile run, .0782; miles run, 701,424¼; passengers carried, 3,470,480; number of paying passengers per mile of main track operated, 136,016; number of paying passengers per mile run, 3,936; number of employees, 90; number of cars, 55.

Earnings from operation, \$149,469; operating expenses, \$94,588; net earnings, \$54,880; income from advertising, \$450; rent of land and buildings, \$248; total income, \$55,578.

Deductions from income: Taxes (state) accrued, \$6,214; other taxes, \$228; interest on funded debt, \$25,000; interest on floating debt accrued, \$8,533; total, \$39,976.

Net income from all sources, \$15,601; deficit for year ending June 30, 1902, \$18,721; total deficit for year ending June 30, 1903, \$3,219.

INTERURBAN STREET RAILWAY CO.

The report of the Interurban Street Railway Co. for the year ending June 30, 1903, the first full year of the operation of the Metropolitan Street Railway Co. after its consolidation with the Interurban company, shows how the gross earnings are divided between the two parts. Metropolitan and Interurban have reported a combined gross income of \$918,377 for 1902. Fixed charges were reduced by \$10,144 for interest on the \$1,000,000 of Metropolitan 4 per cent. refunding bond.

The consolidated income account of the Metropolitan lines gives gross earnings of \$16,178,563; net earnings, \$8,372,245; gross income from all sources, \$8,620,844. The surplus available for guaranteed dividend of 7 per cent on capital stock of the Metropolitan Street Railway Co. is \$3,509,339, which with a balance of guaranteed dividend paid by the Interurban company of \$130,452 makes a total of \$3,639,791.

The consolidated income account of the Third Ave. lines aggregates \$5,370,892; net earnings from operation, \$1,788,191; gross income from all sources, \$2,113,000, leaving a deficit of \$141,684.

During the year the Metropolitan lines carried 469,183,445 fare and transfer passengers, while the Third Ave. lines carried 152,888,278 passengers. The report includes a schedule of 60 pieces of real estate, with an assessed value of \$22,000,000.

MELBOURNE TRAMWAY & OMNIBUS CO.

The 30th annual report of the Melbourne Tramway & Omnibus Co., Limited, of Melbourne, Australia, shows the traffic receipts for the year ending June 30, 1903, to have been £443,221, a decrease of £13,106. The total receipts, including a balance of £25,994 from the year before, were £488,539; disbursements, £462,291; balance, £26,248. During the year £48,000 was paid in dividends; wages amounted to £127,745; salaries, £18,076; income tax, which was paid for the first time, £3,819; repairs and maintenance, £60,610; interest and sinking fund, £107,250; transferred to reserves, £32,313; rating on tramway lines, £19,885; written off interest and sinking fund, £3,000.

The company is capitalized at £2,000,000, of which £400,000 is paid in; its assets are placed at £951,001.

At the annual meeting August 18th the managing director, Mr. Francis B. Clapp, reported that the cost of feed, licenses, salaries, wages, expenses of tramway trust and income tax caused an increase of £11,101, while fuel, repairs and maintenance, office expenses, tramway rating and leaseholds decreased £12,163. There was a decrease in tramway traffic of £15,043 and an increase of omnibus traffic of £1,937. The total number of passengers carried by tramcars was 46,832,910, an increase of 389,894; by omnibuses, 1,171,456, an increase of 352,900; total number of passengers, 48,004,366; total increase, 742,794. Number of train miles run by tramcars, 9,044,282, an increase of 166,060; by omnibuses, 450,109, an increase of 101,448; total miles run, 9,494,391; total increase, 267,508. The total mileage operated by the company is 48 miles of double track.

During the year the accommodation at a number of car houses was increased and an addition was built to the Nicholson St. car and machine shops.

LEWISTON, BRUNSWICK & BATH RY.

The annual report of the Lewiston, Brunswick & Bath Street Ry., Brunswick, Me., for the year ending June 30, 1903, shows a deficit for the year of \$4,025, notwithstanding that 100,000 more passengers were carried than the year before. This is the second longest trolley line in the state. Following are excerpts from the report:

The gross transportation earnings were \$221,379, against \$210,901 in 1902; total earnings, \$223,597, against \$213,100 in 1902; operating expenses, \$161,344, against \$141,137 in 1902; net earnings, \$62,153, against \$72,963 in 1902. The gross income above operating expenses was \$70,502, against \$90,819. The total charges and deductions from income account were \$74,528, leaving a deficit of \$4,025. Last year the total net income was \$7,358.

The company expended \$21,525 for maintenance of roadway and buildings, against \$16,398 in 1902; for maintenance of equipment, \$32,963, against \$27,747 in 1902. The transportation expenses were \$93,881, against \$82,338 in 1902. The net expenditure charged to property account was \$8,078.

This year the receipts from park, advertising, etc., were \$8,338, or \$9,547 less than in 1902.

There is a decrease in the number of Maine stockholders from 26 to 24, but an increase in the amount of stock held in Maine from \$88,800 to \$94,000, although there was no change in the amount outstanding.

The record of traffic shows: Passengers carried, 4,351,114, against 4,237,065 in 1902. Average number of persons employed, 180, as against 178 in 1902. Salary for officer and clerk, \$8,254, for the 123 other employes, \$7,224. During the year there were four accidents, in which two persons were killed and three injured.

PHILADELPHIA RAPID TRANSIT CO.

The annual report of the Philadelphia Rapid Transit Co. for the year ended June 30th shows the number of passengers carried to have been 365,068,051, an increase of 40,066,088, and the total receipts \$15,436,572. The detailed report compared with last year's annual report of the Union Traction Co. shows:

| | 1903. | Increase. |
|-------------------------|--------------|-------------|
| Earnings from operation | \$15,277,800 | \$1,308,573 |
| Miscellaneous earnings | 158,700 | 9,840 |
| Operating expenses | 7,234,892 | 832,554 |
| Net earnings | 8,201,680 | 485,850 |
| Fixed charges | 6,805,080 | 1,071,140 |
| Licenses and taxes | 900,701 | 86,800 |
| Net income | 405,888 | *672,140 |
| Operating ratio | .5384 | .0154 |

*Decrease.

The large increase in fixed charges is due in part to the payment of \$900,000 Union Traction rental; the balance of the increase in fixed charges was due to new leases made during the year. The fire insurance fund was increased during the year by \$178,375; and \$500,000 of the amount charged to operating expenses was expended on the Chestnut St. and Walnut St. lines. During the year approximately 25 miles of new lines were built; 23½ miles of track was renewed, and 550,564 lineal feet of duct conduit was laid. The power equipment was increased by 1,500 kw. A number of new cars of the large type were added to the equipment.

The report of the treasurer shows the total receipts to have been \$20,040,970; disbursements, \$19,725,456; balance, \$315,514.

The report of the treasurer of the Union Traction Co. shows the receipts for the year ending June 30, 1903, to have been \$8,656,549, including a balance of \$230,464 as per report of June 30, 1902.

THE AMERICAN RAILWAYS CO.

Accompanying the fourth annual report of the American Railways Co., of Philadelphia, for the year ending June 30, 1903, is the report of the president, Mr. J. J. Sullivan, which shows that the gross earnings of the subsidiary companies were \$1,245,298, an increase of \$238,802, or 23 per cent, over 1902. Dividends amounting to \$223,774 were paid, leaving a balance of \$50,917, which, added to the surplus of 1902, makes this year's surplus \$381,783. The rest of the issue of \$2,500,000 of collateral trust convertible bonds remaining unsold June 30, 1902, amounting to \$910,000, was disposed of during the year at a price netting the company 98 per cent with interest. The \$150,000 of first mortgage five per cents received from the Bridgeton & Millville Traction Co. in part payment for its Port Norris extension were sold at par and interest. During the year holders of the American Railways Co. 5 per cent collateral trust convertible bonds amounting to \$52,000 converted the same into stock. The company sold 2,000 shares of its unissued stock in September, 1902, netting \$100,000, making the capital now outstanding \$3,903,000, full paid.

During the year the company purchased the rest of the stock of the People's Railway Co., of Dayton, O. In March, 1903, the company purchased the Home Electric Light & Steam Heating Co., of Tyrone, Pa.; also the Tyrone Electric Railway Co., owning and operating about 12 miles of street railway in Tyrone, and from Tyrone to Bellwood. By building 1,700 ft. of track in Bellwood connection was made with the Altoona & Logan Valley system and through cars are now run between Altoona and Tyrone. The company now has in Altoona 43.8 miles of track; the total trackage of the company is 217.1 miles, showing a gain for the year of 34.1 miles.

The company has in Joliet, Ill., and between Joliet and Chicago, three power houses aggregating 2,000 h. p., and 74 cars on 77 miles of track; in Dayton, O., it has one power house containing 2,000 h. p., and 111 cars on 28.3 miles of track; in Springfield, O., it has two power houses aggregating 1,200 h. p., and 54 cars on 30.3 miles of track; in Bridgeton, N. J., and from Bridgeton to Millville, and from Bridgeton to Port Norris, it has 28 cars on 37 miles of track, and one power house containing 850 h. p.; in the Altoona system it has three power houses aggregating 3,400 h. p., and 72 cars. The company owns one locomotive and eight freight cars, making a total of 348 cars.

The company owns three electric light plants, one in Springfield, one in Tyrone and one in Bridgeton, and it has municipal contracts

for a term of years for lighting all three cities. Near Altoona the company owns 160 acres of land for park purposes; in Dayton it owns 47 acres; in Springfield 18 acres, and in Bridgeton 11 acres. The highest standard of efficiency has been insisted upon and maintained in the roadway, car equipments and power houses of all the properties.

In conclusion Mr. Sullivan states that while the growth of the properties shows a handsome improvement, the increase in cost of labor, coal and electrical equipment has been a factor in keeping down the profits of the company.

The treasurer's report shows the gross income for the year to have been \$423,028; deductions from income, \$148,336; net income, \$274,691.

Strikes of the Month.

The Newark conductors and motormen of the Public Service Corporation of New Jersey struck September 24th and threatened to involve all the lines operated by the company. The next morning the strike was called off, upon the company promising to consider changes which should be to the men's advantage. The company declined to deal with the union, however, or with any employee representing himself as a union man; it also declined to grant the increase in wages demanded. Later the employees on all the company's lines in the state voted upon the advisability of beginning an extensive strike, with the result that 75 per cent of the men declared themselves against it.

Because the company refused a proposition to arbitrate the conductors and motormen employed by the People's Traction Co., of Galesburg, Ill., went out on strike September 23d. The company had discharged three men for drunkenness, but the men claimed it was because they belonged to the union, and that precipitated the strike. Since the strike began the trolley wires have been cut twice by strike sympathizers, but aside from that there have been no riotous indications. The company has managed to keep the cars running more or less regularly. October 5th the union presented a petition to the Galesburg city council praying that it compel the company to arbitrate. The petition was referred to the mayor and city attorney, with power to act, it being decided by the council that it involved a question of law enforcement.

September 26th the conductors and motormen employed by the Citizens Railway Co., of Waco, Tex., went out on strike, tying up the entire system. The demand of the union is that the company shall enter into the customary agreement with the Amalgamated Association of Street Railway Employees of America. Citizens appointed a committee to endeavor to adjust the differences, without success, although both sides were willing to make concessions. The company absolutely refused to allow the union to pass upon the discharging of the men, however, so the strike was renewed with more vigor. There has been a little rioting on the part of the men. October 9th the mayor of Waco notified the company that it must run its cars or proceedings to forfeit the charter would be commenced. Preparations were then begun to try and operate the cars. October 12th the first cars were run.

October 7th the union trainmen of the San Antonio (Tex.) Traction Co., about 175 in number, struck for higher wages and for the regulation of the right of discharge. Previous to the strike the company discharged 11 turbulent union leaders and that brought the situation, which had long been strained, to a climax. The company ran cars over part of its system October 8th, employing nonunion men. Rioting broke out on the San Pedro and Government Hill lines, but the disorder was promptly suppressed. The grand jury immediately took hold of the situation and the city officials promised to give the company all the protection possible. October 10th the company announced that it had all the men needed to operate on regular schedules and full service would be re-established October 12th. During the riots two men were shot.

The Houston, Tex., city council has adopted an ordinance requiring compartment cars on the Houston street railway lines to separate the white and black races.

The City Street Car Co., of Staunton, Va., was placed in the hands of a receiver September 16th last. What will be done with the property had not been determined up to September 26th.

Cars for the New York Subway.

The St. Louis Car Co. began to ship the new subway cars built for the Interborough Rapid Transit Co., New York, the first of this month and up to October 12th 28 cars had been delivered, deliveries taking place at the rate of 15 cars per week. Two hundred of these cars have been ordered for use in the underground system of New York City, and they are stated to be the finest of the kind ever built.

An exterior and an interior view of these cars are shown herewith. Some of the principal dimensions are as follows: Length of



INTERBOROUGH CAR. ST. LOUIS CAR CO.

car bodies over all, 51 ft. 5 in.; over corner posts, 42 ft. 7 in.; distance from center to center of needle beams, 10 ft. 11 in.; width over side sills, 8 ft. 8 3/4 in.; height of end door openings, 6 ft. 6 1/4 in.; height of body from bottom of sill to top of roof, 8 ft. 9 7/8 in. The car bodies taper toward the top, being designed to give the maximum seating space and at the same time allow the maximum clearance of tunnels.

The bottom framing is of combined steel and wood; the bolsters are of heavy rolled steel plates, top and bottom members machined at the outer ends, bolted together and re-inforced with steel castings, which are planed on faces and edges and have triple floor. The lower floor is covered with 1/4-in. asbestos, rolled fire felt, and the finishing or third floor is grooved and acts as a floor mat. Underneath the bottom they are covered with 1/4-in. transite board, securely nailed to all bridges and fitted to the side sills.

The trucks are swing bolster type, with solid forged frames, transom bars and all bolts and wearing parts are machine fitted, the bolt holes being drilled.

The car body proper is covered with copper sheathing, to make



INTERIOR OF INTERBOROUGH CAR.

the car is fireproof as possible consistent with building a hand some passenger coach.

The interior finish is finest African mahogany; the seats are arranged crosswise in the center of the car and longitudinally at the ends. The sash are arranged so the top sash will drop, the lower sash remaining stationary. The cars are equipped with automatic air brakes and other modern appliances and are heated with electricity.

Nashville Railway & Light Co.

The Nashville Railway & Light Co. has completed the reconstruction of its track on Broad St., Nashville; the West Nashville line, which is being double tracked, is about half finished, and the double track on Woodland St., from 1st to 10th St., is practically completed. The extensions of about 1/4 mile each on the Gallatin and Vaughn Pikes have been completed and the cars operating over them are being patronized to a much greater extent than was anticipated. The company is receiving from the Tennessee Coal, Iron & Railroad Co. 1,200 tons of 70-lb. steel rails to be used to complete the double track to West Nashville and in the reconstruction of the double track on South Spruce St., which leads to the company's Glendale Park, from Broad St. to Fogg St.; the rest of the line to the park is in good condition and will not be reconstructed at present.

At the corner of Broad and Spruce Sts. special track work has been laid whereby some of the cars may be diverted down Broad St. and up College St., to the center of the city and the transfer station, instead of Spruce and Church Sts., where traffic is greatly congested. This also gives more direct connection between the South and West Nashville lines and the Union station on Broad St. These

improvements have been in charge of the company's engineers, Messrs. Ford, Bacon & Davis.

An ordinance is pending in the city council giving the company the right to build and operate a double track line on Church St. from McTyeire Ave. through Felder Ave. to the Horse Show building on Cedar St. At present there is a single track on Church St., but none whatever on Felder Ave. Heretofore the crowds that annually attend the Horse Show have been inadequately handled over the old line via Jo Johnston Ave. The bill has passed its second reading in the face of considerable opposition and now it is thought the way is clear for its final passage.

The company has experienced considerable trouble in both the railway and light departments, owing to lack of power while the change is being made from the old to the new power plant. Recently, however, an arrangement was made whereby the company will temporarily obtain steam from the city's electric plant, which adjoins the company's new power station.

Chicago Elevated Traffic.

In September the South Side Elevated Railroad Co. carried 81,887 passengers, as against 76,572 in September, 1902, an increase of 6.94 per cent; the Northwestern Elevated Railroad Co. carried 112,993 passengers, compared with 109,751 last year, an increase of 6.50 per cent; the Metropolitan West Side Elevated Railroad Co. carried 68,107 passengers, compared with 63,950 in September, 1902, an increase of 2.95 per cent; the Lake Street Elevated Railroad Co. carried 41,705 passengers on its main line, an increase of 1.27 per cent; with transfers it carried 44,563. In August Lake Street traffic decreased .91 per cent.

An Accident Report.

The following report was turned in by a conductor of the Rochester (N. Y.) Railway Co. recently:

Date Sept. 28, 1903

Where accident occurred In front of Mr. Katz' sausage factory Name and residence of witnesses No Body seen it

Statement of accident in full: Mr. Katz' Mongrel Dog chased a Sparrow and the Sparrow flew over the car and the Dog flew under the car almost upsetting it with his enormous carcass Extraordinary fat he was indeed he Died Instantly I understand Mr. Katz Buried him Decently

Conductor.

September 21-25, inclusive, the Lehigh Valley Traction Co. and the Philadelphia & Lehigh Valley Traction Co. carried 475,247 cashfare passengers, it being Fair week. This exceeds all previous records.

Canadian Notes.

The Toronto Railway Co. is rushing work on contemplated improvements to cost at least \$750,000. Four batteries of boilers, two new engines and two dynamos are being installed at the power house, which will increase its capacity by 3,200 h. p., and to secure additional power during rush hours a storage battery with a capacity of 3,000 ampere-hours is being erected. Nearly 50 miles of new feeder wire is being strung, also. A number of new cars are being built for winter service, 15 of them to be convertible cars.

The Montreal Street Railway Co. has applied for an extension of franchise for 30 years and offers to remove snow and dust, and to water the streets upon which its cars run, on condition that it be given power to arrange with other companies matters affecting the use of these streets, and at the end of 30 years, in event of expropriation by the city, the latter shall acquire all of the company's undertakings in and out of the city. The company will further agree to sell workmen's tickets 10 for 25 cents, the new obligations to be in lieu of all taxes except such as all joint stock companies are required to pay.

A bill for the construction of a radial railway from Toronto to Hamilton passed the Senate at Ottawa September 24th. The projectors of the road are Frederick Nichols, second vice-president and managing director Canadian General Electric Co.; William MacKenzie, president Toronto Railway Co., and Col. H. M. Pellatt, 36 King St. East, Toronto.

The citizens of Woodstock, Ont., September 22d passed a resolution pledging their support of the proposed electric line between St. Mary's, Embro and Woodstock, for which a charter has been granted.

The electric road which is to connect St. George and Galt with Blue Lake, Paris and Brantford, Ont., is practically completed from Paris as far as the new plant of the Ontario Portland Cement Co. A franchise has passed the first reading in the council at St. George. S. Ruter Ickes, president of the Brantford Street Railway Co., James G. Wallace, president of the Woodstock, Thames Valley & Ingersoll Electric Railway Co., and W. B. Wood, of Brantford, are interested.

Mr. H. M. Sloan, of Chicago, is president of the Stratford Radial Railway Co., which is to build a system between Stratford, Mitchell and St. Marys, for which surveys have been completed. Idington & Robertson, Stratford, Ont., are the company's solicitors.

The Winnipeg Electric Street Railway Co. has been granted a franchise in St. Boniface, one of the conditions being that cars shall be running before winter sets in. Construction has begun.

The Peterboro Radial Railway Co., which recently secured a 30-year franchise in Peterboro, Ont., and will use the tracks of the defunct Peterboro & Ashburnham company, is building a new dam and power house at a cost of \$250,000.

A by-law has been enacted providing for the taking over of the Guelph Railway Co. by the city at a cost of \$78,000.

The British Columbia Electric Railway Co., Ltd., plans to extend its line from New Westminster to Ladner, crossing the Fraser River.

Municipal Ownership.

Mr. Charles Francis Adams, of Boston, is quoted as having made the following remarks to an inquiry concerning municipal ownership and its practicability in Kansas City:

"It so chanced I have had occasion to examine very carefully municipal transportation, both for city service and for railroads in Europe. I can only say that, as the result of careful official examination on my part, I have never yet found in Europe, anywhere, a case of municipal or public transportation worthy of an instant's consideration as compared with our own. The municipal systems in Glasgow would lead to a riot within 24 hours if put in use in Kansas City.

"Under the circumstances, do not look for sympathy from me in a movement in that direction. You may regard our present condition as being in the frying pan. I can only say that if you wriggle out of it into anything in use in Europe you would find yourself sizzling in the fire at short notice. Please don't talk to me of doing business through government machinery. It is one colossal exhibition of waste, extravagance and incompetence."

New Officers for the C., H. & D.

The Ticket and Freight Soliciting Departments of the Cincinnati, Hamilton & Dayton Ry., which have been located in the Chamber of Commerce Building, in Cincinnati, for the past fifteen years, have removed to the corner of Fifth and Walnut, in the new Traction Building. This building, which is the second of the so-called "Skyscrapers" in that city, is a magnificent one. The location is on the Public Square in the busiest corner of the city. The offices are furnished in mahogany, with tile floor, and contain all modern improvements. The character of the furniture and the magnificent frontage of fifty-five feet on Fifth St. will enable the company to show its friends what is now and will likely be for some time the finest railroad soliciting office in the country.

Transit Plan for East River Bridges.

Bridge Commissioner Lindenthal, of New York City, recently submitted a plan, which has been transmitted to the Rapid Transit Commission, for connecting the East River bridges with the surface and elevated lines of Manhattan and Brooklyn. The plan includes an elevated crosstown line in Manhattan extending from the new Manhattan Bridge to the North River, crossing the Second, Third, Sixth and Ninth Ave. elevated roads, with transfer stations at the intersecting points. The Brooklyn Bridge would be double-decked, the upper portion to be used for the elevated tracks, the trolley tracks to occupy the space on the lower part now used by the regular bridge cars. At the Brooklyn end of the bridge the elevated tracks will connect with those on Fulton St., and those leading to Myrtle and Flatbush Aves. It is proposed to continue the Flatbush Ave. line on the new avenue that will be laid out as an approach to the new Manhattan Bridge across the bridge and extending thence to the North River, as stated. It is also suggested that the south track of the Fulton St. elevated road, after it is continued over the Manhattan Bridge, be turned off into Division St., taking the place of the present Second Ave. elevated structure on that street, and continued down Division St., crossing the Second and Third Ave. lines at Chatham Sq., and continued on a second deck down Park Row into the proposed new City Hall station. In this station the tracks will be on the same level with the tracks on the Brooklyn Bridge, and the elevated road would form a complete loop from Fulton St., Brooklyn, over Manhattan Bridge and back over Brooklyn Bridge to Fulton St.

It is proposed to remove the present elevated structures on the Plaza in Brooklyn and convert the space into a park. The present Bridge station will then front the park and it will be a through station.

Regarding the proposition to remove the trolley tracks from the roadway on Brooklyn Bridge, Mr. Lindenthal states that when the bridge was built the placing of trolley tracks on the roadway was not foreseen and the stiffening system of the suspended portion of the bridge is not adapted for the exigencies of the elevated and trolley car traffic. Furthermore the running of trolley cars on the roadway not only impedes the movement of trucks, but it overstrains the bridge floor construction, entailing constant and extensive repairs. It is suggested that provision be made in the plans for the new City Hall station for a terminal of 10 loops; that, it is believed, will allow ample facilities for all trolley cars in the future.

As to the Williamsburg Bridge Mr. Lindenthal suggests plans for connecting the trolley tracks in Williamsburg with the surface and elevated lines in Manhattan. He also advocates the moving platform plan which is now being considered by the Rapid Transit Commission. It is proposed to run this moving platform, which would have a capacity of 70,000 passengers an hour, over the bridge from the Williamsburg end under Delancey St. in Manhattan to the Bowery, and thence under the Bowery, Park Row and Nassau St. to the Battery.

The elevated railroad tracks on the Blackwell's Island Bridge, it is suggested, should be connected in Manhattan with the Second Ave. elevated by two stub tracks, and on the Queens side a similar spur should join the elevated road either at Thompson or Jackson Ave.

The long-projected electric line of the Bakersfield (Cal.) and Ventura Railway Co. is under construction between Bakersfield and Hueneme. A cargo of ties was recently received at Hueneme.

New Publications.

THE AMERICAN RAILWAY ENGINEERING AND MAINTENANCE OF WAY ASSOCIATION has issued Bulletin No. 43, September, 1903, containing the Report of Committee No. III.—On Ties. Pamphlet form, 6 x 9 in., 40 pages. This bulletin is being sent to members in advance of the fifth annual meeting of the association, which is to be held at the Auditorium Hotel, Chicago, March 15-17, 1904.

INDEX OF THE TECHNICAL PRESS is the title of a new monthly publication which was first issued in April, 1903, by the Association de la Presse Technique, of Brussels. Its contents comprise a series of indexes giving the title, with brief explanation, the name of the author, the original date of publication and the length of articles of general interest appearing in the principal technical journals throughout the world. It is a handy volume, 4 x 9 in., with paper covers, containing 300 pages, it having been increased from 75 pages in less than five months. It is unique in that it is printed in three languages, the English, French and German journals and reviews being indexed in these languages, respectively; for Italian, Spanish and Russian papers French is employed, while the Scandinavian and Dutch journals are indexed in German. The subscription is 5 shillings per annum.

Forestry Station at Purdue University.

The Bureau of Forestry, United States Department of Agriculture, has established a timber testing station at Purdue University Lafayette, Ind., which is the nucleus for work in the Mississippi Valley for an investigation of the mechanical properties of the commercial timbers of the United States. Other stations have been established at the University of California, at Yale University and at Washington. The work at Purdue University will be under the direction of Dr. W. K. Hatt, and the immediate work of the bureau will be the study of the red gum, a wood that possesses valuable qualities but at present neglected largely because of prejudice. Also work looking to the standardization of dimensions for packing cases will be carried on with a view of eliminating the necessity for much of the waste that now exists by reason of the want of information as to the strength needed for such cases. The location of a forestry station at Purdue University is doubtless in recognition of the excellent work done there in the testing of materials of construction, and the appointment of Dr. Hatt as a director is a high compliment to him.

Chicago Union Traction Co.

On October 8th Judge Grosscup in the United States Circuit Court resumed hearings on various matters connected with the receivership of the Chicago Union Traction Co., which had been adjourned from August 18th. Further testimony was heard regarding the negotiations for compromise in which \$100,000 was demanded by some minority stockholders. The receivers were exonerated from blame in this transaction. Mr. Townsend and his attorneys, who had been restrained from instituting any proceedings in the state courts attacking the action taken by the stockholders of the Union Traction and its lesser companies August 18th, have arranged for an appeal to the United States Circuit Court of Appeals from the order granting the interlocutory injunction, and the contempt proceedings against Mr. Townsend and his attorneys in Judge Grosscup's court are in abeyance until the court of appeals shall have passed upon the injunction order. Judge Grosscup directed the receivers to pay \$80,000 to the stockholders of the North Chicago Street Railway Co. October 15th, as provided by the amended lease.

The Waterloo & Cedar Falls Rapid Transit Co. recently removed its general offices from the Mullan Block, Commercial St., Waterloo, to the new building at the corner of Third and Commercial streets. In addition the company has secured space in the new building for a ticket office and waiting room.

More Brill Cars for the Camden Interstate Railway.

The Camden Interstate Railway Co., of Huntington, W. Va., has lately added to its equipment three fine combination, passenger and smoking cars, built by the J. G. Brill Co. The railway operates between Guyandotte, W. Va., through Huntington, Central City, Kellogg, Ceredo and Kenova in West Virginia, Cattlesburg and Ashland, Kentucky, and by transfer across the Ohio River to Coal Grove and Ironton, Ohio.

The system is 32 miles long. The company owns and operates amusement parks at Kellogg, Ashland and Ironton, which increases very materially the number of passengers carried during the summer months. The new cars are intended for through service between Guyandotte and Ashland, but as the district through which the road extends is thickly populated and the cities near together, the cars will not be required to run at a very high speed; therefore they are mounted on short-base trucks of the "Brill 27G" type, which can be run at about 30 miles an hour.

As the engraving shows, the cars are vestibuled at either end, have steam car roofs, and straight sides. The upper sashes of the windows are stationary, and the lower arranged to be raised for their full height, recesses being provided in the side roofs for that purpose. Three-bar window guards extend along the sides for the full length of the car. The vestibules are sheathed inside and out with tongued and grooved boards.

The entrance doors are arranged to fold against the body ends, and folding gates are provided which close against the vestibule posts.

The vestibule sashes have single lights, and are arranged to drop



BRILL CAR FOR HUNTINGTON, W. VA.

into pockets. Between the passenger and smoking apartments are hardwood partitions with single sliding doors. The passenger compartment has seats for forty passengers; the seats are of spring cane with reversible backs and are placed transversely in the car. The seats in the smoking compartment are also of spring cane, are placed longitudinally and will accommodate 12 passengers.

The principal dimensions are: Length over end panels, 37 ft.; over vestibules, 40 ft. 5 in.; trim end panels over vestibules, 4 ft. 8 in.; width over sides, 8 ft. 2 in. The side sills are plated on the inside with $\frac{3}{8}$ x 12 in. steel plates; besides these steel plates the car is trussed with upper and lower rods. Platform timbers are reinforced with angle irons and strengthened and protected with angle iron bumper. The interiors are finished in natural cherry and the ceilings are of birch, neatly decorated. The trucks have a 4-ft. wheel-base, 33-in. wheels and 4½-in. axles. The cars are provided with four motors of 35 h. p. each.

Casino Technical Night School.

The Casino Technical School, of East Pittsburg, Pa., instituted on September 1st a night school in the Casino buildings for instruction in mechanical-electrical engineering, mechanical-steam engineering and shop practice, for the benefit of mechanics, clerks and apprentices. School sessions will be held every evening except Saturdays and holidays until June 1st. The school is under the management and personal direction of Mr. Henri F. Chadwick, B. S., formerly one of the faculty of Tufts College, and the American School of Correspondence at the Armour Institute of Technology, Chicago.

New Club Rooms at Schenectady.

The formal opening of the new club rooms of the Schenectady Railway Benefit Association in the Fuller St. station of the Schenectady Railway Co. occurred at 8 p. m., October 1st. After an address by the president of the association there was a vaudeville entertainment, followed by dancing. The new rooms, which had been open for inspection from 10 a. m. to 6 p. m., were warmly commended, and the evening's entertainment was most enjoyable. The committee of arrangements comprised Messrs. James O. Carr, J. S. Coles, E. J. Ryan and E. Reichmyer.

Disastrous Windstorm at Pleasantville, N. J.

The newly completed car barn and power house of the Atlantic City & Suburban Railway Co., at Pleasantville, N. J., were in the path of the fierce gale that destroyed much property in that vicinity on September 16th, and, with the exception of the power house chimney, were entirely demolished. No lives were lost and but one person was injured. Fortunately no heavy pieces of wreckage fell upon the machinery in the power house. Six new Brill semi-convertible and "Narragansett" cars were standing in the car barn



WRECK OF CAR BARN, PLEASANTVILLE, N. J.

and received the whole weight of the roof and girders when they fell, and, strangely enough, the girders bent over the car roofs without damaging the cars below the roofs. For several days the cars had to remain under the wreck and on being taken out revealed no straining of the side posts or injury to the framing. The lines were opened only a few days previous to the storm and only one car was running. Several more cars were at the Brill works ready to be shipped to Pleasantville at the time of the storm, and by a fortunate occurrence were not sent. The wreckage was quickly removed and building operations have commenced, the plans calling for more substantial construction.

Injunction Against Stark Ry. Modified.

Recently the village of Beloit, O., secured a temporary injunction restraining the Stark Electric Railway Co. from entering the village. The people of Beloit claimed that the company never secured a franchise and was about to enter upon the streets of the village without legal right. At a hearing the company claimed that it had a private right of way and did not intend to enter on any of the streets of the village, and it prayed the court to annul the injunction as far as it might apply to the private right of way. The court did so.

The Jackson & Battle Creek Traction Co. has instituted half-fare tickets for children under 12 years of age for all sections of the road. This is believed to be the first electric interurban railway to adopt a half-fare rate.

A Method of Babbitting Armature Boxes.

The accompanying illustrations show a convenient method of babbitting armature boxes which is in use at the shops of the Los Angeles and the Pacific Railway Companies. This method has been found to give entire satisfaction and it permits of rapid and accurate work. A cast iron plate, A, an inch or more in thickness, is counter-bored as shown to fit the outside of the shell. A wrought iron or steel bar, B, is turned to the size of the inside diameter of the babbitt before finishing, and it has a very slight taper so that it can be

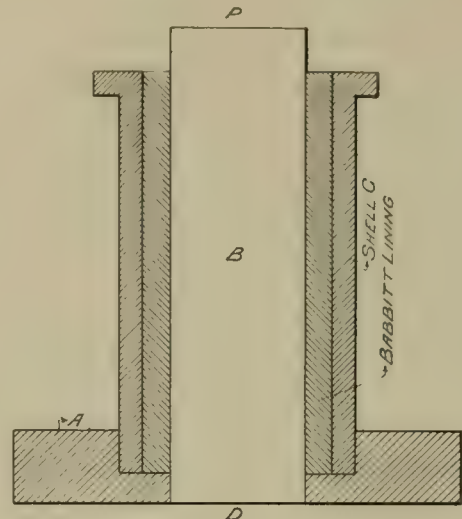


FIG. 1.

withdrawn after the babbitt is poured. The plate A is drilled at the bottom so that this bar fits tightly into it and stands perfectly perpendicular. This bar and the shell are then set up in the position shown in Fig. 1 and care must be taken that when the parts are in place the shell and the bar are concentric so as to give a uniform thickness to the babbitt.

In babbitting new boxes before the oil holes have been drilled, all that is necessary is to insert the core in the plate, put the shell in position and pour the babbitt. Old shells which are to be rebabbitted are first put in the pot and the old babbitt melted out. They are then put in position on the plate and wrapped with a piece of asbestos to prevent the babbitt from running out of the oil holes.

This method of babbitting also works well with split boxes. After being put in position the box is wrapped with asbestos paper and

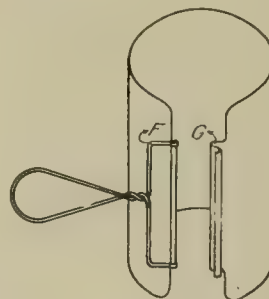


FIG. 2.

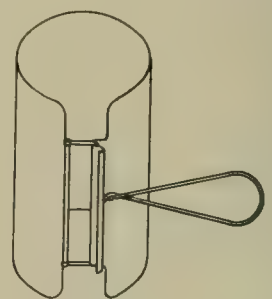


FIG. 3.

the babbitt poured in. The method of holding the asbestos paper is shown in Figs. 2 and 3. A piece of galvanized iron is cut and rolled to the shape shown. A wire handle is fastened to one end of the piece and the opposite end is bent so that when the handle is in the position shown in Fig. 3 it engages with the bent end of the curved piece drawing it tightly around the asbestos which it holds in place.

When the babbitt has hardened the shell and lining may be removed by turning the whole upside down and striking the end, P, upon a block of iron, when the shell and lining will slide off, or the core, B, may be driven out of the plate, A, by a blow at, D, and the shell and lining driven off as before.

Progress on the Buffalo, Dunkirk & Western.

Work along the line of the Buffalo, Dunkirk & Western Railroad from Buffalo to Westfield is progressing rapidly. The line from Fredonia to Westfield—a distance of about 20 miles—is substantially finished. The company will be operating cars on this section within two weeks. The line from Buffalo west to Angola—a distance of 22 miles—has been graded for double track with all of the concrete, culverts and foundations for bridges in. The bridges have been delivered and will be soon erected. Ties and poles have been delivered along this section of the line and it is intended to have the line to Angola from Buffalo in operation before January 1st. From the rapidity with which construction has been progressing during the past summer the entire line should be in operation by July 1, 1904—which will be six months in advance of the date of the completion of the contract. When completed the company will have a roadbed and overhead work of the latest and best pattern. There will be 90 miles of track operated.

Evansville & Princeton Traction Co.

The Evansville & Princeton Traction Co., of Princeton, Ind., has about completed its system and plans to open the road to the public November 1st. The line will draw from a territory having a population of 90,000 and will pass through the towns of King, Fort Branch, Haubstadt, St. James, Stacer, Ingle, Darmstadt and Laubscher. The power house is at Fort Branch and it is anticipated that the road will eventually be extended through Hazelton to Vincennes, which is 25 miles north of Princeton, the present length of the line being 28 miles.

The rails are 70-lb. T-rails, laid on heavy ties, and the line will be ballasted with broken stone. There are seven cars built by the St. Louis Car Co. at a cost of \$8,000. They are equipped with Westinghouse apparatus and will seat 68 passengers. The interior finish is mahogany, the seats are upholstered in rattan and the cars will be heated with hot water. They will be equipped with toilets and water coolers.

The officers of the company are: President, Joseph Heston, Princeton; vice-president, Jonah G. LaGrange, Fort Branch; secretary and general freight and passenger agent, E. J. Baldwin, Princeton; general manager, W. L. Sonntag, Evansville; treasurer, S. G. Heston, Princeton; superintendent, H. E. Burchfield, Fort Branch.

Electric Shocks Through Fire Stream Nozzles.

One of the objections to the erection of electric high-tension wires on poles in cities is the hindrance they offer to free access to a building by means of ladders and fire towers in case of fire. It is at times necessary to cut such wires to afford access to a burning building—a work which is not highly appreciated by the fire-fighters. Another danger to the firemen is that of electric shocks due to electric currents carried to the nozzle by the stream of water when it comes in contact with live wires. Such shocks have more than once been of sufficient strength to disable firemen for a time, but, so far as is known, no fatalities due to this cause have occurred. In order to ascertain to what extent firemen are subject to risk of life, if at all, when the stream of water thrown from the hose strikes against live wires, a series of experiments were recently undertaken in Germany. They were made with pressures of 6,000 volts alternating current, and 550 volts direct current. The stream of water was directed against a portion of the wires from which the insulation had been previously removed. With the 6,000 volts pressure it was found that the resistance of about one foot of ordinary hydrant water reduced the potential of the current to a point when it was not dangerous, but the effects were not pleasant. When the resistance of the water was lowered by the addition of a small percentage of soda, the minimum safe length of the stream was increased to about 40 in. With 550 volts direct current a dangerous voltage was not reached with pure hydrant water, but with the same percentage of soda in the water harmful potentials

were indicated by the voltmeters used in the tests when the stream of water was only 3 inches long. On the whole, the results of the experiments showed that the danger to firemen from the contact of water from the hose with live wires carrying high potentials is not ordinarily so great as has been generally supposed hitherto. This, however, is no reason for lessening the precautions looking to the safety and best interests of all concerned in this matter.—From Cassier's Magazine for October.

New Car for Boone, Ia.

The American Car Co., of St. Louis, recently built a handsome semi-convertible car of the Brill patented type, for the Boone Electric Co. for use on a line which connects a neighboring town. Though a small city, Boone is an important railroad point and the commercial center of a large district. It is situated in the center of the state and is about 40 miles north of Des Moines. Being the county seat, there is a considerable amount of travel from neighboring towns in connection with legal business. The railway company controls two popular amusement parks which largely increase the receipts during the summer.

As the loading and unloading is from one end only, the vestibules are furnished with but one door which is hinged to the vestibule post, and the door giving entrance from the platform to the car is



NEW CAR FOR BOONE, IA. AMERICAN CAR CO.

set at the side to accelerate movement in and out. The large windows of the vestibules are composed of single lights and the sashes are arranged to drop into pockets. The windows of the sides of the car have pockets in the side roofs which receive both upper and lower sash in the well-known Brill semi-convertible method. The seats are spring cane with reversible backs, 18 to the car, giving a seating capacity of 36. Although the width of the car is but 8 ft. 2 in., over the posts at the belt rail the seats are 36 in. long and the aisles 22½ in. wide. The absence of wall window pockets permits this ample interior width. In addition to the light appearance given to the car by the large windows, the wood work of light cherry in natural color and the birch ceilings make the interior very bright and attractive.

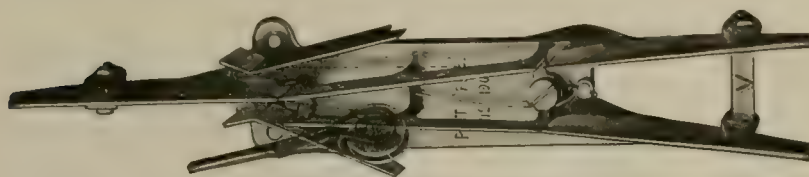
The length of the car over vestibules is 37 ft. 5 in. and over end panels, 28 ft. From end panels over crown pieces is 4 ft. 8½ in. The width over sills is 7 ft. 10½ in. and over posts at the belt rail 8 ft. 2 in. The corner posts are 3¾ in. thick, and the side posts 3¼ in., the sweep of posts being 1¾ in. The side sills are 4 x 7½ in. and are plated with ½ x 12 in. steel; end sills, 5¼ x 6¾ in. The floor is double, with one inch of mineral wool between to deaden sound. The clear width of the monitor deck is 4 ft. 6 in. From the rail to the top of the step is 16¾ in., from step to platform 14½ in. and from platform to car floor 8 in. These are the standard step heights of this type of car mounted on 33-in. wheels. Among other patented specialties of Brill make with which the cars are equipped, are angle-iron bumpers, sand boxes, alarm and conductors' gongs, folding gates and radial draw bars. The trucks are Brill No. 27-G, 4-ft. wheel base, and equipped with 35 h. p. motors. The approximate weight of the car and trucks without motors is 25,000 lb.

The Indiana Union Traction Co. has established parcel rooms for checking articles that belong to passengers at its various stations.

The Cornell Trolley Switch.

We present herewith a view of the Cornell trolley switch, which is manufactured by the Cornell Manufacturing Co., Syracuse. It is an exceedingly simple device, comprising two sections, and it is guaranteed to be effective. The top plate, or support, together with the stationary rails at the ends of the top plate and the flanges at the sides, are made in one piece. The stationary rails, which are 3-16 in. wide, are grooved to receive the trolley wire and are provided with ears to secure it in place. The main trolley wire is placed in the single stationary rail, passes across the top plate and out through one of the two stationary rails at the other end of the plate; the stub wire is run into the other stationary rail. The flanges at the sides of the plate have a depth of $1\frac{3}{8}$ in. to protect the switch from rain and sleet.

The movable switch section is composed of two short parallel



CORNELL TROLLEY SWITCH.

rails, or tongues, placed between the ends of the stationary rails, each tongue being fastened to the top plate at one end by a pivot bolt. The opposite ends of the tongues are attached to a small movable plate inserted in a mortise in the top plate, the function of the movable plate being to make it impossible for the switch tongues to drop down, at the same time acting as a guide. A bronze wire spring attached to the small movable plate at one end and to the top plate at the other serves to withdraw the switch tongues into normal position after the trolley wheel has passed through.

When the Cornell switch is in position on the trolley wires the right-hand rail of the movable section is in alignment with the single stationary rail, so that the trolley wheel going in one direction takes this right-hand rail upon entering the switch and passes through without disturbing the alignment. Going in the opposite direction, the trolley wheel enters on the stationary rail on the left side of the switch and comes into contact with the left flange of the top plate, which causes it to crowd the left-hand movable rail into alignment with the single stationary rail, at the same time forcing the right-hand tongue against the right flange of the top plate, giving the wheel an uninterrupted way to pass along and out onto the main line.

The claims that are made for the Cornell trolley switch include the following: That its use will keep the overhead work and trolley wheels in better order, thereby saving the cost of the switches in one year; that it is impossible for a trolley wheel to jump or leave the switch while passing through it; that, being made of the best metal, it is practically impossible for it to break or wear out; that it is the cheapest switch on the market and, once properly hung, it will keep in better condition than any other; that by its use three cars will do as much business as four will do otherwise, as a car can enter and leave a switch at unlimited speed; and that the trolley wire will last longer and give better service.

The company recently received a letter from Mr. W. B. Rockwell, general manager of the Syracuse, Lakeside & Baldwinsville Ry., in which he pronounces the Cornell switch the best overhead switch on the market, having given it a severe test on the company's high speed line, the cars making over 40 miles an hour.

Steam Turbines for Long Island R. R.

Westinghouse, Church, Kerr & Co. recently ordered three steam turbines of the Westinghouse Machine Co., to form the initial installation in the new Long Island power house of the Pennsylvania R. R., which will serve the tunnels for the Hudson and East Rivers, the new New York terminal at 32d St. and Seventh Ave., and that part of the Long Island R. R. system which is being converted to electricity. The turbines will have a capacity of approximately 7,400 electrical h. p. each and will drive 5,500-kw. three-phase a. c. generators operating in parallel. Their overload capacity will be

over 11,000 h. p. each. Each generator will be directly connected to the turbine shaft. Current will be delivered directly to the distribution system at 11,000 volts, no transformers being employed. The turbine equipment will operate under 200 lb. steam pressure, 28 in. vacuum and 175° F. superheat. Eleven Westinghouse turbines of practically the same size are now under construction for electric railway service in this country and abroad.

An Effective Trolley Catcher.

The accompanying illustrations show a new trolley catcher which has been perfected by Johnson & Morton, of Utica, N. Y., and which depends upon the simplest principles for its effective operation. The trolley cord is wound on the drum by means of a plain coiled spring 15 ft. long, which winds upon a shaft 1 in. in diameter, one end of which rests in a bearing, open at the top, at the back of the case. When the trolley leaves the wire the cord starts very suddenly to unwind and this action instantly lifts the drum from its bearing before the cord has been unwound more than a fraction of an inch. By this means a ratchet on the drumhead is brought into engagement with a stationary tooth attached to the case, which prevents the turning of the drum, with the result that the trolley pole is stopped in its upward course as suddenly as it started. In fact, the action is so rapid and positive that barely half an inch of cord is paid out before the catcher operates, thereby keeping the trolley pole well below the span wires.

This catcher will coil 15 ft. of $\frac{1}{4}$ -in. rope, which size is recommended, although $\frac{3}{8}$ -in. cord may be used. The heavier cord is not required, however, as the movement of the trolley pole between the time of leaving the wire and the instant of its arrest is so slight that there is no excessive strain upon the cord. A crank is attached to the shaft of the cord drum on the outside of the head of



PARTS OF JOHNSON & MORTON TROLLEY CATCHER.

the case by means of which the spring may be wound. The cord is attached to the drum by means of a chain with a hook in the end.

The interior parts of the catcher are accessible by removing the case-head, which is fastened by a latch joint and arranged to be taken off instantly, but so designed that it cannot become loosened by accident. The spring is held in a recess in the case-head and can be removed without tools when it is desired to inspect or replace it.

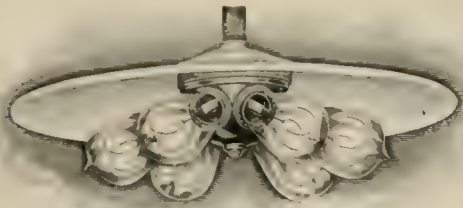
The base of the catcher is attached to the car by three bolts, and by the use of a bayonet lock the catcher can be removed by a half turn of the case but accidental loosening of the case is stated to be impossible. By this method it is possible to use only one catcher upon reversible cars, as a base can be fastened on each end and the catcher readily transferred when the trolley is reversed.

To insure durability the bearings in the case are made of chilled iron, as is the rack upon the cord drum. The drum shaft and spring shaft are of the best mild steel and easily renewed at trifling cost. The catch case is of hardened steel and the spring is made of finely tempered steel.

September 23d a trial trip was made from Ashtabula to Geneva, O., over the recently completed portion of the Cleveland, Painesville & Ashtabula Railway Co's. system. A large portion of the completed section has been leased, pending the completion of the entire system, to the Ashtabula Rapid Transit Co., and has been put into operation.

Wireless Electric Light Cluster.

The accompanying illustration shows one style of "Benjamin" wireless clusters made by the Benjamin Electric Manufacturing Co., 141 S. Clinton St., Chicago. These clusters consist of a porcelain insulating base, two one-piece contact plates attached thereto and a removable casing of brass or aluminum supported by porcelain rings or bushings of special design. In series clusters the contact plates are made in sections, each section except the two



"BENJAMIN" WIRELESS CLUSTER.

carrying the binding screws, serving two adjacent lamps, the inner and outer plates overlapping each other, thus connecting lamps in series without wiring.

Care has been taken in designing these clusters to have them conform to the requirements of the National Board of Fire Underwriters, with the result, it is stated, that many architects and engineers now specify them. By doing away with wires in the body of the cluster the cost of installation is considerably reduced, while the cluster is neat, strong and well insulated. These clusters are covered by numerous patents. The company also makes an all-weather socket which is considered just the thing for lighting around engines, boilers, machinery, etc.

The Benjamin Electric Manufacturing Co. numbers among its largest customers such electric roads as the Interborough Rapid Transit Co. and the Interurban Street Railway Co., of New York, the St. Louis Transit Co., and the Pacific Electric Railway Co.

Water Power Plant Near Sunbury, Pa.

A company with \$3,000,000 capital has been incorporated in New Jersey to build a water power electric plant just south of Sunbury, Pa., to furnish light, heat and power to the surrounding country. The plan is to dam the Susquehanna River at a point between the Philadelphia & Reading Ry. and the Northumberland bridges, where the river is a mile wide and about 20 ft. deep. The proposed plant will furnish electricity to the following companies: Lycoming Electric Co., Milton Electric Incandescent Co., Williamsport Passenger Railway Co., Vallamont Traction Co., East End Passenger Railway Co., South Side Passenger Railway Co., Montoursville Passenger Railway Co., Sunbury & Northumberland Electric Railway Co., Northumberland Electric Light, Heat & Power Co., Milton Electric Light, Heat & Power Co., Shamokin Electric Light, Heat & Power Co.,

Shamokin & Edgewood Electric Railway Co., Lewisburg & Northumberland Street Railway Co., Lewisburg Street Railway Co., Muncy & Watsonstown Street Railway Co. and the Muncy & Hughesville Street Railway Co. The last four companies are building their roads.

It is expected that by the time the plant is ready for operation all the trolley roads will be connected from Shamokin to Williamsport, and the Shamokin line will be connected with lines to Pottsville, Reading and Philadelphia, making a through line between Williamsport and Philadelphia. Prominent engineers have examined the

plan and have endorsed it as being feasible. The projectors include wealthy residents of Williamsport, Sunbury, Milton and Shamokin.

John A. Stewart Electric Co.

The John A. Stewart Electric Co. is the present name of the business established by Mr. John A. Stewart, who is one of the oldest and best-known men in the electrical trade, having been for many years with the Thomson-Houston Co., afterwards with the General Electric Co., and later with Rossiter, McGovern & Co. When Mr. Stewart established a business of his own its growth was far more rapid than he had expected. The company's warerooms and factories are at Ludlow, Ky., where excellent shipping facilities, both by rail and water, are available. The offices of the company are at 430 Sycamore St., Cincinnati.



JOHN A. STEWART.

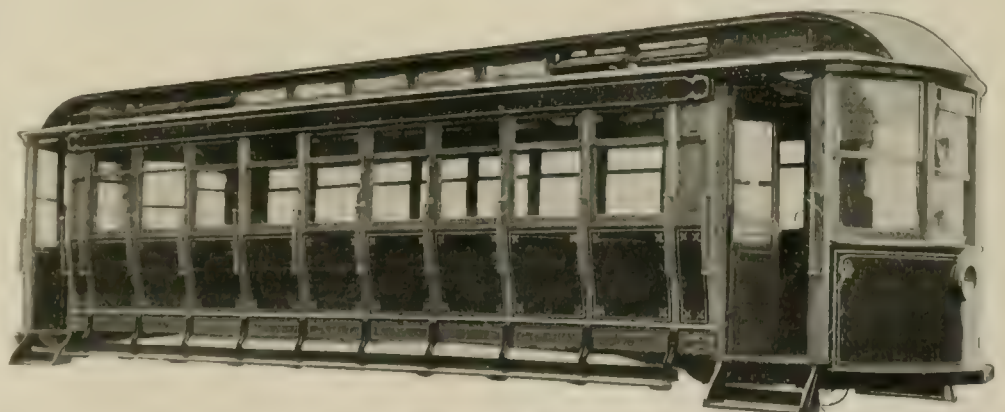
The company is prepared to purchase for cash electrical and steam apparatus and carries a large stock on hand for sale on the same terms, and also makes a specialty of commutator building and electrical repairs.

The John A. Stewart Electric Co. should not be confused with the Stewart Electric Co., also of Cincinnati, which is an entirely different concern.

The Kimble Convertible Car.

The accompanying illustration shows one view of a new convertible car which is manufactured by the A. Kimble Car & Truck Co., of Zanesville, O., and which possesses the merit of appearing as a perfect open car when open, as well as a completely closed car when closed. Its transformation is brought about by means of removable parts, which are so arranged as to make it exceedingly easy to effect the change. The car has practically a steel frame. A steel plate is set into the top of the posts at each side, the plate extending the full length of the car. The posts are of full size and are bolted through the sills to make the car perfectly rigid. Trust bars run on the top of the sills and are attached to the outer ends of the vestibule sills. The trucks are arranged to permit the car to hang low, the bottom step being 19 in. and the top step 17 in. The wheels are 33 in.

There is no difficulty in taking out or putting in panels or sash.

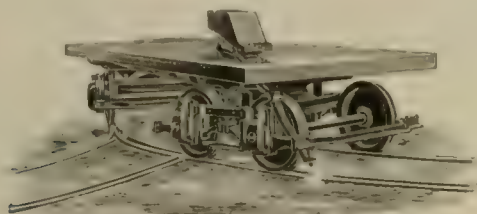


KIMBLE CONVERTIBLE CAR.

The running board turns up and lifts out, and the running board brackets, as well as the handles, can be taken off very readily. As an open car, a seat is put in each vestibule and the short seats inside the car at the ends are extended. The curtains are so arranged that they extend to the floor for an open car and to the window sills for a closed car. This car can be changed from a winter to a summer car by two men in two hours. There is a case 3½ ft. x 3½ ft. x 8 ft. to hold the panels, sash, doors and upholstery, as well as the seats and seat backs. This case is mounted on wheels to make it convenient to handle.

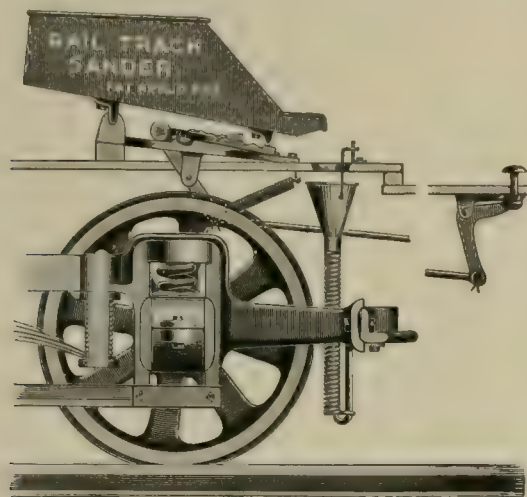
A New Track Sander.

The Positive Railway Sander Co., of Lancaster, Pa., has placed on the market a track sander for which is claimed a number of improved features. The two chief claims for the device are that it is



"POSITIVE" TRACK SANDER.

not affected by the weather, inasmuch as it will handle wet sand as well as dry, and it will positively sand any curve. The box does not operate with a valve, so there is little danger of the sand clogging. The sand drops on to an inclined plane and is fed through a



DETAILS OF SANDER.

flexible nozzle directly on to the rail and immediately in front of the forward pair of wheels.

The company will be glad to send further particulars on application.

Advertising Literature.

THE SPRAGUE ELECTRIC CO., New York, has issued Bulletin No. 411, 2d edition, on "Iron-Armored Conduit Junction Boxes, Fittings, Tools, etc."

THE CROCKER-WHEELER CO., Ampere, N. J., publishes in a 28-page pamphlet, $3\frac{1}{2} \times 6$ in., an alphabetical list of the Chicago users of Crocker-Wheeler motors.

THE NERNST LAMP CO., Pittsburg, has issued special publication N-7,000, 24 pages, 6×9 in., treating of the Nernst lamp and containing, among others, half-tone interior views of the Frick Building, Pittsburg, which is lighted by these lamps.

THE NEWTON MACHINE TOOL WORKS, INC., of Philadelphia, has issued Catalog No. 36, 236 pages, 6×9 in., treating of electric-driven tools which it manufactures for army, navy, railway and general machine shop use. The catalog is illustrated and carefully indexed.

THE BALDWIN LOCOMOTIVE WORKS recently issued Catalog No. 44, "Record of Recent Construction." It contains 32 pages, 6×9 in., describing and illustrating a variety of locomotives of different gauges and for different kinds of service representing current requirements.

THE PITTSBURGH BLUE PRINT CO., of Pittsburg, has just issued a new catalog, 6×9 in., 28 pages, describing and illustrating

the different types of the cylindrical electric blue printing machine which it manufactures. The catalog also contains a partial list of users and many testimonials.

A. C. WOODWORTH, general manager of the Consolidated Car Fender Co., 39 Cortlandt St., New York, is distributing a natty pocket memorandum pad with Russia Leather back and a receptacle for slips it is desired to retain. Callers at the company's exhibit at the Saratoga convention were presented similar pads and found them very useful.

THE OHIO BRASS CO., of Mansfield, O., has issued an 8-page booklet, 4×9 in., entitled "About Track-Cleaning Devices," the object being to call attention to the advisability of placing orders for these devices as early in the season as possible. The Monarch track cleaner, track brooms, brush holders and snow sweeper rattan are among the devices treated of.

THE LINK BELT ENGINEERING CO. has issued a 28-page pamphlet, 6×9 in., illustrated, treating of "Shallow Trough Belt Conveyors" and "Coal and Coke Crushers." The half-tone views are especially good and show some important installations by this company, among the more recent being those for the South Jersey Gas, Electric & Traction Co.'s coke oven plant at Camden, N. J.

THE H. W. JOHNS-MANVILLE CO., 100 William St., New York, has issued a folder containing two pictures showing "Uncle Sam" before and after the recent investigation of roofing for use on the army buildings in the Philippines, which investigation resulted in giving the H. W. Johns-Manville Co. two orders for its asbestos "army brand" roofing, one order being for 11,120 rolls and the other for 2,900 rolls.

JAMES BONAR & CO., INC., of Pittsburg, has taken over the business heretofore known as James Bonar & Co., and has issued a new catalog treating of the Pittsburgh feed water heaters (open and closed types), Bonar gage cocks, Bonar steam traps, Bonar improved oil filters and Bonar oil filters, classes A and B. The catalog contains 48 pages, 6×9 in., illustrated, with a partial list of users, which comprises nearly 500 names.

THE R. WOODMAN MANUFACTURING & SUPPLY CO., 63 Oliver St., Boston, has issued a new illustrated catalog, 7×10 in., 46 pages, treating of the principal supplies it manufactures and handles for use in railway offices and stations, including ticket punches, dating stamps, perforating and numbering machines, badges, checks, buttons, key tags, sealing presses, speed indicators, etc. Also a circular treating of the "hand tally register," or automatic counter.

THE GENERAL ELECTRIC CO. has published two pamphlets (591,869, Nos. 1 and 2) relative to the case of the General Electric Co. v. Wagner Electric Co., et al., in which suit was brought to prevent infringement of an air-cooled electric transformer (Moody Patent 591,869), the first pamphlet containing the opinion of Judge Wheeler, filed in the United States Circuit Court, Southern District of New York, and the second containing the decree of the court ordering a permanent injunction in regard to five of the seven claims specified.

THE JOSEPH DIXON CRUCIBLE CO., of Jersey City, presents an entertaining symposium in Graphite for October, made up of likenesses of a number of the company's salesmen, each likeness being accompanied by a character sketch furnished, it is stated, by a New York phrenologist, to whom the original photographs were sent to be "read." It is announced that inadvertently photographs of Joseph Dixon, the founder of the company, and several officers and superintendents were mixed in with the other photographs and "readings" were also furnished for these. The result is as interesting as it must be gratifying to all concerned.

THE AUSTIN MANUFACTURING CO., of Chicago, recently issued a very handsome catalog treating mainly of Austin gyratory crushers and incidentally of elevators, screens, hoists, cars, wagons and other equipment pertaining to rock crushing plants. The new catalog contains 116 pages, $7\frac{1}{2} \times 10\frac{1}{2}$ in., 32 pages being inserts containing strong testimonial letters. There are a great many half-tone illustrations showing plants that have been installed by this company in all parts of the country and Canada; also views of the company's works at Harvey, Ill., and details of its apparatus. The reading matter embodies considerable valuable information.

THE BULLOCK ELECTRIC MANUFACTURING CO., of Cincinnati, issues a very handsome monthly calendar suitable for office or parlor desk. It is a card, $3\frac{1}{2} \times 6$ in., one side of which contains the calendar surmounted by the photograph, in colors, of

one of the scientific world's celebrities, calendar and picture being set in ornate designs involving a wealth of colors harmoniously assembled. On the reverse side is printed a sketch of the career of the subject, that for October being Sir George Biddell Airy, K. C. B., the great English astronomer, who died in 1902, and who organized systems of record filing and reduction of data which pervade all scientific and engineering work of today.

THE PERKINS ELECTRIC SWITCH MANUFACTURING CO., of Bridgeport, Conn., recently issued a new catalog (August, 1903) of electrical supplies. It contains 102 pages, 3 1/4 x 6 1/2 in., with rounded corners; the cover is dark green buckram. The front cover design shows a nickel-plated flush plate with two rotary flush switches; the back cover design is a "Perkins" key socket with shade holder rigidly attached to the shell, this being a new product shown for the first time in this catalog. The catalog contains about 1,200 articles, each having an individual catalog number and telegraph code word. The numerous illustrations are half-tones. Inquiries for the catalog may be sent to any electrical supply house in the country; they are not distributed direct to the consumer.

THE KENNICOTT WATER SOFTENER CO., of Chicago, has issued through its railroad department an exceptionally attractive catalog, 64 pages, 9 x 12 in., treating of "soft water and how to obtain it for railroads and industrial purposes." The Kennicott system of softening water is concisely and interestingly described and illustrated; what it is designed to do and has done is shown, and its especial adaptability to railroad uses is pointed out, as well as its economy of operation. The catalog is printed on tinted paper, the type is large and clear and the illustrations numerous. There are about 30 photographic views of installations for leading railroads that call for special mention, the reproductions being of unusual merit.

A DIAGRAM OF JOHNSON'S FORMULÆ FOR STEEL-CONCRETE BEAMS, together with a reprint of tests of the union between concrete and steel, made at the Massachusetts Institute of Technology, have been issued in folder form by the St. Louis Expanded Metal Fireproofing Co., Century Building, St. Louis, general agents for Johnson's corrugated steel bars for steel-concrete construction, for which T. L. Condon, M. Am. Soc. C. E., 1750 Monadnock Block, Chicago, is agent for Michigan, Indiana, Illinois and Wisconsin. The formulæ from which the diagram was obtained were derived by A. L. Johnson, M. Am. Soc. C. E., the company's engineer, and are given in the company's book, "Steel-Concrete Construction," which will be mailed free upon request.

THE GENERAL ELECTRIC CO. has issued the following publications: Bulletin No. 4334 (supersedes No. 4300), "Direct Driven Continuous Current Generators for Lighting and Power." Bulletin No. 4335 (supersedes No. 4155), "Engine-Driven Revolving Field Alternators." Bulletin No. 4336 (supersedes No. 4271), "Isolated Plant Switchboards, Continuous Current Two-Wire Type." Bulletin No. 4337, "Blower Sets for Air Blast Transformers." Bulletin No. 4338, "Power Factor Indicator for Balanced Systems." Pamphlet, "Core Type Transformers," reprint from a technical journal with additional illustrations. Supply Catalog No. 7583 (supersedes No. 7552), "Parts of U. S. Trolleys." Flyer No. 2114, "Diffusion of Light by Concentric Diffusers." Flyer No. 2116, "Meter Jewels." Flyer No. 2117 (supersedes No. 2056), "Combined Switch and Enclosed Fuse Cut-out for Car Lighting." Errata, Supply Catalog No. 7582: Page 24, bottom of page, Cat. No. 51632, should be changed to read 16325.

THE WESTINGHOUSE ELECTRIC & MANUFACTURING CO. has published two pamphlets (A. C. Motors-A, Nos. 5 and 6) relative to a contempt motion entered in the suit of the Westinghouse Electric & Manufacturing Co. v. Bullock Electric Manufacturing Co., brought to enjoin infringement of the Tesla polyphase system (Patents Nos. 381,968-382,279-382,280), and for an accounting. Pamphlet No. 5 contains Judge Thompson's opinion, filed in the United States Circuit Court, Southern District of Ohio, and Pamphlet No. 6 contains the order of the court finding the defendant guilty of contempt and ordering a fine of \$500. The company has also issued a pamphlet (A. C. Motors-C, No. 5) relative to the final hearing in the suit of the Westinghouse Electric & Manufacturing Co. v. H. C. Roberts and Sangamo Electric Co., brought to enjoin infringement of the Tesla polyphase motor (Patents Nos. 511,559 and 511,560), the pamphlet containing the opinion of Judge Archibald, filed in the United States Circuit Court, Eastern District of Pennsylvania and ordering a decree in favor of the complainant.

Creaghead Flexible Brackets

ARE STANDARD

CREAGHEAD ENGINEERING CO.

ENGINEERS
and MANUFACTURERS

OVERHEAD LINE MATERIAL.

For Single
and Double
Wire.



No. 402.
Type C.

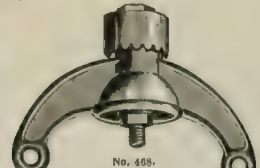
West End Cap
and Cone and
Solid Types of
Insulators.



Trolley Splices,
Strain Ears, Feeder
Ears, etc.



No. 472.



Ears for Round Figure S,
and Groove Forms of
Trolley Wire



No. 200.

Solid Type
Insulators.



No. 448.

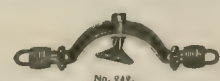


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Type D. For Single
and Double Wire.



No. 208.



No. 248.



No. 458.

Complete Equipment for
Overhead Construction.

THE CREAGHEAD ENGINEERING CO.

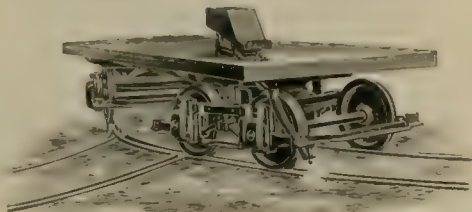
ENGINEERS AND
MANUFACTURERS

WRITE FOR
CATALOGUE

CINCINNATI,
OHIO.

This Is It

Look at it carefully



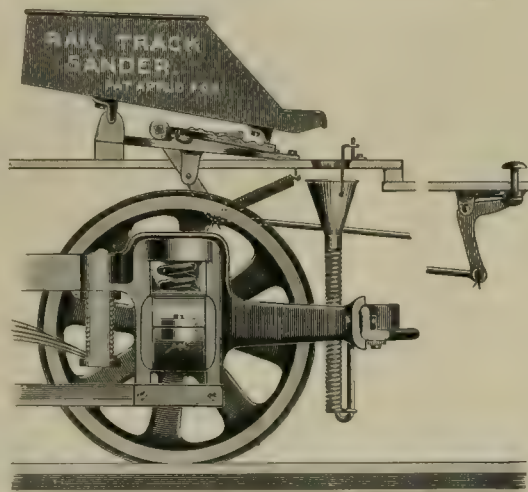
Beats Them All

The only Sander that is not affected by the weather. Will throw sand out wet or dry. (No valve to clog.) Will positively sand any curve. See it!

Guaranteed to work. Send for one to try.

References by those who are using them.

Prices quoted on application.



THE

Positive Railway Sander Co.

LANCASTER, PA., U. S. A.

Eastern Sales Agent,
H. F. SANVILLE

710 and 711 Girard Trust Bldg.,
Philadelphia, Pa.

26 Cortlandt Street,
New York

THE BORDEN & SELLECK CO.'S. catalog No. 5, which treats of the Harrison conveyor, and elevating and conveying machinery of every description, is a very useful as well as comprehensive compilation of 134 pages, 6 x 8 1/4 in. It is profusely illustrated, many of the views showing large plants in which this company's machinery has been installed. A few of these plants are those of E. L. Hedstrom & Co., Delaware, Lackawanna & Western Railroad Co., James S. Kirk & Co., Chicago Public Library, West Chicago Street Railroad Co., Mutual Fuel Gas Co., Armour & Co., Siegel, Cooper & Co., all located at Chicago, and the Toronto Street Railway Co., and the Armour Packing Co., of Kansas City. The company also equipped the Toledo Traction Co. and the Chicago City Railway Co.'s. plants. The Borden & Selleck Co., whose main office is at 48-50 Lake St., Chicago, is not only manufacturer of and dealer in modern conveying machinery, but is also contractor and designer of complete plants and docks for the storage and handling of coal.

Trade Notes.

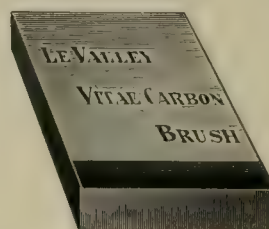
THE TRANSIT FINANCE CO., of Philadelphia, announces the removal of its office to the Land Title Building, corner of Broad and Chestnut Sts.

THE CHASE-SHAWMUT CO. announces the removal, October 20th, of its office and factory to Newburyport, Mass., where it has greatly increased facilities.

THE LORAIN CAR CO. has been organized with a capital of \$200,000 to establish a car building plant at Lorain, O., for the manufacture of electric cars.

THE BROWN CORLISS ENGINE CO., of Corliss, Wis., reports the receipt of an order from the Lorain Steel Co. for one 30 and 60 x 60-in. cross compound corliss engine.

THE STANDARD UNDERGROUND CABLE CO. announces the removal of its San Francisco office, October 1st, from the Mills Building to more commodious quarters in the Crossley Building, at Mission and New Montgomery Sts.



Will Carry 100 Per Cent More Load than any other Carbon BRUSH.

The only brush perfectly and permanently Self-Lubricating—Non-Sparking--Non-Cutting—Noiseless.

All others so-called are poor imitations. Commutators are not worn down by Le Valley Brushes and last indefinitely. Le Valley Brushes last from 4 to 10 times longer than any others. All sizes on hand for prompt shipment.

LE VALLEY VITÆ CARBON BRUSH CO.

Offices and Storerooms: 119-125 E. 42d St., N. Y.

Telephone 5215-38th St.

Cable Address: "Vitæbrush-New York."

**FROM ST. MICHAEL
TO MANILA,
11,974 MILES.**

And the Stars and Stripes affording protection to American Commerce all the way.

See the new "Round the World" folder of the New York Central Lines, just out.

A copy will be sent free, post-paid, on receipt of three cents in stamps, by George H. Daniels, General Passenger Agent, Grand Central Station, New York.

STREET RAILWAY REVIEW

Vol. XIII

NOVEMBER 20, 1903

No. 11

The Interurban Railway & Terminal Co.

Owning and Operating the Interurban Terminal, the Rapid Railway, the Suburban Traction and the Cincinnati & Eastern Electric Ry.

The Interurban Railway & Terminal Co., of Cincinnati, Ohio, was incorporated under the laws of that state Nov. 1, 1902, by the consolidation of the Interurban Terminal Co., the Rapid Railway Co., the Suburban Traction Co. and the Cincinnati & Eastern Electric Railway Co. This consolidation comprised 86.4 miles of main line track, and 22 miles of city track on which the company has a 44-year contract for the operation of its cars, making a total of 108.4 miles of track owned and under contract by this company.

Terminal station and this line operates over the line of the Cincinnati Traction Co. to the city limits; thence over its own double track line through the new water works to California and Coney Island; thence over its single track line to Sweet Wine, Eight Mile, Nine Mile, New Palestine, Blairsville to New Richmond, with a connecting branch extending from Coney Island to Mt. Washington, on the Suburban division.

A 5 ft. 2½-in. gage is used throughout this system, which is



VIEW ALONG THE LINE SHOWING CENTER POLE CONSTRUCTION

Divisions.

The Rapid Railway division commences at the Interurban Terminal station in Cincinnati and extends over the tracks of the Cincinnati Traction Co. to Norwood, a distance of 5 miles; thence by its own double track through Pleasant Ridge, Kennedy, Silverton, Deer Park; thence by single track with turnouts to Ross-moyne, Terra Alta, Blue Ash, Hazelwood, Brecon, Miltomson, Mason, Kings Mills, South Lebanon and Lebanon.

The Suburban Traction division commences at the Interurban Terminal station in Cincinnati and extends over the double-track East End line of the Cincinnati Traction Co. to the city limits; thence over its own tracks to Mt. Washington, Cedar Point, Fruit Hill, Forestville, Cherry Grove, Tobasco, Withamsville, Amelia, Hamlet, Mt. Holly, Bantam and Bethel.

The Cincinnati & Eastern Division begins at the Interurban

the same gage as that of the tracks of the Cincinnati Traction Co., over which these cars operate inside the city, and all passengers, freight and express matter is delivered into the heart of Cincinnati without change of cars.

The Interurban Terminal Station

It was early apparent that to successfully handle the interurban passenger and freight business in Cincinnati it would be necessary to establish an Interurban Terminal station in the central part of the city. A site on Sycamore St. between 4th and 5th Sts. was selected and a lot 60 x 236 ft. purchased, on which was erected a 6-story building, 60 x 160 ft. This building is of heavy warehouse construction; built of steel and specially selected brick, with Bedford stone front, and presents a very handsome appearance. This building was described and illustrated in the "Review" for February, 1903.

The lower floor of this building is divided as follows:

The general waiting room, which is 30 x 64 ft., finished with tiled floor, marble wainscoting, and equipped with ticket offices, news stands, telephone and telegraph offices, check rooms, etc.



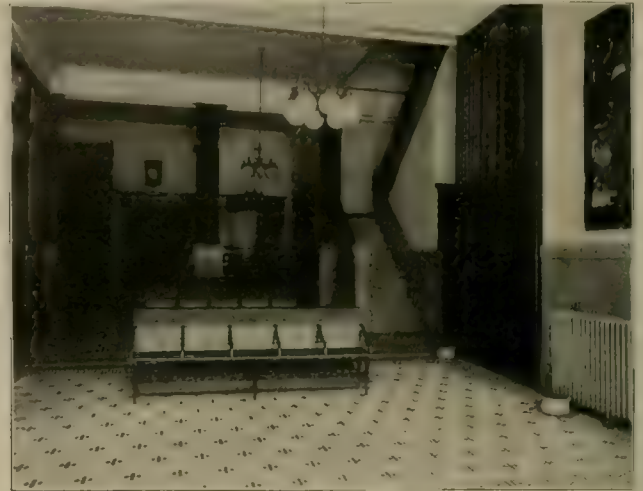
INTERURBAN RAILWAY & TERMINAL SYSTEM.

The ladies' waiting room, which is 20 x 24 ft., finished with marble wainscoting, tiled floor, toilet rooms, etc.

In the rear of the waiting rooms is the general express receiving

A space 202 x 30 ft. is utilized for storage tracks, for the loading and unloading of both freight and passengers. This space is covered with an asphalt floor, and is connected in the rear with an alley, which makes very convenient and economical the handling of all kinds of freight and express matter.

The upper floors of the building are devoted to the general offices, express and freight storage rooms.



VIEW IN GENERAL WAITING ROOM.

The building is complete in every detail, having its own electric light and steam heating plants, passenger and freight elevators, etc. It is located within one block of Government Square, the heart of Cincinnati, and convenient to all the leading business houses, local street car lines, etc., and is from seven to twenty blocks nearer the central part of the city than any of the steam railroad passenger stations.



EXTERIOR OF POWER STATION NO. 1, CONEY ISLAND.

rooms, 32 x 26 ft., adjoining which is a freight room, 40 x 40 ft. The express room is connected with the upper floors by a large electric elevator.

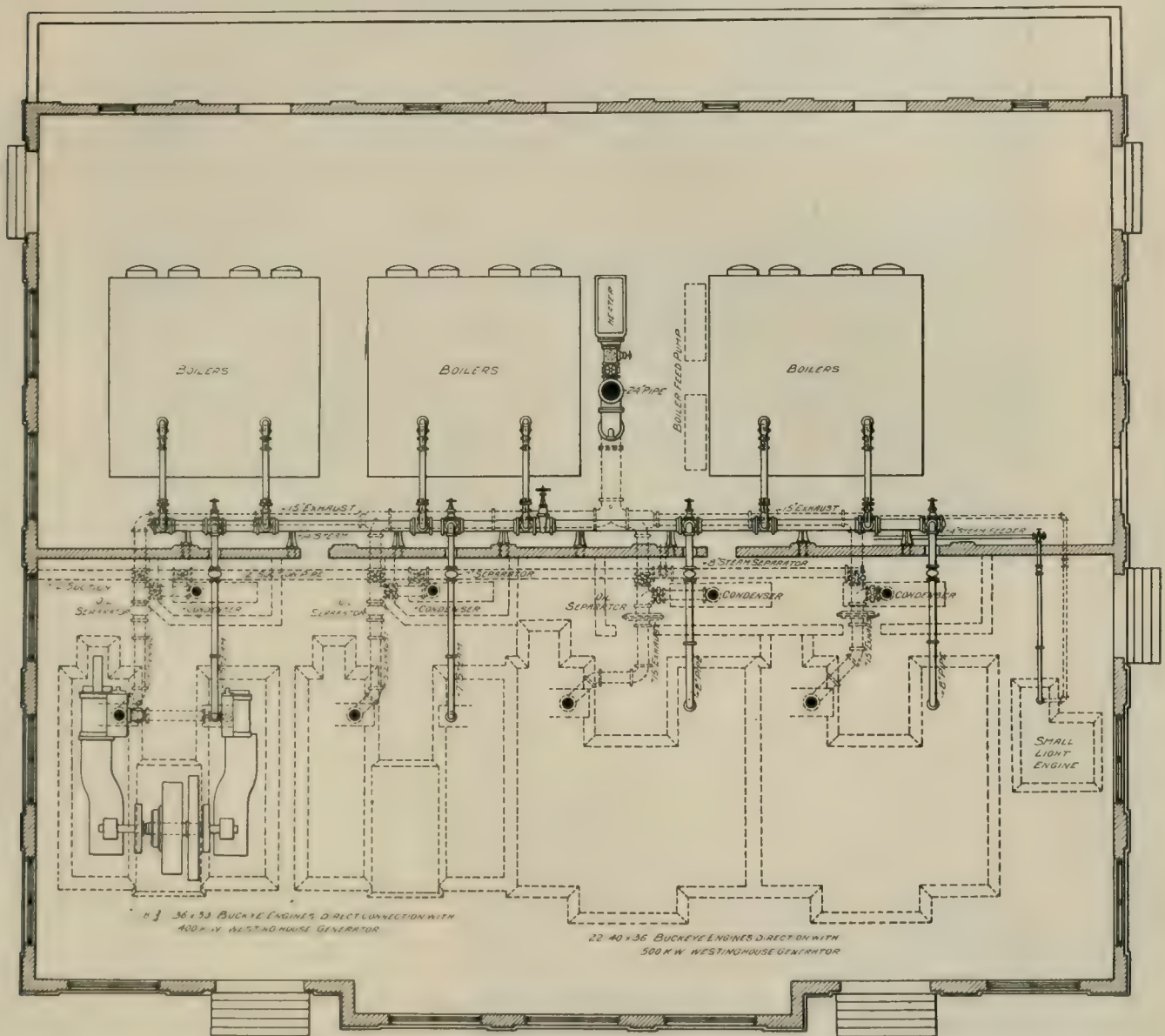
Cincinnati & Eastern Division.

After leaving the city limits this line passes through the New water works property of the city of Cincinnati now being con-

structed, and around which when completed will be one of the finest parks in America. Adjoining the water works property is the town of California, east of which is Coney Island, one of the largest and best equipped pleasure resorts in the West. From this point east, the road traverses a thickly populated district, and follows closely the line of the Ohio River, making one of the most picturesque trolley rides in this part of the country. After leaving Coney Island, the road passes through a number of towns and terminates at New Richmond.

New Richmond, the largest town in Clermont County, is a live

river and the city, it is an ideal residence district. At Cedar Point, adjoining Mt. Washington, are located several institutions, the largest of which is St. Gregory's Catholic Seminary, which is directly upon the line of this road. Fruit Hill and Forestville are suburban towns, surrounded by a very rich district with a large tributary population, and Cherry Grove, Tobasco and Withamsville are centers of trade for the market garden district. Amelia is a town about two miles long built up on each side of the Ohio Pike, with fine country homes, and during the summer months the town is crowded with summer boarders. From Amelia the line traverses



PLAN OF MAIN AND EXHAUST PIPING, POWER STATION NO. 1.

manufacturing town and has on account of the convenient lumber supply large lumber mills, sash and door factories, planing mills, deck factory, church and school furniture factory, besides woolen mills, knitting mills, etc. The town has its own water works, electric light plant, city buildings, etc.

This entire territory has no steam railroad connections, thus insuring a large passenger and freight business, besides which the road draws from several thousand population on the Kentucky side of the river, connections with which are made by ferries.

Suburban Traction Division.

This road operates along the Ohio Turnpike, the principal street of Mt. Washington, which is probably the most picturesque suburb of Cincinnati. Situated on a high plateau overlooking the Ohio

Mt. Holly, a central distributing point for a large and thickly settled territory, the Bantam fair grounds, Bantam and Bethel, the present terminus, a beautiful town with its broad, well kept streets lined with rows of massive old trees, its business district of modern stores and factories.

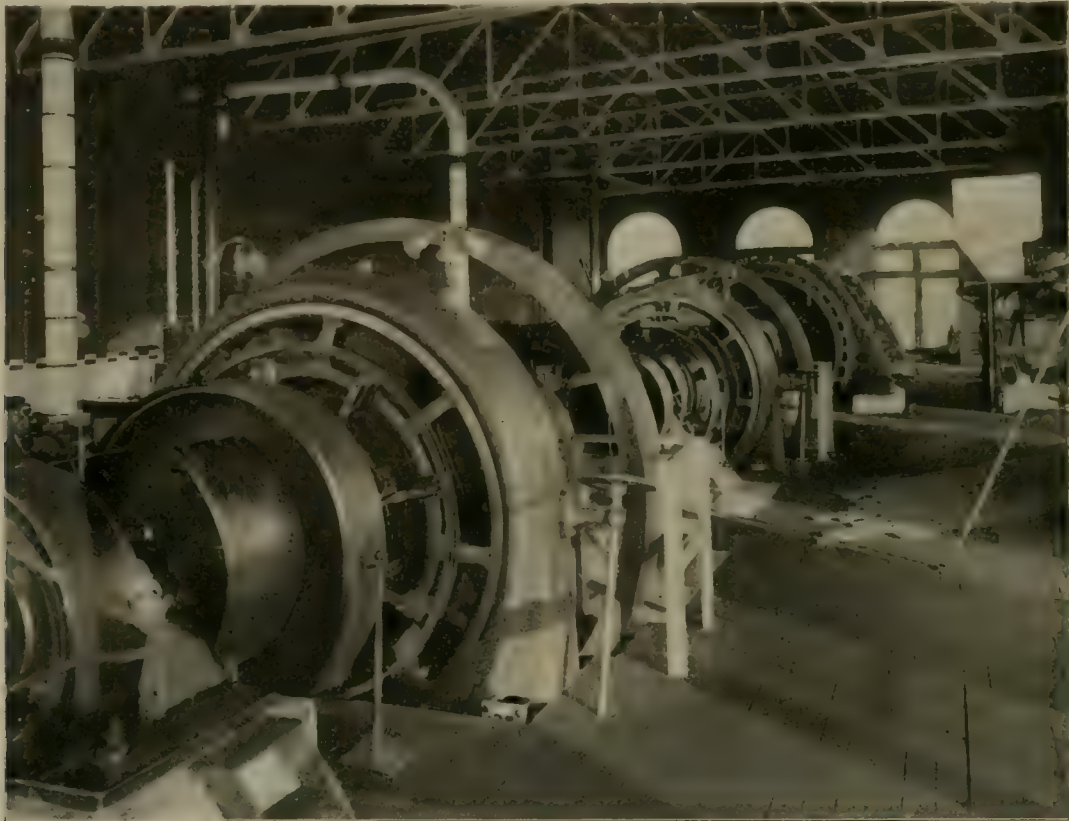
The entire line passes directly through the largest market garden district of Cincinnati, the territory between the numerous towns being cut up into small farms from which is received a large amount of light freight and express matter.

Rapid Railway Division.

This line operates through the town of Norwood, the new factory district of Cincinnati, and at which place is located such well-known manufacturing plants as the Globe-Werneck Co., the Bullock

Electric & Manufacturing Co., the United States Playing Card Co., the United States Lithographing Co., etc., at which plants are employed thousands of people. Leaving Norwood, the line passes

in southern Ohio. Leaving Mason, the road operates to Kings Mills, where the Kings Powder Co. and the large works of the Peter's Cartridge Co. are located. These companies have from 1,200



INTERIOR OF POWER STATION NO. 1.

through several towns to Brecon, all suburbs of Cincinnati whose residents are employed in the city, which makes a very heavy com-

to 1,500 employees, and it is their policy to have their employees live at points away from the works, and a large number of them are residents of Miltnomson, Mason, South Lebanon, Morrow and Lebanon, making an exceptionally good riding population for the road at these points. From Kings Mills the road operates to South Lebanon (with a branch to Morrow to be constructed this year) and on to Lebanon, the county seat of Warren County, probably the richest town of its size in the state. This entire road is practically located through a continuous row of towns, and one is never out of sight of one of them while on the cars. The territory through which this line passes is one of the richest and most thickly settled districts of southern Ohio.

Power Station No. 1.

This station is located at Coney Island at the junction of the Cincinnati & Eastern, and the connecting track of the Suburban division, and supplies power for both divisions.

The building is of an attractive design, constructed of buff colored pressed brick, and Bedford stone trimmings with engine room 59 x 125 ft. and boiler room 60 x 125 ft., separated from the engine room by a fire-proof dividing wall. Heavy steel roof trusses support the roof, and the entire structure is made as near fire proof as possible. The entire building was erected on concrete foundations.

The site selected for this building, was near the center of distribution of the power it was to supply. The grounds cover about five acres and are well situated, and near the lake from which the water supply is taken. The grounds are well graded, and the approaches to the building are terraced and sodded, and surrounded by a rustic wall. Gravel driveways are on each side and concrete walks with wide concrete steps lead from the roadway to the building.

The generating equipment of the engine room consists of two heavy duty condensing cross compound engines, 18¾ and 36 in. by 33 in. stroke; these engines have a rated capacity of 600 h. p. each with an economical range of from 450 to 850 h. p., and are direct connected to two 400-kw. Westinghouse direct current generators.



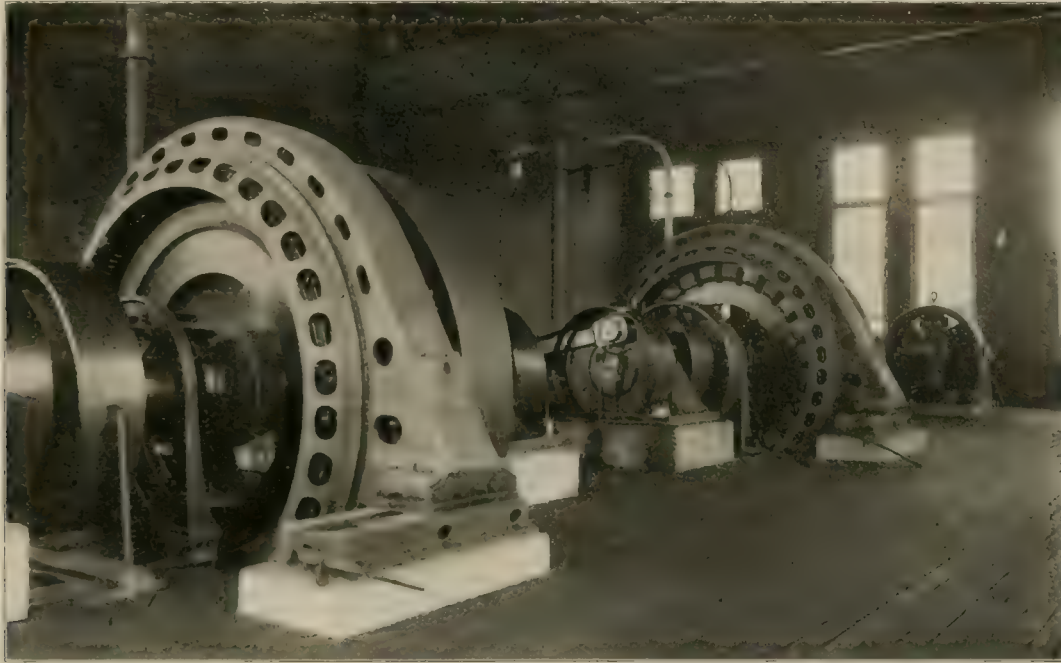
EXTERIOR OF POWER STATION NO. 2. SOUTH LEBANON.

muter business for the road. Passing Brecon, at the new High Point subdivision, the road enters Warren County, and passes through Miltnomson and Mason, one of the most beautiful residence towns

The above units supply power for the Cincinnati & Eastern division. The Suburban division is supplied with power by two heavy duty direct connected condensing cross compound Buckeye engines, 22 and 40 in. by 36 in. stroke. These engines have a rated capacity of 800 h. p. with an economical range of from 600 to 1,080 h. p. These engines are direct connected to two 500-kw. Westinghouse 10,000-volt alternating current generators of the revolving field type

The piping of this plant is practically in duplicate and any unit or section can be easily closed for repairs without interfering with the operation of any other part of the plant. Cochrane oil separators are installed in the main exhaust line between engines and condensers.

The design throughout represents the best engineering practice,



INTERIOR OF POWER STATION NO. 2

The exciting sets are one direct connected motor-generator exciter of 37½-kw. capacity, and one high speed direct connected Buckeye engine 7¼ by 12 in. stroke, direct connected to one 37½-kw., 125-volt Westinghouse generator.

The direct current switchboard is of blue Vermont marble, and consists of one main panel, two machine panels, and two feeder panels with the necessary instruments, circuit breakers, etc. The alternating current high tension switchboard is of blue Vermont marble, and consists of two generator panels, two high tension feeder panels, and one double-exciter panel, with the necessary instruments, circuit breakers, etc. These boards were furnished by the Westinghouse company.

The boiler room contains six horizontal sectional water tube boilers, each with 3,209 sq. ft. of heating surface, made by the Aultman & Taylor Machinery Co., one Cochrane 2,000 h. p. heater and purifier, two McGowan boiler feeder pumps, each with a capacity sufficient to operate the plant.

Wheeler "Admiralty" type surface condensers mounted above combination air and circulating pumps, are used. On the engines used for driving the direct current generators, these condensers are 12 x 14 x 14 x 12, capable of condensing 12,000 lb. of steam per hour, and having 1,230 sq. ft. of cooling surface. The condensers used on the two large engines are 12 x 16 x 16 x 16, each capable of condensing 16,000 lb. of steam per hour and containing 1,410 sq. ft. of cooling surface.

Great care was exercised with the piping of this plant, it being designed for high pressure work throughout, extra heavy pipe with long fire bends and extra heavy fittings being used. On all the main and exhaust steam lines the Fairbanks company's extra heavy high pressure valves with bronze removable seats and rings and bronze stems are used.

On the exhaust and water lines Fairbanks standard valves are used.

and the piping was installed by the John H. McGowan Co., of Cincinnati.

The coal supply is taken from the barges in the Ohio river, near which this station is located, and the water for the boilers and condensers is supplied from a large lake adjoining the power station. The foundations of the building and all the machinery are made of concrete, and vary in depth from 14 to 20 ft. The boilers are con-



SUBSTATION NO. 1, FORESTVILLE, O.

ected to a self-upsetting coal stack, 10 ft. in diameter and 150 ft. high. This is erected on concrete foundations 20 x 20 ft. and 28 ft. in depth. The entire construction and equipment of this plant is of the most substantial type.

division, and is equipped with two 300-kw. rotaries, and six 125-kw. transformers with necessary switchboard, etc.

Sub-station No. 4 is equipped with one 400-kw. rotary, with three 150-kw. transformers, switchboard, etc. This sub-station is located at power station No. 2, South Lebanon.

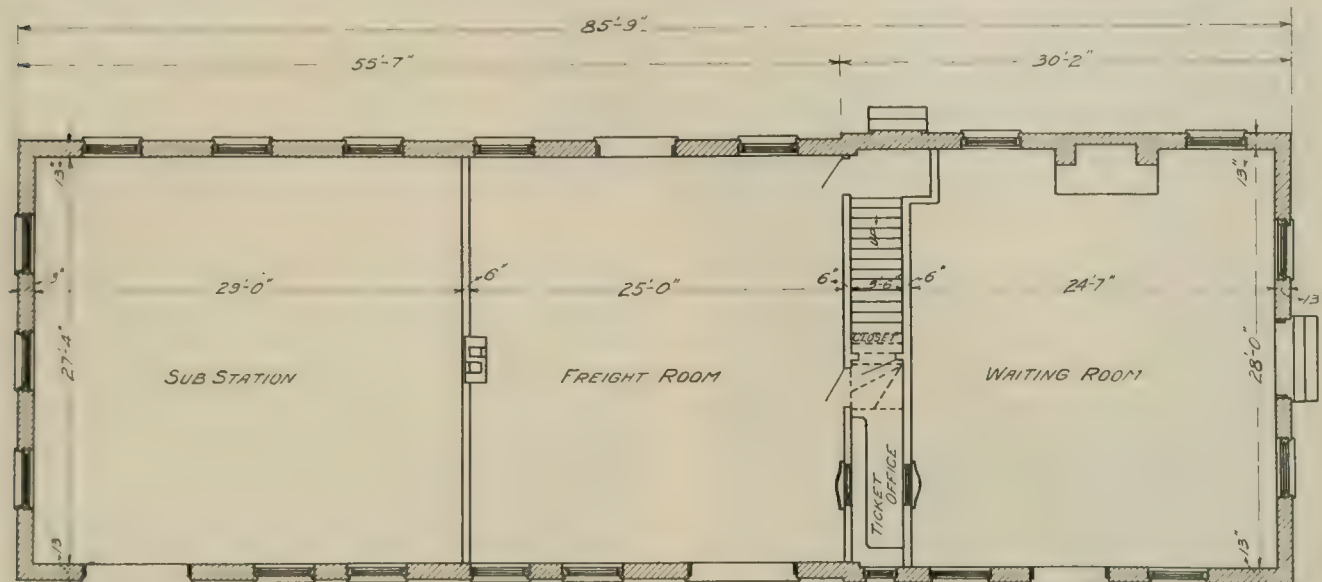
Car Barns.

Car barn No. 1 is located at Coney Island on the Cincinnati & Eastern division, and is a substantial brick building 100 x 275 ft.

strain incident to this class of work. They are equipped with Westinghouse air brakes, arc and incandescent headlights, fare registers, etc., and are mounted on St. Louis Car Co's. all steel trucks.

The open cars are of the 14-bench type, and have a seating capacity for 70 people. They are equipped with four Westinghouse motors, air brakes, arc and incandescent headlights, double controllers, etc.

The terminal station, depots and the country through which the



PLAN OF AMELIA SUB-STATION.

with three-story pressed brick office building, in which is located on the ground floor the superintendent's and cashier's office. On the second floor are located the motormen's and conductors' rooms, and on the third floor, the dispatcher's office. In the rear is located the store rooms, machine shops, etc. This car barn has a storage capacity for 36 interurban cars.

Car barn No. 2 is located at Deer Park on the Rapid Railway division and is an exact duplicate of the barn at Coney Island, except with some slight changes in the architectural design of the trimmings of the office building.

Rolling Stock.

The present equipment of the road consists of six 14-bench open motor cars, equipped with four Westinghouse No. 49 motors; 26 passenger cars with smoking rooms, equipped with four Westinghouse No. 56 motors; nine combination passenger and express cars equipped with four Westinghouse No. 56 motors; three freight and express cars equipped with four Westinghouse No. 56 motors, and one private car, making a total of 45 cars. In addition to this, the company has three motor work cars, and a large number of ballast and construction cars.

The passenger cars are 46 ft. over all, with two 6-ft platforms, and have a seating capacity of 52 passengers. These cars are divided by a glass partition, making one-third of the car a smoking compartment, furnished with rattan seats, and the other two-thirds a passenger compartment, furnished with plush seats, toilet room, water cooler, etc. The interiors of these cars are finished in selected mahogany.

The combination cars are 46 ft. over all, and have a seating capacity for 36 passengers exclusive of the express room which is furnished with movable seats, so that when not being used for express it can be used as a smoking room. These combination cars are provided with plush seats, toilet room, water cooler, and the interiors are finished throughout with selected mahogany. These cars are of steel frame construction and all parts are made extra heavy to withstand the

roads operate, makes it necessary to use independent freight motor cars. These cars are similar in appearance to baggage cars used on steam railroads, and are operated for the handling of freight at night and at such times during the day as occasion demands.

These freight motor cars are 46 ft. long and have an interior space of 40 ft. with a 9 ft. ceiling. They have a carrying capacity of 40,000 lb. and are provided with sliding doors on each side. They are each equipped with four Westinghouse No. 56 motors, geared for a speed of 42 miles an hour, thus allowing a very fast schedule to be made when operating in connection with the regular passenger cars. They are provided with Westinghouse air brakes, arc and incandescent headlights, etc. All of the company's cars were built by the St. Louis Car Co.

In addition to the depots, numerous platforms have been built



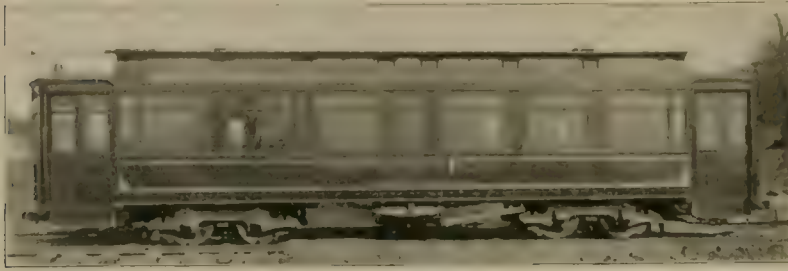
CAR BARN

along the line, where the farming community leave their produce and receive goods from the city. These cars make collections on a regular schedule.

For trolley parties and special excursion trips, the company owns a parlor car which represents the latest development in the art of car building. It is 46 ft. over all, and is divided into two

compartments with entrances at the sides, and has a motorman's cab at each end.

One compartment is arranged with a buffet, writing desk, card and dining tables, movable chairs, settees, etc., and the other compartment, which is used as an observation and smoking room, is furnished



STEEL FRAME PASSENGER CAR

with card tables, settees, movable chairs, toilet rooms, etc. At both ends of the car are large observation windows, giving an unobstructed view when the car is running in either direction, as the motorman's cab occupies only a small space.



INTERIOR OF CLOSED CAR.

The buffet is equipped with china closets, linen closets, ice box, oil stove, etc., and under the car is a refrigerator for storage.

The interior finish of this car is of specially selected mahogany, and all the decorations are inlaid in white birch. All the posts, scroll work, etc., are hand carved of solid mahogany. The roof is of the empire pattern, and all the glass is selected French plate, with beveled edges. Special care was taken in the selection of rugs, curtains, draperies, etc.

This car is equipped with four No. 56 Westinghouse motors geared for a speed of 60 miles an hour, air brakes and arc and incandescent headlights. It has a seating capacity for 40 persons.

Track Construction.

The entire track is constructed in the best possible manner, all heavy grades and sharp curves being eliminated, and great care was taken in the location and alignment of these roads. Outside of the city, 70-lb. T-rails of A. S. C. E. section are used. These rails are laid on strictly first-class white oak ties, 6 x 8 in. x 8 ft., no chestnut nor black oak being used.

The lines are ballasted the greater part of the way with crushed stone and the balance with gravel. Inside of the city, and in some of the towns 7-in. Trilby grooved rails are used, with ties bedded in concrete. All the special work is the "Guarantee" type furnished by the Lorain Steel Co. Split switches and double spring frogs are used whenever possible. "Continuous" rail joints

are used on the greater part of the track, both inside and outside the city, and the track is bonded with one or more No. 0000 9-in. General Electric rail bonds. Great care was taken in the bonding of the track, the drilling having been done after the rails were in position, and the bonds inserted in the holes as soon as the rails were drilled. The rails are also cross-bonded every thousand feet, and at all the special work and turnouts.

Overhead Construction.

The greatest care was exercised in the construction and design of this branch of the work. Specially selected poles are used throughout, a large portion being Idaho cedar. These poles are carefully graded for high voltage lines 35 ft. above the track, and for direct current and span work 30 ft. above the track. The poles are set with face and heel boards, thoroughly tamped. Through the country side pole bracket construction is used, and in the towns, span construction, erected on both wood and iron poles, and in a few cases center iron pole bracket work is used. The material used is very heavy, having been manufactured to withstand the severe usage to which it is subject.

Two trolleys are used on all single track work, which avoids the necessity of switches in the line at turnouts. Great care was taken in the distribution of copper throughout the system, and the feeder system installed is considerably above the present requirements.

Telephone System.

At points every half mile along the road, and at all switches and turnouts, on single track lines, telephone boxes have been installed. These telephones are connected direct to the dispatcher's office, and are used for the dispatching of cars only, no general conversation being allowed over the line, as a separate telephone system is used for that purpose.

Bridges and Masonry.

The bridges and culverts throughout are of first class construction. But one large bridge was required, that being across the Little Miami river on the Cincinnati & Eastern division. This bridge is double track with the main span 400 ft. long and an approach span 60 ft. long.

Where the span required was more than 30 ft., through span girder bridges were constructed; when less than 30 ft. and more than 10-ft. openings were required, concrete arch culverts were used; when less than 10-ft. and more than 24-in. openings were required, concrete or cut stone arch culverts with concrete wing walls were used, and openings less than 24 in. were made of double strength sewer pipe with concrete head walls.

Parks and Pleasure Resorts.

There are a number of parks, picnic grounds, groves, etc., situated



EXPRESS AND FREIGHT CAR.

ated at points along the different divisions. The largest of these is the new water works park on the Cincinnati & Eastern division. This property will cost the city of Cincinnati upward of \$9,000,000 and when completed will be one of the finest park systems in America. The grounds are beautifully situated, overlooking the Ohio

River, and the immense reservoir and filtration basins with rolling sodded slopes and the beautiful drives and walks make one of the grandest attractions in the vicinity of Cincinnati. The Cincinnati & Eastern division operates a double track line through the center of this park, on the only public highway, the remainder of the driveways being on park property, and not available for street railways.

Coney Island, one of the largest pleasure resorts in the West, is located along the double track line of the Cincinnati & Eastern division, and cars are operated directly into the center of the grounds over a double-track loop.

This resort comprises about 130 acres of ground beautifully situated along the banks of the Ohio River, and about one-half of the acreage is covered by a heavy growth of large trees. In this part of the grounds are located the club house, theater, band stands, dancing pavilion, bowling alleys, riding galleries, skating rink, scenic railroad, chutes and other features. The equipment of the park is very complete, and all of the buildings are of permanent construction.

Near the center of the park is located Lake Como, covering about fifteen acres, in the center of which is an island, used for open-air performances, fire-works, balloon ascensions, etc. This pleasure re-



OVERHEAD CROSSING OF PENNSYLVANIA R. R.

sort has been established for about twenty years, and is run on an extensive scale, everything being first class in every particular.

Franchises and Rights of Way.

It has been the policy of the company to purchase private rights of way wherever possible, and also to purchase or control the highways along which the roads operate. Private rights of way vary in width from 40 to 75 ft. and are all purchased with a view of having sufficient space to construct a double-track road. Through all of the towns and villages passed the road occupies the principal streets under a 25-year franchise.

Operation.

Passenger cars are operated on the Cincinnati & Eastern and Suburban divisions from 5 a. m. until 10 p. m., with theater cars leaving the Terminal station at 11:40 p. m. On the Rapid Railway division cars are operated every 15 minutes for three hours in the morning and evening to Blue Ash, and every hour from 5 a. m. until 11 p. m. from the Terminal station to Mason and Lebanon. On Sundays and holidays cars are operated every 30 minutes, or oftener as the traffic warrants, on all divisions.

Every three hours a combination passenger and express car is operated on each division, on which cars are handled only mail, newspapers and express matter on which express rates are charged. All heavy freight is handled after 9 p. m. out of the city, and delivery is made at points along the line early in the morning. These cars collect freight during the day, and deliver it at the city terminal after 9 p. m.

The passenger, express and freight departments are each in

charge of a special agent and the business is handled similarly to the standard practice of steam railways and express companies.

Express and Freight.

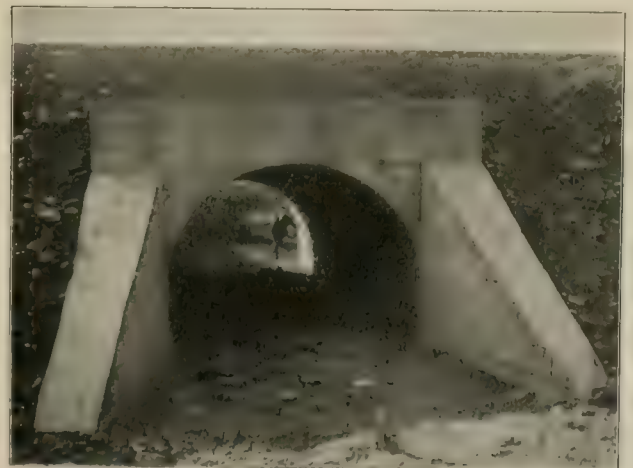
One of the interesting features of the express department is its express tariff sheet, which is the same for all three divisions of the



OVERHEAD CROSSING OF BALTIMORE & OHIO R. R.

system, excepting that rates are varied slightly according to local conditions and distances between stations. For instance, there are 12 stations enumerated on the tariff list which went into effect Sept. 10, 1903, on the Cincinnati & Eastern division, and package rates range from 10 to 35 cents; on the Suburban division 16 stations are given, package rates ranging from 10 to 40 cents; on the Rapid Railway division 17 stations are named and package rates range from 10 to 40 cents on that line also. The rates for poultry are practically the same all over.

The express tariff is printed on white paper, 7 1/4 x 16 in., and black-face type is used so it may be plainly read. At the top of each tariff sheet is the name of the company and directly under it the name of the division; then the words "Express Tariff", followed by the date upon which the tariff went into effect. Then in schedule



CONCRETE ARCH CULVERT

form appear the package rates. At the left under the sub-head "Stations" are given the names of the stations on the division, one station to a line. Next is a column in which are shown the number of miles each station is from the terminal station at Cincinnati; then come seven columns under the head "Package Rates", in which are given the rates per weight, beginning with "5 pounds and under" and ending with "100 lbs. and not under 50 lbs." Another

and final column shows the rate "Per 100 pounds" for "Poultry and Undressed Poultry." The instruction is also given, "To find any rate between stations take the number of miles between stations, then follow down the column and take rate opposite."

The heading and schedule of package rates occupy half of the tariff slip, the lower portion being given over to special rates for



CONCRETE PIERS CROSSING SMALL STREAM.

special articles, such as the following: Ice, packed, to any point 10c per 100 lb.; bread in baskets, 25c.; fresh meat, in sacking, 25c. per 100 lb., etc. There are 22 of these items.

The freight tariff used by the company naturally differs from the express tariff, inasmuch as the rates are named in cents per hundred pounds and the classification is much more simple, all freight being divided into first, second, third, fourth, fifth and sixth classes.

of the company, followed by the words "Traffic Department," its purport and date of going into effect.

Express and freight receipts, waybills, etc., are printed on yellow paper, as are the agents' and conductors' daily abstract sheets. The express receipt is $4\frac{1}{4} \times 8\frac{1}{2}$ in. in size and contains besides the usual data blanks the following notices: "This company is not responsible for damage caused by poor packing", and "Goods delivered at points where there are no agents ends this company's responsibility." A duplicate express waybill is used, which is $4\frac{3}{4} \times 8\frac{1}{4}$ in. in size, and contains the usual formula. The original and duplicate are attached and are used with carbon paper.

A novelty is a combined freight bill and receipt, which is used in duplicate, the original side being marked "Freight Bill" and the duplicate side "Freight Receipt". The original and duplicate are identical, with four exceptions: On the original side, in place of "Received from", the word "To" is used, and after the name of the road and division the word "Dr." is added; at the bottom of the statement on the original side are the words "Received Payment"; on the duplicate side this line reads "Received the above described property in good condition"; on the original, under the signature line, is the word "Agent", and on the duplicate "Agent" is omitted; for the rest this form contains spaces for entering the waybill number, date, name of consignor, point of shipment and name of connecting line. The body of the form is ruled to permit the convenient entry of the number of packages shipped, names of articles, rate, etc. At the bottom of both bill and receipt is the notice: "Original Freight Bill must accompany all claims for Overcharge, Loss or Damage." After the agent has filled out the form he gives the original to the shipper for a freight bill; the shipper signs the duplicate for a receipt, which he returns to the agent.

Two sizes of freight waybills are used, one $8\frac{1}{2} \times 14$ in., containing lines for 26 entries, and the other 4×14 in., containing spaces for 8 entries. Another form of waybill used is called a "Bill of Lading". It is $8\frac{1}{2} \times 11$ in. in size and contains at the top the rules and regulations. It is really a receipt to be signed by the agent for the company, after noting the condition in which the goods

| STATIONS. | | The Interurban Railway and Terminal Co. Passenger Tariff No. 1. Suburban Division. In Effect September 15, 1903. | | | | | | | | | | | |
|--------------------------|---|--|--|--|--|--|--|--|--|--|--|--|--|
| Cincinnati... | Cincinnati. | SINGLE TRIP FARE. | | | | | | | | | | | |
| Carrell Street. | 5 Carrell Street | | | | | | | | | | | | |
| Gwendolen .. | 10 5 Gwendolen. | | | | | | | | | | | | |
| Water Works. | 10 5 5 Water Works. | | | | | | | | | | | | |
| California.. | 10 5 5 5 California. | | | | | | | | | | | | |
| Coney Island . | 10 5 5 5 5 Coney Island. | | | | | | | | | | | | |
| Mt. Washington | 10 5 5 5 5 5 Mt. Washington. | | | | | | | | | | | | |
| Cedar Point | 10 5 5 5 5 5 Cedar Point. | | | | | | | | | | | | |
| Fruit Hill | 15 10 10 10 10 5 5 Fruit Hill. | | | | | | | | | | | | |
| Forestville. | 15 10 10 10 10 5 5 5 Forestville | | | | | | | | | | | | |
| Cherry Grove... | 20 15 15 15 15 10 5 5 5 Cherry Grove. | | | | | | | | | | | | |
| Tobasco. | 20 15 15 15 15 10 10 5 5 5 Tobasco. | | | | | | | | | | | | |
| Withamsville | 25 20 20 20 20 15 15 10 10 5 5 Withamsville. | | | | | | | | | | | | |
| Hights Farm . | 25 20 20 20 20 15 15 10 10 5 5 Hights Farm. | | | | | | | | | | | | |
| Amelia | 30 25 25 25 25 20 20 15 15 10 10 5 5 Amelia. | | | | | | | | | | | | |
| Hamlet. | 30 25 25 25 25 20 20 15 15 10 10 5 5 Hamlet. | | | | | | | | | | | | |
| Mt. Holly | 35 30 30 30 30 25 25 20 20 15 15 10 10 5 5 Mt. Holly | | | | | | | | | | | | |
| Bantam . | 35 30 30 30 30 25 25 20 20 15 15 10 10 5 5 Bantam | | | | | | | | | | | | |
| Bethel. | 40 35 35 35 35 30 30 25 25 20 20 15 15 10 10 5 Bethel | | | | | | | | | | | | |
| Round Trip Fares. | | INSTRUCTIONS | | | | | | | | | | | |
| When Single Trip Fare is | Sell Round Trip Ticket at | To Ticket Agents: No. 1—Sell Single Trip Tickets at rates given in this tariff until further notice. No. 2—Sell Round Trip Tickets to and from all points for which single trip fares are quoted at the round trip fares given in the tariff shown. No. 3—Sell Full Fare Tickets for children 7 years of age or over. Children under 7 years of age when accompanied by person in charge holding regular ticket, are carried free. | | | | | | | | | | | |
| 15 cents. | 26 cents. | | | | | | | | | | | | |
| 20 " | 36 " | | | | | | | | | | | | |
| 25 " | 46 " | | | | | | | | | | | | |
| 30 " | 55 " | | | | | | | | | | | | |
| 35 " | 65 " | To Conductors: To and from all Points collect and register full cash fare from all persons over 7 years of age who do not hold tickets or other evidence of being entitled to passage. B. E. MERWIN, General Superintendent. | | | | | | | | | | | |
| 40 " | 75 " | | | | | | | | | | | | |

PASSENGER TARIFF SHEET FOR SUBURBAN DIVISION.

As with the express tariff, the freight rates are given in schedule form. They range, on the Cincinnati & Eastern division, from 5 cents to 15 cents per 100 lb., according to class, etc.; on the Rapid Railway division freight rates range from 5 to 17 cents, and on the Suburban division, from 5 to 15 cents. No shipment is taken for less than 25 cents. The freight tariff is printed on paper $8\frac{1}{2} \times 11$ in. in size, and there being no special classifications no space is taken up by special rates. As noted, the highest freight rate is 17 cents, that being the charge for first class freight to Lebanon, 32 miles. Besides the schedule, the freight tariff contains the name

have been received, there being a column for remarks, as well as one for a description of the goods.

The daily abstract blanks referred to are of two sizes. One, $8\frac{1}{2} \times 11$ in., is a conductor's daily abstract of express business, and the other, 12×18 in., is the agent's daily abstract of express or freight business as the case may be.

For use between stations, and at points at which the company has no agents, the conductor receiving freight or express matter makes a triplicate record of the transaction by means of blank shipping tickets with which he is provided, using carbon paper be-

tween the blanks. Three different colored blanks are used—white, yellow and pink. The white ticket has printed upon it at the top "(Original) Shipper Receipt," and this is given to the shipper by the conductor; the yellow ticket is marked "(Duplicate) Accompany Freight," and is forwarded with the articles shipped; the pink slip is marked "(Triplicate) Auditor's Copy," and it goes to the auditor. In the upper right hand corner of these tickets the series number is inserted in red by a numbering machine. Each ticket also bears the title of the company, the word "Express," also at the top; a line for the conductor's name, a date line and spaces in which to insert the names of the places from and to which the freight is shipped. The lower half of each slip is ruled to permit the necessary data to be scheduled under the following heads: Shipper, Consignee, Articles, Weight, Rate, Freight, Charges, Prepaid. These tickets

The Interurban Railway & Terminal Co. SUBURBAN DIVISION.

Commutation Tickets.

In Effect September 15, 1903.

| STATIONS | Single Trip | Round Trip | 10 Ride | 20 Ride | 50 Ride | Monthly | School |
|----------------|-------------|------------|---------|---------|---------|---------|--------|
| Cincinnati | | | | | | | |
| Carrel Street | 05 | 10 | 50 | 1.00 | 2.50 | 2.50 | |
| Gwendolen | 10 | 20 | 95 | 1.90 | 4.50 | 4.50 | 3.00 |
| Water Works | 10 | 20 | 95 | 1.90 | 4.50 | 4.50 | 3.00 |
| California | 10 | 20 | 95 | 1.90 | 4.50 | 4.50 | 3.00 |
| Coney Island | 10 | 20 | 95 | 1.90 | 4.50 | 4.50 | 3.00 |
| Mt. Washington | 10 | 20 | 95 | 1.90 | 4.50 | 4.50 | 3.00 |
| Cedar Point | 10 | 20 | 95 | 1.90 | 4.50 | 4.50 | 3.00 |
| Fruit Hill | 15 | 25 | 1.25 | 2.40 | 6.00 | 6.50 | 3.75 |
| Forestville | 15 | 25 | 1.25 | 2.40 | 6.00 | 6.50 | 3.75 |
| Cherry Grove | 20 | 35 | 1.70 | 3.25 | 7.80 | 8.50 | 4.25 |
| Tobasco | 20 | 35 | 1.70 | 3.25 | 7.80 | 8.75 | 4.25 |
| Withamsville | 25 | 45 | 2.15 | 4.20 | 10.25 | 8.25 | 6.00 |
| Hights Farm | 25 | 45 | 2.15 | 4.20 | 10.25 | 8.50 | 5.00 |
| Amelia | 30 | 55 | 2.60 | 5.10 | 12.00 | 10.00 | 6.00 |
| Handet | 30 | 55 | 2.60 | 5.10 | 12.50 | 10.00 | 6.00 |
| Mt. Holly | 35 | 65 | 3.15 | 6.10 | 14.50 | 10.50 | 7.00 |
| Bantam | 35 | 65 | 3.15 | 6.20 | 14.50 | 10.75 | 7.00 |
| Bethel | 40 | 75 | 3.60 | 7.00 | 16.50 | 11.00 | 8.00 |

COMMUTATION RATES ON SUBURBAN DIVISION.

are 3" x 8 in. in size, and are attached to a stub and bound in book form and are torn out as used.

B. E. Merwin is general superintendent, in charge of the operating department, and J. M. Kennedy, jr., purchasing agent.

Personnel.

The executive officers of the company are G. R. Scrugham, president and general manager; Lee H. Brooks, first vice-president; Ellis G. Kinkead, second vice-president and general counsel; Jno. M. Kennedy, treasurer; W. E. Hutton, secretary, who together with Chas. H. Davis, Geo. H. Worthington and Guy W. Mallon constitute the board of directors.

The properties were all constructed by the company direct, the details of which were in charge of an executive committee, consisting of G. R. Scrugham, Chas. H. Davis, Jno. M. Kennedy and Lee H. Brooks, assisted by J. M. Harper, chief engineer; E. J. Heckle, first assistant engineer; F. H. Talbot, superintendent of construction. C. J. Williams is auditor of the company; W. L. Hallpike, cashier, and Werner & Adkins, architects.

DON'T ever sacrifice safety for speed.

DO remember that for good men it is easier to do right, than to find an excuse for not doing so.

DON'T think that it is a pleasure for the boss to reprimand, or send on discharge men. (Bazzard's Bay Philosophy.)

Coal Feeding Difficulties in Hoppers and Spouts.

BY WILLIAM L. MORRIS, M. E.

There seems to be but one rule laid down for the designing of coal hoppers, spouts, etc., and that is "the angle of the sides must not be less than 40 degrees from a horizontal plane."

Coal in the pile will ordinarily assume an angle of about 45 degrees. One of the first difficulties that this 40-degree rule leads us into is in the design of a square bin having the four sides of the bottom placed at this angle. The natural inference is that since all

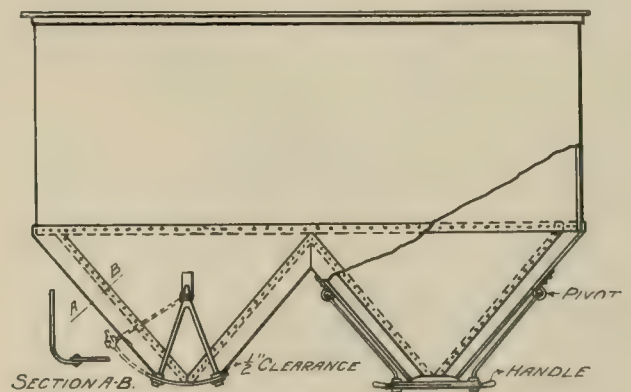
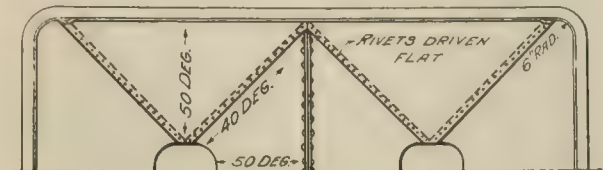


FIG. 1.

sides have the prescribed pitch, the bottom will be self clearing. We easily overlook the fact that the intersections of the sides of the bottom have but a 31-degree angle with one or possibly two seams of rivets running down the intersections. The result is that in the corners having this slight angle the coal will stand indefinitely and begin heating, and although coal may be constantly drawn from the hopper, the coal in the corners will remain even more securely than before heating began, due to coking onto the plates. The only method of releasing the burning corners is to empty the bin and poke the corners loose, the coal falling out red and smoking from the heat.

This defective design is not only objectionable on account of the loss of coal, but it causes a bad eating action on the metal.

The life of a hopper bottom is seriously reduced by allowing



FIG. 2.

coal to stand and generate heat and also to evaporate moisture out of the coal at these heated points.

I have in mind a case where a brace was run from an inclined bottom of a hopper and caused an obstruction at that point, permitting a portion of coal to remain indefinitely. The coal was damp and the hopper lay over a boiler flue. The continuous heating and evaporating at this point caused the 1/4 x 4-in. brace to be eaten entirely through after being in use about 16 months, and caused serious defects in the hopper plates also. This hopper was placed in a hot locality, but the difficulties observed in coal bin bottoms pre-

viously mentioned were not due to a hot locality, the bin bottoms being virtually in a cellar, the coolest portion of the plant.

This demonstrates that placing coal in storage even in a perfectly cool locality does not insure against fire starting in the bins. There were 18 bins and practically every one started heating after standing about 60 days. Each bin had about 100 tons slack, with more or less moisture, just as received from the mines.

Another detail that proved insufficient was where a spout 12 in. wide had a 40-degree bottom. This angle though sufficient for a

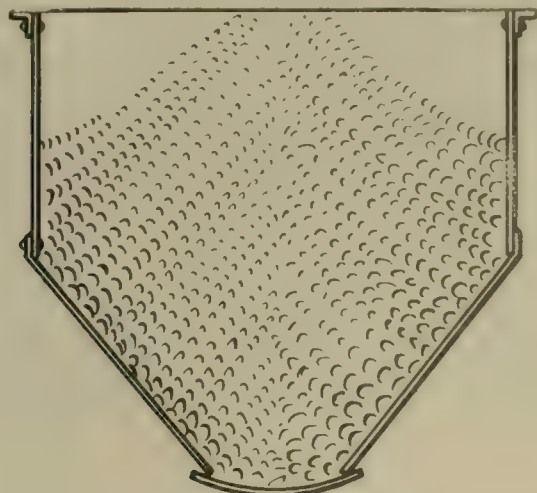


FIG. 3.

large surface was not enough to permit the corners to clear themselves. The corners were of short radius and full rivet heads projected into the spout.

It will be quite readily understood from the foregoing difficulties that we cannot accept the 40-degree rule and secure proper results. If we are to use it at all, it should be modified to read that "no portion of the bottom shall offer greater resistance than a smooth uninterrupted surface at an angle of 40 degrees." If we are to use square hoppers with bottoms inclined we should make the corners of no greater resistance than that of a smooth flat plate at an angle of 40 degrees. This is a very difficult detail to provide at times, but if fire in hoppers is to be avoided there is no alternative.

Fig. 1 shows a square tank with a cone-shaped bottom. The corners are described with a long radius to avoid rivet and corner re-

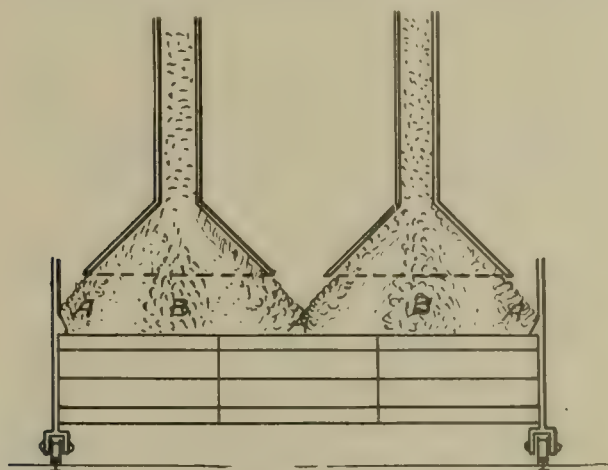


FIG. 1.

sistance, until an angle greater than 40 degrees is reached. The valve is shown supported entirely from the outside and arranged to draw from either side and keep all sides moving. The radius at the corner is 6 in., the angle of bottom at the sides 50 degrees and at corners 40 degrees.

The seams are made shingle fashion, a detail that would be unsatisfactory for caulked work, but without any particular objection for this class of work. There are many forms of hoppers that can

be more economically constructed using standard corner construction and long radius bent false corners placed in the tank as shown in Fig. 2.

Round hoppers with cone bottoms at an angle of 45 degrees offer no obstruction to the flow of coal provided rivets are not close and do not have heads. This form is by far the more satisfactory, and the coal movement is uniform around the entire shell.

However, this form is very difficult to provide in many cases, and if the following rule be adhered to it is safe to assume that there will be no difficulty encountered as far as fire and eating out of plates is concerned, providing coal is occasionally drawn off at the bottom. If the coal is not drawn off any hopper will get on fire under the ordinary conditions in which coal is received. The rule proposed is as follows:

Sides or corners should offer no greater resistance than smooth plates set at an angle of 40 degrees; no corners should be less than 6 in. in radius; seams should be placed shingle fashion; rivets should be driven flat inside; the valve should be arranged to permit

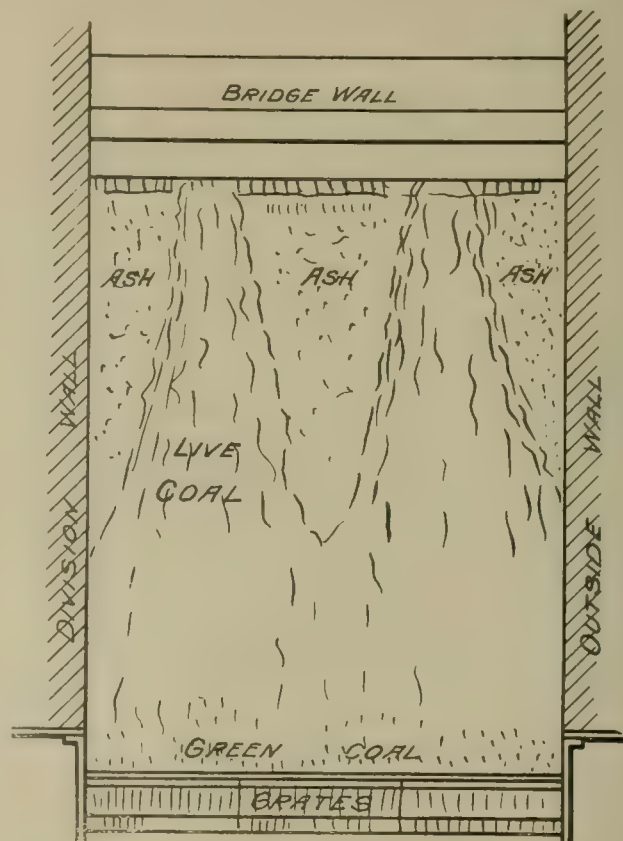


FIG. 5.

flow from all sides. This rule, if closely followed, will save one many repentances. The writer formerly erred in thinking that "coal will make its angle on itself." It certainly will make its angle, but what eventually happens to coal that forms the "false bottom?"

When it comes to the economic side of the question the loss of tank bottoms alone will more than pay the difference in cost of the long radius corners and special design of the bin shown in Fig. 1.

We will now consider another feature of coal tank and spout designing—a detail that is almost if not wholly overlooked in designing bins and spouts.

When a car of coal arrives at a plant after considerable jarring in transit we can note very readily that the coarse coal lies entirely on top and the fine coal at the bottom. We can also note in drawing off bins at the bottom that we get nothing but coarse coal for some time, then nothing but fine. Then going to spouts feeding boilers, in case they have independent tanks over them, we can see much the same thing again, viz., that coal is feeding into the furnace hoppers nearly all coarse part of the time, then all fine at other times. In looking at the fire where an automatic furnace is used we can notice that it is streaked, part burning and part consumed; looking into

the furnace hopper, we can see that the same condition of sorting exists and that a portion of the furnace gets fine dust and other portions get lumps.

Without prearrangement on our part the coal at all times tends to sort in size; this sorting takes place wherever the coal can "run."

For example, if coal is thrown on top of a pile the coarse rattles off to the sides, as in Fig. 3. The coarse runs together and the fine stays in the center. We draw from the bins, taking all fine or all coarse, and we drop it into say an overhead boiler hopper and that sorts it again. We next drop it down into the furnace hopper, where the sorting is repeated. The result of all this is that furnaces may be burning irregularly because they are fed very coarse coal today and all dust tomorrow. And whatever grade we are getting at the boiler hoppers, we are regrading again at the furnaces, feeding coarse at one point on the grate and fine at another. This sorting out is difficult to overcome, yet it is both wasteful in fuel and annoying.

When operating with heavy loads you can perhaps draw nothing but fine dust, and when running light you may use nothing but coarse coal. The difficulty on the grates, if using a chain grate, appears in shape of "streaked" fire. Fig. 4 shows a spout as used in connection with a chain grate. At points A the coal would be the coarsest, the heavy coal "running" down. The very fine would be at B and the pressure from the column of coal in the spout would

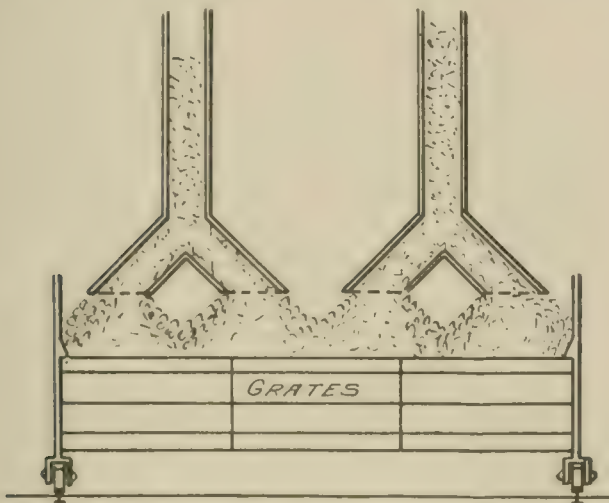


FIG. 6.

compress it closely on the grate. After this fire has burned for some time it would appear as in Fig. 5. Some portions would be nothing but ash, the two points of live coal burning so slowly that it would be necessary to dump part of it into the ash pit in order to burn sufficient coal to keep up steam. The coarse coal would flash up quickly and burn out. The dust and dirt would not burn up by the time the grates had reached the end of their travel, and would go over into the ash pit.

In order to at least partly remedy this the spouts were changed as shown in Fig. 6. The weight was taken off at points B and the dead streaks were made more numerous, but not so long. There seems to be but one practical method out of this "sorting" difficulty, in view of the fact that it is almost impossible to prevent sorting, that is, to make for chain grates or furnaces with gates a sectional gate with many small lift pieces, each consisting of one tile separately raised and lowered. The main gate would carry all the different tile. As shown in Fig. 7, the tile can be raised and lowered along the lower line of the gate, and, since the grade of coal varies, when a small amount of coal has been consumed by the time it reaches the "dump."

Inclined automatic stoker grates could be fitted up in a similar manner. Without this detail properly provided for it is necessary to stoke both in the furnace magazine and through fire door, spreading live coals over dead spots. This means both labor and fuel loss. There is no particular objection to feeding either all coarse or all fine coal to a furnace, the only practical requisite being that the coal shall burn uniformly over the entire grate, though not necessarily of a uniform thickness, and by the time the fuel reaches the

discharge to the ash pit the line between the consumed and burning coal be fairly straight; if it be otherwise, the furnace cannot be run to its full capacity without considerable loss in fuel and damage to the furnace due to carrying live coals into the ash pit.

When we take into consideration the fact that coal has become sorted while in transit, and each handling tends to do the same, the difficulty of mixing and retaining it mixed up to time of placing it on the grate is too great to undertake. There remains virtually but

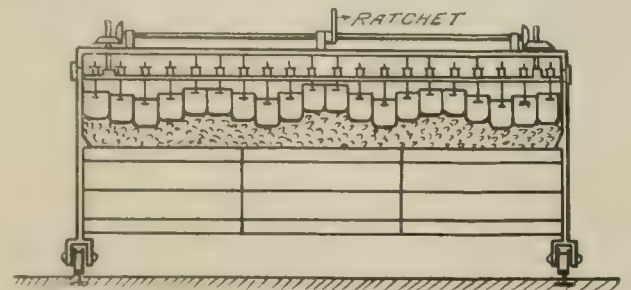


FIG. 7.

one method for us to pursue to keep a uniform thickness of the bed of coal and a fairly uniform grade of fineness across the entire width of furnace, and that is as shown in Fig. 8.

The stationary hopper spout discharges into a reciprocating hopper or spreader, which travels backward and forward across the magazine. Owing to the spreading action in receiving and the spreading action in discharging, the coal would be fed in layers of coarse and fine, but each foot in width would be layered the same. Coarse coal could be fed out of the hopper one time, then all fine, but the spreader would distribute a small amount of each over the entire width of the furnace.

There is still another factor that enters into the maintenance of a uniform straight "dead fire line." In the case of boilers in a battery, the side of the furnace alongside of an outside wall will be very likely to carry live coal over, due to slower combustion against the cooler wall. To avoid this the coal gate must have a projection on its lower edge to reduce the quantity fed. The draft resistance shows differently at various points in the width and, taking all conditions into consideration, we must provide different thicknesses of coal bed, even with a uniform size fuel across the furnace.

The difficulties as here outlined have been only too forcibly dem-

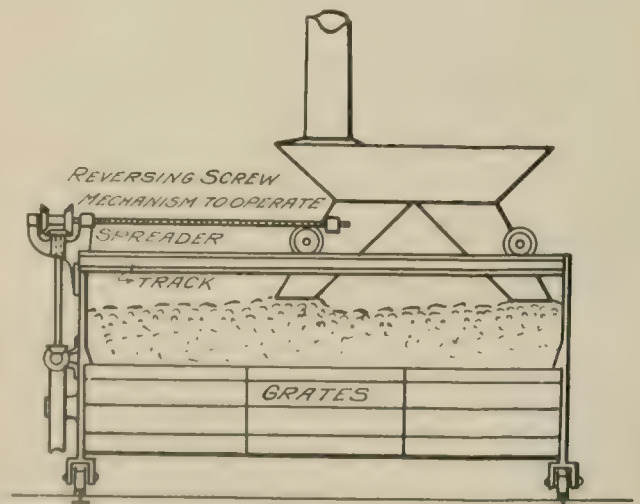


FIG. 8.

onstrated, the remedy suggested has been but partially proven as being sufficient to overcome the difficulties. This subject is turned over to the reader where the writer left off, and by more careful consideration possibly some remedy more suitable for the purpose than is here outlined can be devised.

The York & Wrightsville Electric Ry., of York, Pa., has purchased several lots of land at Wrightsville and will erect thereon large car barn and repair shop.



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CO-OPERATION BETWEEN STEAM AND ELECTRIC RAILWAYS.

The extent to which electricity will be adopted in the near future as the motive power for existing steam railroads is a mooted question, but some recent developments indicate that there is a method by which the relative advantages of steam and electricity can be determined amicably and without the actual or threatened duplication of investment by rival interests which is so undesirable from an economic standpoint. The experience of interurban electric railways in all parts of the country has clearly demonstrated that as between an electric and a steam railroad the former will secure the local passenger business, the three points of more frequent service, more convenient terminals and cheaper rates being effective arguments with the public. Also, it is admitted that passenger train operation on branch lines of steam railroads does not pay. Our readers who have followed the history of the independent motor car cannot fail to have observed the numerous attempts to displace "shuttle" steam trains, and the failure of these attempts from such widely differing causes as faulty design of the cars and threatened labor troubles.

Where a steam railroad is operated between towns less than twenty miles apart it is only a question of time when there will be an electric interurban proposed to serve the same territory. In many instances the desirability of such a road as an investment may be problematical, and such local electric railway companies as operate in the towns may for this reason hesitate to try the experiment. It is apparent that if the electric interurban is built it should be done by the interests that already control the urban roads at the termini, in order that competition may not be introduced as a factor of urban operation.

On the one hand the steam railroad is saddled with an unprofitable passenger service, and threatened with a competitor for freight business; on the other the electric street railway must hazard a considerable investment or see that investment made by other interests which may become competitors, or at least will ask for city franchises and effectually curtail the development of suburban extensions into the territory served by the interurban.

Conditions in some respects similar to those here outlined have led to the adoption of a plan of co-operation between the Northern Pacific Railway and the Everett Railway & Electric Companies, and the joint operation of the Northern Pacific's branch line between Everett, Wash., and Snohomish, a distance of about nine miles. The Northern Pacific has made an agreement with the Everett Railway & Electric Co. under which the latter was to erect trolley wire over the railroad from Snohomish to a point a little over two miles from Everett, which is the terminus of a suburban line of the electric railway, and care for all passenger, baggage and express business between Everett and Snohomish in electric cars, while all freight would be handled by the Northern Pacific with steam locomotives. The electrical construction under this agreement was completed very recently and the line was expected to be in operation by November 20th. In lieu of the former passenger service, which was limited to one train each way daily, the Everett company will give an hourly service between 7 a. m. and 10 p. m.

Electric cars will be manned by employes of the Everett company, but operated under the rules of the Northern Pacific. Under the agreement the electric company pays an annual rental for the use of the roadbed and stations, but incurs no additional charges other than for taxes and maintenance on the electric construction.

Such an arrangement as this is one that can be made entirely "without prejudice" to either of what are too often considered as opposing interests, and is one that is very easily capable of expansion as circumstances may warrant, and in this case we believe both parties are to be congratulated on undertaking an experiment that not only amicably avoids danger of wasteful competition, but also points the way for giving to many other communities the advantages afforded by electric traction earlier than would otherwise be the case.

FIELD OF THE NEW ASSOCIATION.

The American Railway Mechanical and Electrical Association was organized at Cleveland in February, 1903, by the representatives of a few of the most important electric railway systems of the country, who believed that the development of apparatus and equipment to meet the modern conditions on street railways and the rapid extension of interurban electric railways in recent years had intro-

duced so many new questions to the heads of shop and motive power departments as to justify the existence of a national association, whose work should deal exclusively with these branches of electric railroading. If there were ever any doubt as to there being a field for this youngest of the national electric railway organizations, that doubt was certainly removed by the first annual convention of the association held at Saratoga Springs in September last. That meeting demonstrated that there was much work the association could appropriately undertake, and also that the association was capable of carrying its undertakings to successful conclusions.

The subjects coming before this association are those connected with shop practice, power house design and operation, and the design and equipment and care of rolling stock.

All of these subjects involve a great mass of details, which individually might be neglected with impunity, but which collectively determine the success or failure of a shop or power plant administration. To secure satisfactory results these subjects must be considered by men who are themselves familiar not only with the general practice, but with all the details, and the A. R. M. and E. association has, therefore, a field that is peculiarly its own. The papers and discussions before the association have so far been confined mostly to shop practice and the care of rolling stock; the power-house portion of the field will perhaps be taken up for the next convention.

The Mechanical and Electrical association has the hearty approval and support of the American Street Railway Association, and is in a position to be of great service to the electric railway industry by co-operating with the A. S. R. A. in its work of standardizing equipments—in fact, it should assume the work heretofore undertaken by the committee on standards of the A. S. R. A.

The adoption of a standard is usually a matter for the management to decide, and in many cases the general manager would not act without laying the matter before his board of directors; the recommendation of what should be adopted as the standard is, however, especially within the province of the man in responsible charge of the department wherein the standard belongs. The choice of a standard can properly be made only after the fullest discussion of the merits and demerits, and consideration of how the proposed change will affect other parts of the apparatus or structure. Since the heads of the mechanical departments are the ones who, so to speak, live with the standards, they are most competent to consider proposed changes with the view of eliminating the bad points of the design and improving the good points, and this discussion can be had best before such a body as the Mechanical and Electrical association.

The head of department will also have occasion to consider proposed standards with his management, but the place for that discussion is quite evidently not on the floor of a convention.

Similarly this association can work with advantage in connection with the Accountants' Association, by laying before the latter the master mechanic's views as to how he can best make the records of material and pay-rolls that the accounting department requires.

To continue the work of the American Railway Mechanical and Electrical Association in keeping with the manner it has been begun will require earnest effort on the part of the officers and membership, both active and junior, but we predict that this effort will be gladly made, and that in a short time this association will be recognized as occupying a position relative to the electric railways of the country that is similar to that of a master mechanic or superintendent of motive power in the organization of his own road.

CAR SHOP PRACTICE.

The tendency of the large street railway system at present appears to be in the direction of building large car shops which may really be classed as complete manufacturing establishments for making almost every part of the cars and their equipment. Owing to the restriction of room at the large companies by successive consolidations, or by the purchase of smaller ones, many of these systems have found themselves in a position of a number of small repair shops scattered about different parts of the city, and under these conditions it has been found impossible to make repairs or to build new cars or appliances economically, as it necessitated carrying work from one part of the city to another. Beside this, for

economic reasons, it is manifestly impossible to equip a number of small shops with as complete automatic machinery and labor-saving devices for handling work, etc., as can be placed in a large plant where all the different departments of work are centered. This practice is exemplified in the new car shop of the St. Louis Transit Co., which is described elsewhere in this issue. In this case the new shop takes the place of nine isolated shops at which repairs of various kinds were formerly carried on, and now all heavy repairs and manufacturing work are carried on in these new shops, the only other repair work being done at the barns at the termini of some of the routes. These latter repairs, however, are only such as can be readily made without the use of machinery and any car which cannot be put in order by the use of ordinary hand tools is immediately sent to the new shop.

The equipment of this new shop comprises a number of features which are of special interest, the most notable one being the very extensive use which is made of compressed air. From the central compressor room the air is piped to outlets all over the shop so that connection with the compressed air system can be made for the use of pneumatic tools in almost any locality where it is desired to operate them. A large number of automatic hoists suspended from the overhead travelers are in almost constant use for the purpose of elevating and moving heavy machinery, mounting the work on lathes, planers, etc., and being always accessible and ready for use they effect a wonderful saving in the amount of manual labor required in the shop.

The overhead traveler system which is described in connection with this shop is also a great saving of both time and labor. While, of course, it is inferior to an overhead crane in carrying capacity, yet its capacity is ample for any work ordinarily handled in a street railway shop, and where the crane can be used only for one operation at a time, this system may be in service at any number of points throughout the shop simultaneously. It also has the advantage of requiring considerably less height than the crane, so that the building can be made correspondingly lower.

The car hoist system used in this shop, while not entirely novel, embodies some improvements not heretofore used. While such a hoist may be somewhat more expensive to install than some other kinds, it has the merit of being absolutely safe, which is a consideration which should weigh more than that of first cost. Its action, also, is absolutely uniform, so that there is no possibility of car bodies being strained by any unequal effort at different points. The cost of operating such a hoist is hardly to be considered, as it is in actual motion but very seldom. An old-style motor which would no longer be permitted upon car equipments is well adapted for the motive power of such hoists.

Another feature of this shop which is noticeable is the extensive use of jigs and templates for shaping work, punching holes, bending and other operations. In hardly any case is the work laid out to dimensions, which not only means that the work can be performed by cheap labor, but it also means a much greater uniformity in the finished product. While much of the equipment of this shop is far too expensive to be recommended for the shops of smaller railway systems, this shop contains a number of time and labor saving devices that are well within the reach of the smallest repair shops and which could profitably be copied by them.

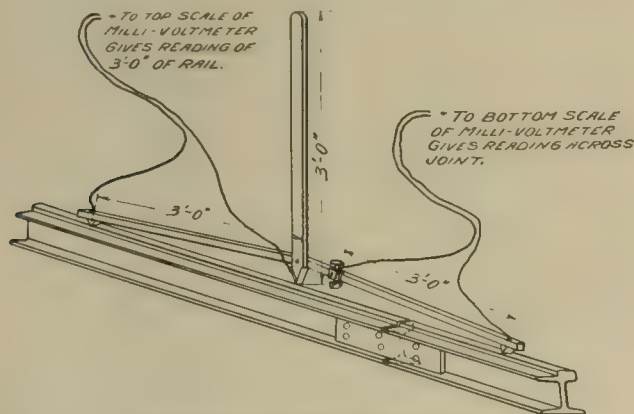
PROTECTED THIRD RAIL.

Elsewhere will be found an interesting article on "Some Operating Data on the Wilkesbarre & Hazelton Ry," which, in addition to giving a general description of some of the unusual features of this road, also gives some figures on the current consumption of cars operating on different grades and at various speeds. This road is the first, we believe, to make use of a protective covering for the third rail, and the experience already gained with it appears to justify its use in this locality at least. In places less subject to severe snow and sleet storms the usefulness of the third rail protection may be reasonably questioned, but in the test runs described in this article, where part of the third rail was exposed and part protected, the difficulty of running a car along the exposed portion after a sleet storm was in marked contrast to the ease and smoothness with which it ran after reaching the protected part.

Testing Rail Bonds.

At all of the fall electric railway conventions, the bonding question received attention in the discussions, and although there seems to be no difference of opinion as to the importance of the subject of installing, testing, and maintaining bonds, the discussions developed a wide range as to the methods of handling this phase of track work. This was particularly true as regards methods of testing to determine voltage drop and defective bonds, the ways suggested varying from the "guess" method of taking readings across each bond with a simple voltmeter to the use of a special car elaborately fitted up with apparatus and appliances for taking and recording voltage readings over an entire system. Apropos of this discussion, a description of a method of bond testing suggested and used with satisfaction by Mr. P. Frank Gerhart, electrician for the Harrisburg (Pa.) Traction Company, will be of value. The system is not claimed to be new nor absolutely accurate from a theoretical standpoint, but it is found sufficiently accurate within practical limits, and its low cost and simplicity render it available for the average and smaller-size road.

The method involves the familiar application of a double scale milli-voltmeter in conjunction with means for taking the reading of a standard length of rail (usually 3 to 5 ft.) and a reading across the joint to be tested. By comparing the reading across the joint with the reading through the standard length



DEVICE FOR TESTING RAIL BONDS.

of rail with the same current flowing, the resistance of the joint can be determined inasmuch as the resistance of the joint will be to the resistance of the rail as the drop across the joint is to the drop across the standard rail length.

The novelty in Mr. Gerhart's suggestion is included chiefly in the contact bar or pole, by which contact is made with the rail for the purpose of taking the readings across the joint and across the selected length. This implement consists of an oak piece about 6½ ft. long and 1 in. square, to one side of which are attached cold-chisel points which form the contact points with the rail. There are four of these points instead of three, as are commonly used. The oak piece referred to is slightly bow shaped, so that when placed on the head of the rail without pressure the piece will rest upon the two outer chisel points. Pivoted to the center of this piece is an upright which forms a handle and carries at its lower end one of the four contact points. By reference to the sketch, it will be seen that by placing the foot upon the horizontal piece near the center, the contact point at the end of the upright can be pressed to the rail, thus giving a reading across the length of rail that has been selected as standard. After this reading has been taken on the upper scale of the milli-voltmeter the other foot is placed upon the plunger shown on the sketch, and the remaining contact point is pressed to the head of the rail, thereby giving a reading across the joint upon the lower scale of the milli-voltmeter. If the drop in both joint and rail is alike the resistance of the joint is that of the standard rail length, and the joint is in good condition. If unlike, the resistances are directly in the ratio of the drops, and the exact resistance of the joint in comparison with that of the standard length of rail can be determined at a glance by comparing the readings on the two scales of the milli-voltmeter.

The milli-voltmeter used for this purpose comprises virtually two standard portable direct-current milli-voltmeters of the Whitney type, conveniently and compactly combined in one case. The one that measures the drop on the length of rail has the upper scale, and its terminals are the upper right-hand binding posts. Its range is about 75 milli-volts, and there are 150 scale divisions, each of ½ milli-volt value. The one that measures the drop across the joint or bond has two sets of windings. With one winding in circuit it is of 1,500 milli-volts (1.5 volts) full capacity, and each scale division represents 10 milli-volts. With the other winding, its range is 75 milli-volts, each division then being ½ milli-volt. A push button near the lower left hand binding posts determines which of these windings is in circuit. The push button is normally held up by a spring and the instrument is then of 1.5 volts capacity. On depressing the button its full distance the 1.5-volt winding is cut out and the 75-milli-volt winding substituted. This expedient is adopted because a poor bond might give a drop considerably in excess of the capacity of the more sensitive winding, which would result in injury to the meter. As the 1.5-volt scale is always in first and is kept so by the spring, unless deliberately cut out by manipulating the push button, not only is this danger obviated, but it becomes possible to measure the resistance of good or poor bonds with equal accuracy.

When using the instrument without a four-point contact bar, as devised by Mr. Gerhart, it will frequently occur that the instrument will give no reading whatever when contact is made with the rail, and it is then impossible to decide definitely whether this is due to the fact that the joint is perfect or whether it is due to an entire absence of current in the rail itself. With the four-point bar this difficulty is overcome because, if, upon making the contact across the standard rail length, no reading is secured, it can be at once assumed that no current is flowing. With an instrument of this kind, it is possible to tell in which direction the current is flowing, whether plus or minus, by the direction in which the needle moves, and it can therefore be determined whether the rails are plus or minus to surrounding objects.

With this contact bar and instrument bond testing can be done by one man if necessary, and Mr. Gerhart states that he has tested all the bonds on over a mile and a half of track in a single day. When working on outlying lines where it is not possible to have at least one regular car at all times beyond the point at which the men are testing so as to insure flow of current in the rails, it is customary to take out a special car, which runs slowly ahead of the men, so that there will be sufficient current passing back to the power house to give readings. Or, if it is desired to have the car stand still, the same results can be secured by keeping the light circuit on in the car. If it is not desirable to use a special car, the men can carry a fish pole connection along with them and make contact with the trolley wire through resistance at any point.

The double scale milli-voltmeter can be purchased for about \$75, and the contact pole with the four contacts, as described, can be made for about \$1.50.

Competition in England.

According to Mr. Marshal Halstead, United States consul at Birmingham, Eng., the English steam railroads are endeavoring to compete with existing electric systems, and to forestall and prevent the building of other electric lines, by establishing self-propelled individual passenger cars, and also establishing railway stations and automobile services in country districts.

In a recent report Mr. Halstead incorporated a paragraph from the speech of the chairman of the Great Western Railway Co., to the effect that the company had suffered from the competition of tram and motor service to such an extent that it had decided to establish a motor-car service of its own by means of a combination engine and car which seats 52 passengers, and the company also ordered five motor cars, to be driven by petrol, capable of carrying 22 persons each, to be used as feeders to the Great Western system.

DON'T forget that enthusiasm makes heavy work light.

DO your best to keep your car on schedule time; also on the track.—Buzzard's Bay Philosophy.

Some Operating Data on the Wilkesbarre & Hazelton Ry.

Physical Features of the Road — Protection of Third Rail — Novel Form of Shoe — Test During Sleet Storm — Bonding Tests to Determine Consumption of Current by Cars and Trains — The Question of Trailers — Power House Data and Practice — Sub-station Practice — Tying Stations Together — General Results.

BY J. E. WALLACE, CONSTRUCTING ENGINEER, WITH L. B. STILLWELL, NEW YORK CITY.

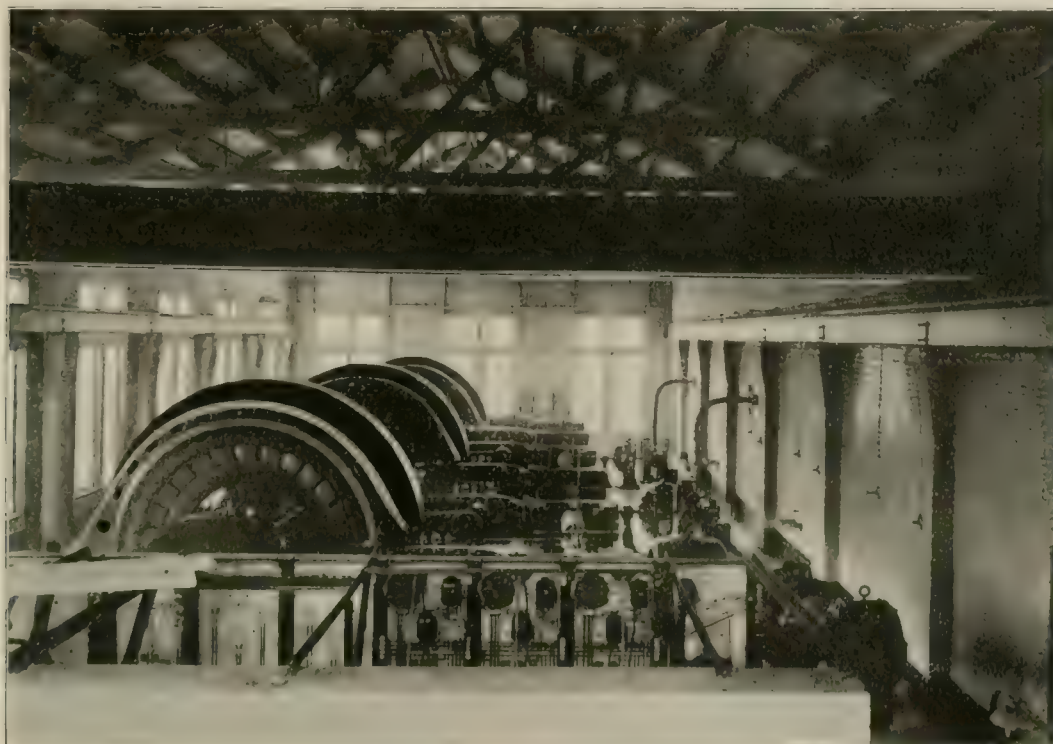
The Wilkesbarre & Hazelton Ry., in the heart of the anthracite coal fields of Pennsylvania, constructed during the summer of 1902 and put in operation for the transportation of passengers during February of the present year, presents some features, notably a protected third rail, which may be of interest.

The road, as indicated by the name, runs between the cities of Wilkesbarre, Pa., and Hazelton, Pa., and connects the traction systems, operating under street railway conditions in the respective cities, by means of a high-speed third-rail electric railway operating under steam railway practice.

The population in and about Hazelton, estimated as 65,000 peo-

Railroad, 50 miles. Roughly speaking, these two routes form the two sides of a circle, on whose diameter it was desired to locate the new route. The map herewith presented gives a very good conception of the routes of all three roads, which, due to the mountainous character of the country, are very devious.

It was desired to accomplish the distance between the two business centers in one hour. The limitation of speed permissible on the streets of the respective cities left but approximately 40 minutes to accomplish the distance over the private right of way between the two junctions. The problem at once became one of high speed, and to reach the results in the most economical man-



INTERIOR OF POWER HOUSE.

ple, is served with transportation facilities by the Lehigh Traction Co., with tracks centering at Broad and Wyoming streets, Hazelton. From City Hall Square, Wilkesbarre, radiate the tracks of the Wilkesbarre & Wyoming Valley Traction Co., serving a populace of about 115,000. From the junction with the former in Hazel Park, on the outskirts of Hazelton, to the connection with the latter in the borough of Ashley, near Wilkesbarre, a distance of 25.7 miles entirely on a private right of way, 60 ft. wide, free from grade crossing and carefully fenced on both sides. By the terms of a traffic agreement between the above-mentioned traction companies and the Wilkesbarre & Hazelton Railway Co. the cars of the latter are enabled to take passengers from the business center of Hazelton, at Broad and Wyoming streets, and deliver them at City Hall Square, the business center of Wilkesbarre, or vice versa, a total distance of 30 miles.

Prior to the building of this road, the travel between the two cities was by means of two routes, that of the Pennsylvania Railroad approximately 71 miles long, and the Lehigh Valley

not 3 per cent grades were chosen as the maximum allowable. A difference in level between the two junctions of 1143.5 ft. in a very mountainous country, and a limitation of a 3 per cent grade made reasonably bold engineering necessary to secure a fairly direct route. Heavy rock cuts and deep fills, as a result, are quite numerous in the roadbed construction, together with a tunnel 2,684 ft. in length. Curves were kept quite low, with the exception of one 18° curve. Operation around this curve, however, is quite easy, due to the cars having double trucks and the center of gravity being low. It would be difficult with the weight that is on the wheels of these cars to get them to climb the rail. A profile of the route shows the various grades which resulted from the survey, 78 per cent of them being grades of over 2 per cent, and the average grade from one end to the other is 76 per cent.

In passing it may be of interest to the reader to know that since operation commenced the passenger service by way of White Haven Junction, on the Lehigh Valley route, has been

abandoned, and great inroads have been made into the traffic of the Pennsylvania route, both local and through. In spite of the fact that the Pennsylvania Flyer covers the distance between the two cities in 1 hour and 35 minutes, and that passengers by the electric lines have to make two transfers between Ashley Junction and City Hall Square, numerous through passengers from Wilkesbarre to Philadelphia come to Hazelton on the W. B. & H. line, and continue on toward Philadelphia from Hazelton. When the ultimate schedule is reached a passenger for Philadelphia can miss his train by 20 minutes in Wilkesbarre and still catch it at Hazelton by the assistance of the new route. The fare one way from Wyoming street, Hazelton, to City Hall Square, Wilkesbarre, is 90 cents; round trip, \$1.50. Books good for several trips are issued, whereby a one-way trip costs 68 cents. Mileage tickets are issued on a basis of \$20 for 1,000 miles. Local tickets are issued on a basis of approximately 3 cents per mile. The rate charged by the Pennsylvania was and still is \$1.50 one way, \$2.50 round trip, and 2 cents a mile by mileage books. Commercial men still prefer the steam route on account of the two transfers that exist in the electric route.

Before continuing the consideration of engineering details, the scenic beauties of the route deserve attention. The track crosses three valleys, climbs the sides of two mountains, and penetrates a third. Leaving Hazel Park, the route passes over Black Creek bridge and through Cunningham gap. From the side of Cunningham mountain is seen Sugar Loaf mountain in the distance, and down in the valley below is a panorama of rural civilization, the whole forming a most attractive picture, which never fails to please the eye and rest the mind. Crossing Butler valley the route passes the power house at St. Johns, and climbs the Nescopeck mountain. From Nescopeck pass the view is in sharp contrast to that previously noted. Here on one side spreads a vast tract of country rugged and uncultivated, where nature has full sway. On the other hand one views a thickly wooded country which is partly under cultivation. Crossing the Schweitz valley and passing through the tunnel, one finds another view of a thickly settled country, with the town of Nanticoke in the distance. After traversing a gorge running over Solomon's Gap bridge and crossing under the Central Railroad of New Jersey, one is presently at Ashley Junction.

Mr. Alvin Markle, of Hazelton, who projected this road and carried it to its completion, was unsparing of money where public safety and convenience were concerned. Among the results of

large bridges of granite masonry complete the amount of bridging to be found in the roadbed construction.

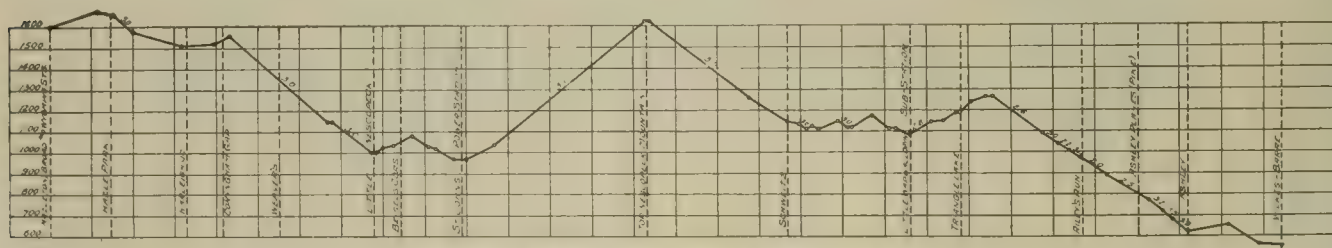
The track construction is on best standard lines of modern practice. The track rails (Boston and Albany section) have a 3-in. head and weigh 95 lb. per yard. Coal cinders and ashes are in use for



MAP OF THE WILKESBARRE & HAZELTON RY.

ballast. Cinders make a nice springy ballast to which will be added in the near future 10 in. of rock ballast when banks and fills have reached stable conditions. Curves are elevated approximately $\frac{3}{4}$ in. per degree of curvature in the track, and the ends tapered off with transition curves. Final elevations are determined by the speed of cars at local points.

The contact rail, in line with the policy of this road as regards safety, is a step in advance of the usual practice, in that a protection over the contact rail is used. It is the belief of the writer that this road enjoys the distinction of being the first to adopt a protected third rail. The design of the rail and protection is such as to permit operation over the road of all standard steam railway equipment, including large composition locomotives and hopper cars



PROFILE OF WILKESBARRE & HAZELTON RY.

his liberal policy is the elimination of grade crossings of all sorts. Operation has demonstrated the wisdom of such a procedure. Cars approaching at high speed on the heavy rails with which this road is equipped give very little warning of their proximity. The writer while walking on the track has at numerous times been passed by cars, and except for the slight singing of the rails, their approach was scarcely noticeable. Instances are known where men walking on the tracks have narrowly escaped being run down by a car coming around a curve upon them. The operator on the car under present conditions has no strain upon his nerves in approaching a crossing, and speed results. This policy of avoiding grade crossings made necessary the construction of 26 highway crossings and cattleways of various kinds, all concrete construction. Nine more bridges, of concrete construction, crossing small streams, and two

for carrying coal. The protection consists of a 2 x 6-in. pine plank held directly over the rail at a distance of $2\frac{1}{2}$ in. This pine plank is supported every 8 ft. by 3 x 4-in. oak posts cut out to clear the side motion of the shoe when journals and track become worn. The illustrations will give the reader a clear conception of this construction, and show the relative position of the contact rail to the track rail. The third rail is 28 in. from the gage line and 5 in. above the track rail. This location of the third rail was arrived at after a consideration of the various conflicting interests involved; height of shoe above pavements, clearance of contact rail protection, an effort to keep the shoe from projecting from under the car, etc. The problem was not simple, since it was desired not to have a shoe that would have to be moved from its running position when the car was on a paved street.

The objects in adopting a protected contact rail were twofold—to prevent the formation of ice on the rail during sleet storms, and to prevent personal injury by accidental contact with the rail. The second object has thus far proven very satisfactory. The writer has often seen men working around the tracks in a very confident



NESCOPECK BRIDGE.

and careless manner, using the rail protection as a brace for the feet in moving heavy objects, and in a general manner showing no fear of injury, which is not usually the case, especially with Italian laborers. One cannot usually get them near a rail which they know to be carrying current. Occasionally an unusually careless laborer with a bar gets a moderate shock, but nothing has ever occurred which resulted in loss of life. Short circuits from crow-bars and chains are very rare. In regard to the primary object—namely, preventing sleet from forming ice on the contact rail—the



ROCK CUT

protection has demonstrated itself as very efficient. In a system like this, where nearly an hour, or a whole night, may elapse between the passage of trains, ice may become very thick and hard on the contact rail. The writer in the capacity of construction engineer, representing the consulting engineer, was present when the guard was being installed. A sleet storm followed by cold and drifting snow came up during the period, and part of the rail protection, about a mile in length, was completed immediately after the storm. Power was then turned on that section of the completed rail, and a car made its maiden trip over the line on a track covered in places with densely packed snow 2 ft. in depth. The experiences of that trip were certainly exceptional in the history of electric railroading. No difficulty was experienced on the outgoing trip, as points of the route deepest under snow were on down grade. Coming to that portion of the rail where the protection had been completed after the sleet storm, pyrotechnic displays were at once in evidence. The continued cold had thoroughly hardened the ice, which was nearly $\frac{1}{4}$

in. thick. Every 8 ft. the workmen installing the guard had melted the ice off with a blow torch in order to attach the post carrying the guard plank, and every 8 ft. came a lunge and more fireworks. The apparatus was being tested out very nicely. The car kept moving, as it was still down grade, and finally reached the power-house, which was the end of the section. The return trip of 8 miles up nearly all 3 per cent grade was then entered upon. The car went forward by jerks for a few hundred feet and stopped—no contact. Presently the shoe, which had become hot from so much arcing, melted through the ice, establishing a connection, and backing out, a fresh start would be made. About a thousand feet of the first mile was up a 3 per cent grade; it took several attempts, and any amount of sputtering and arcing to get up that thousand feet. Finally reaching the rail which had been covered by the protection prior to the sleet storm, the car moved along smoothly and easily. Coming



SOUTH END OF TUNNEL.

to the hard packed snow drifts, which was again up a 3 per cent grade, no difficulty was experienced in keeping the car moving, although heavy arcing could be heard under the snow. The snow was very dense and hard, and, in the opinion of the writer, the ordinary form of shoe carried by links would have been unable to keep the car moving. The drawing and lifting action of the links would have raised the shoe two or more inches high over the snow. Brushes no doubt would assist, but unless they were very close to the shoe the snow would have dropped back and again caused the



ROADBED AND TRANSMISSION LINE.

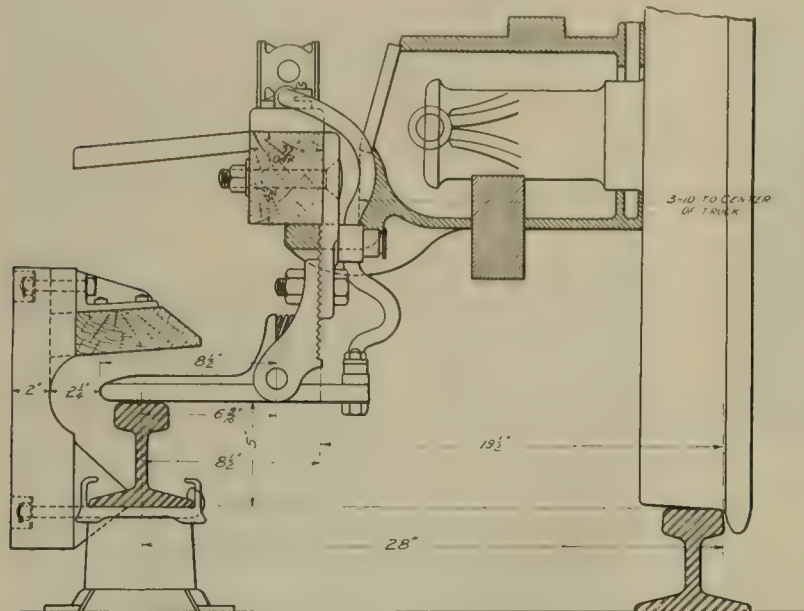
shoe to ride. Under high speed conditions, unless the brushes were very strong, they would not stand the strain that would be imposed upon them from hard packed snow. The shoe with which the car is equipped, however, had no tendency to ride the snow, except that caused by the rounding up of the end usually adopted to

prevent catching on uneven joints and end inclines. The design of the shoe as developed by Mr. W. B. Potter is shown herewith.

The shoe has shown its superiority over the link type in the matter of sparking when operating at high speeds. In several places in the line the joints in the contact rail come midway be-

than 28 in. it was impossible to get 45° in this instance and clear the cylinders of locomotives that might be operating over the line.

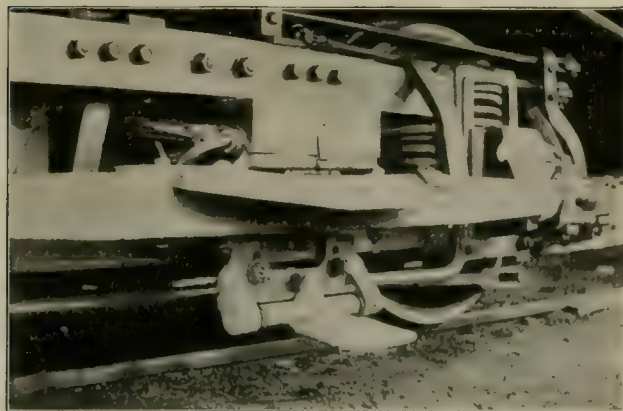
In regard to drifted snow, the shoe has on several occasions brought cars in during drifting storms from regular runs somewhat behind schedule time, but its action of riding and ironing out the snow was not satisfactory, and a shoe of another type, shown herewith, was designed for snowstorm purposes. This latter shoe arrived in Hazleton too late for practical test during the past winter, but from results of tests made prior to its shipment, it



SECTION OF GUARD RAIL AND CONTACT SHOE.

tween the supporting insulators; also many of the contact rails came from the rolling mills somewhat arched, and these conditions combined sometimes resulted in a very low joint. At high speed the ordinary type of shoe would not only be likely to jump such joints, but bound when it struck the other side. No such action, however, occurs with this shoe at any speeds under 50 miles per hour. A spring with which it is equipped, and its small moment of inertia make it respond quickly to irregularities in the third rail.

While the sleet problem has been solved, in its solution has been created a new problem already touched on, of drifting snow. This, however, from the experience gained, does not appear difficult, as



CONTACT SHOE AND SHOE FUSE BOX.

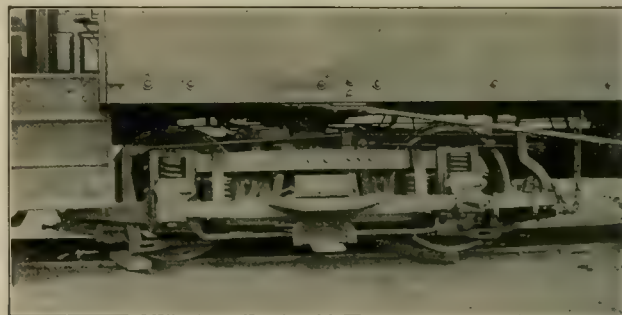
will be presently shown. The writer has never noted a sleet storm in which the sleet drives down at a greater angle than, approximately, 30° from vertical. The angle from the corner of the contact rail to the corner of the overhanging plank in this protection is about 25°. In March of the present year a very driving sleet storm, blowing at right angles to the tracks, caused some ice to form on one side of the contact rail. It, however, was not troublesome, and no difficulty was experienced in operating cars. An angle of 45° from the top corners of the contact rail to the corners of the protecting plank overhanging will give perfect protection from sleet. As it was undesirable to move the contact rail out further



SNOWSTORM CONTACT SHOE.

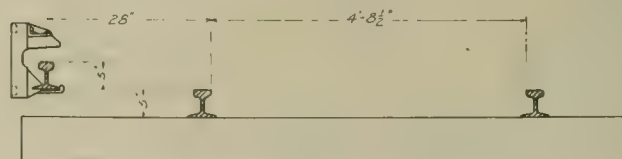
is anticipated that it will do the work. Doubtless to some the thought may occur that the contact area of this latter type of shoe is small for a car taking 900 amperes to accelerate, and often carrying 500 to 600 amperes for periods of several minutes. Practice has demonstrated otherwise, however, as the shoe has been used for periods of several days, giving no evidence of more than natural wear.

The contact rail is an 80-lb. section in 60-ft. lengths, supported by insulators every 10 ft., holding the foot of the rails 5 in. above the



STANDARD TRUCK.

ties. To prevent creeping the fish plates at joints are moderately loose, and an anchoring insulator midway between joints is used in every rail. Mr. Houck, superintendent of motive power of the company, stated to the writer that the guard plank keeping the greater portion of the rail shaded from the sun reduced expansion and thereby the tendency to creep. The rail is of special composition, possessing high conductivity and is quite soft. It was quite a problem to find a method of distributing the lengths of contact



RELATIVE POSITION OF TRACK AND THIRD RAIL.

rails without causing kinks. The method used was to hook on the end of the rail and have the locomotive draw the rail car from under. The rail came off with a long bend and a slap on the ties, and suffered no injury. Third rail distribution of energy to the cars, rather than the trolley, was chosen chiefly because of the difficulty

experienced with the latter from the trolley wheel slipping the trolley wire at high speed. Third rail construction is also usually cheaper than trolley and less costly to maintain. This method of distribution also does away with that rather disagreeable sensation often existing in trolley construction, due to the vibratory action of the trolley pole on the roof of the car. In cars with moderate speeds this action is not so noticeable, but usually exists to a more or less extent.

Both the contact rail and the track rails are bonded with Chase-Shawmut bonds, soldered under the foot of the rail. The bonds have now been applied for nearly a year and a half, and neither the shock of heavy locomotives and cars passing during the construction periods, when alignment was bad, nor the passage of 45-ton cars operating under schedule speed, has caused the bonds to show any indication of breaking away, as found by an inspection of their physical condition, or any changes in the track return. A uniform drop all over the line of approximately 8.6 volts per mile per 100 amperes indicates a uniform condition of the bonds. No systematic test has yet been made throughout the line, but such bonds as have been tested show a joint resistance equivalent to approximately 4 ft. of rail. To apply soldered bonds under the foot of the rail with any degree of economy necessarily involved some departure from the usual methods employed in laying track where protected or other types of bonds which can be applied to the side of the rail



INTERIOR OF CAR SHOWING RELAY BOARD FOR CONTROL.

are to be used. An arrangement had to be made for the passage of the construction train and a sort of schedule was adopted, after which the matter quickly settled down to a routine. The general performance of the bonds have thus far been very satisfactory. The writer is acquainted with some tests that have been made by the Chase-Shawmut Co. which would indicate that the danger from crystallization is overestimated. Also the writer does not believe that any bad results will occur from contraction and expansion by heat and cold.

The schedule originally considered for this road called for an express service every hour, and a local service every hour and a half. To perform this work six cars were provided. They are combination coaches, having a baggage compartment fitted with folding seats for the use of smokers, a passenger compartment seating 38 people, and a toilet room. Electric heaters furnished by the Consolidated Car Heating Co. are used. The interior finish is very handsome, being solid mahogany in the passenger compartment, and natural ash in the baggage room. Loading steps are provided at only one side of each platform the other side being used for the motorman's cab. This latter arrangement would not be good practice on some roads making numerous stops, but in this instance the door is closed automatically.

A view of the interior of the car shows the relay board which operates the motor control. Granite fireproof material is used freely under the car for protection from fire. The cars were built by the J. G. Brill Co. of Philadelphia and are equipped with Brill No. 27 112 truck, weighing 12,000 lb. each without motors. The wheel base is 6 ft. 6 in. and the wheels are 36 in. in diameter, with

steel tires. M. C. B. couplers are used, with Gould platforms, and a cowcatcher is installed at each end, which does not interfere with coupling. The motors are G. E.-66, one being attached to each axle, thus making 500-h. p. of rated motor capacity on the car. The motors, which have thus far given exceedingly fine service, are gov-



MOTOR CONTROL CONTACTORS.

erned by the use of two sets of automatic multiple unit control, as embodied in the Sprague contactor system. These controls operate in parallel, and either set can be cut out by pulling a small switch on the relay board. This system was designed to give operative results similar to the Sprague pilot motor drum control, and obtain the advantages of the contactor system. It is very much quicker in response to the master controller than the original pilot motor control. The system of brakes provided on these cars is in line with the policy of the Wilkesbarre & Hazelton Railway Co. as regards safety of operation, and to the public. In both cities the route includes some grades which are quite heavy for cars of great weight to operate upon, under the conditions of a slippery or icy rail. In Wilkesbarre is a 5 per cent grade ending upon the main line tracks of the Central Railroad of New Jersey. The management is desirous of having this latter grade crossing abolished for a different route or an overhead crossing; otherwise an attempt will be made to reach the center of the city by other means. But in the meantime every precaution has been taken to enable the man in the cab to stop his car at any point under all conditions of rail. The car is equipped with sand, and two independent foundation brake riggings; one having its point of application on shoes between the wheels of the truck, the other on shoes outside of the wheels. The inside brake shoes are actuated by magnetic brakes gripping the rail,



POWER HOUSE AT ST. JOHNS.

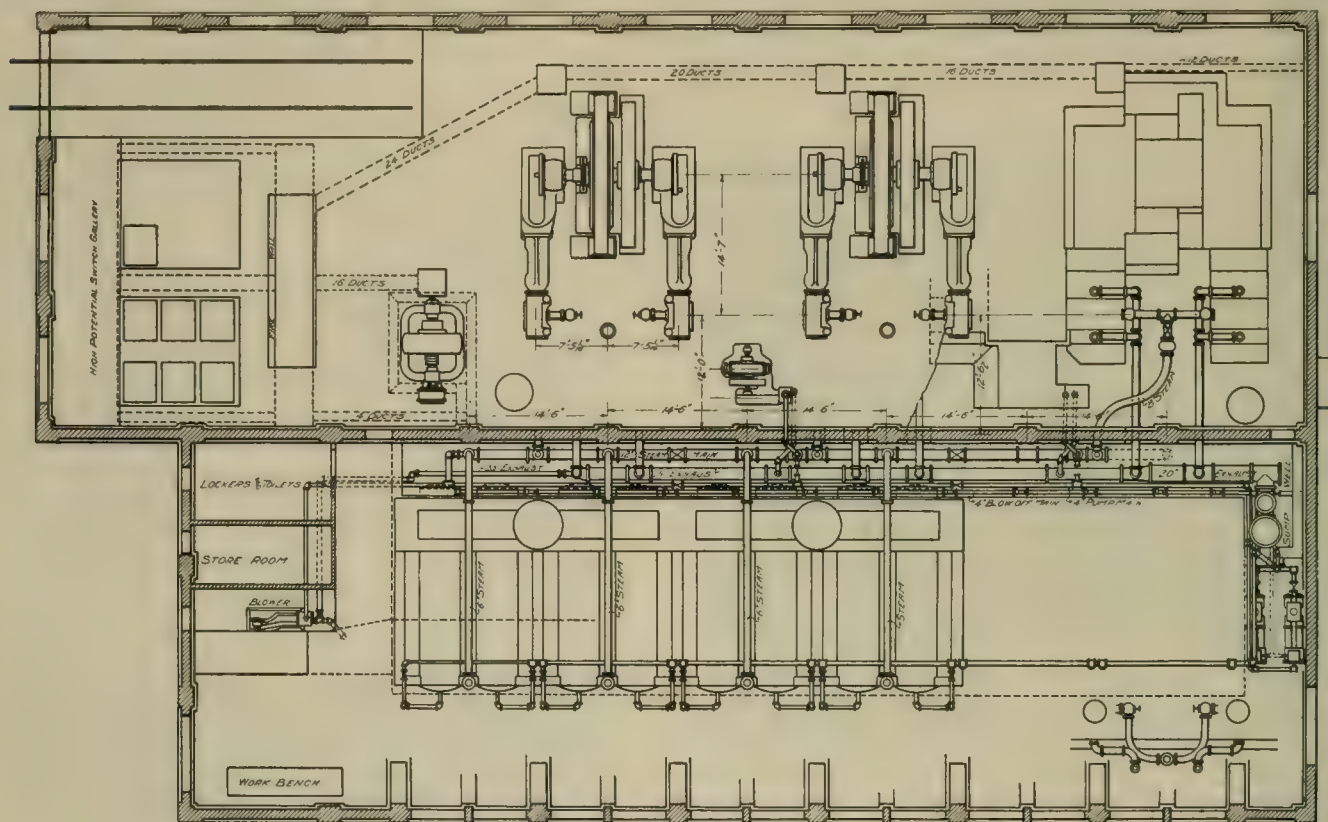
and a ratchet lever in the vestibule of the car. The outside shoes, in line with the standard practice, are applied by Westinghouse automatic air brake equipment, and a ratchet lever in the motorman's cab. This all reduces to two independent brake equipments, with four operative points for application of brakes to the wheels.

An air signal system is provided whereby the conductor at any point on a train can signal the operator at the head end, as is now

done in steam passenger service. Trolley poles permit operation on streets of city traction systems, together with gongs and such equipment as is usually found in street car service. The total weight of the car fully equipped is 84,000 lb. To install all this apparatus on a car in a manner so that it will give satisfactory operative results and be accessible for inspection and repairs is not an easy problem, as the engineer who has met such will appreciate. The equipment has given good service, and the general layout would not be different if it were built in the light of present experience. Every south-bound car in passing Hazel Park Junction is inspected for loose bolts, brake rods, and broken parts in the trucks.

Because of sewer construction going on in Wilkesbarre the cars have thus far run only to Ashley Junction, and there passengers are transferred to the local traction company. The round trip schedule speed at present is slower than intended, and averages about 31 miles per hour. For the round trip the amount of energy drawn by the car from the contact rail is, approximately, 4.2 kw. per car mile, and the amount delivered to the contact rail by the sub-stations 5 kw. per car mile. The average grade from Hazel Park to

makes the ultimate schedule intended easily within the limits of the car equipment. These cars make their schedule so easily that the question of handling a trailer was made the subject of a test. On account of the speeds reached it was not considered advisable to use a trailer coach weighing less than 50,000 lb. For the test an empty 70,000-lb. coach was attached to the empty motor car and run over the line. The run from Ashley to Hazel Park, 25.7 miles, including 6 stops of 10 seconds, was made in 1 hour and 8 minutes. The power absorbed by the cars was 10.75 kw. per train mile, and that delivered by the sub-stations 13.1 kw. per train mile. The power used by the car was practically double what it used in making the trip alone. The current consumption of the train when climbing 3 per cent grade was approximately 850 amperes, and the speed was about 25 miles an hour. The motors had heated up 86 degrees F. in making the round trip. Their action in climbing heavy grades, commutating 200 to 250 amperes, was without a fault. The decision was that as a regular thing it would not be good practice to attempt to use a trailer. The limit switch in the control made it at times difficult to start on grades, and the motors would get very hot.



PLAN OF POWER HOUSE.

Ashley Junction is a down grade of .76 per cent. The consumption of power by cars running toward Ashley Junction is 3.07 kw. per car mile, with stops averaging every 10 miles. During the return trip to Hazelton, the consumption per car is 5.27 kw. per car mile, with the same relative number of stops. A car loaded weighs about 44 tons, and with a gear ratio of 1.85 ascends a 2.74 per cent grade at 37.2 miles per hour with an average energy consumption of 8.02 kw. per car mile; the car starting from a standstill on the grade and passing a point 4.24 miles distant in 7 minutes and 4 seconds. Cars ascend 3 per cent grades at a speed of 38.4 miles per hour, taking from the contact rail 530 amperes at 520 volts. A current of 132.5 amperes in a motor gives 775 lb. tractive effort at the wheel, or 3,100 lb. for the car. Three per cent of the weight of the car deducted for grade resistance from 3,100 lb. leaves 550 lb. as the amount of tractive effort used in overcoming friction, wind, and track resistance, or about 13 lb. per ton. Considered in the light of certain tests that have been made with cars driven by electric motors, 13 lb. per ton seems small, and approaches more nearly results obtained in steam practice. There are no level places in the line of sufficient length to make a check test of current consumption on level track. Running down grades at 45 to 50 miles an hour

When traffic is heavy two motor cars and one trailer will probably be the method adopted.

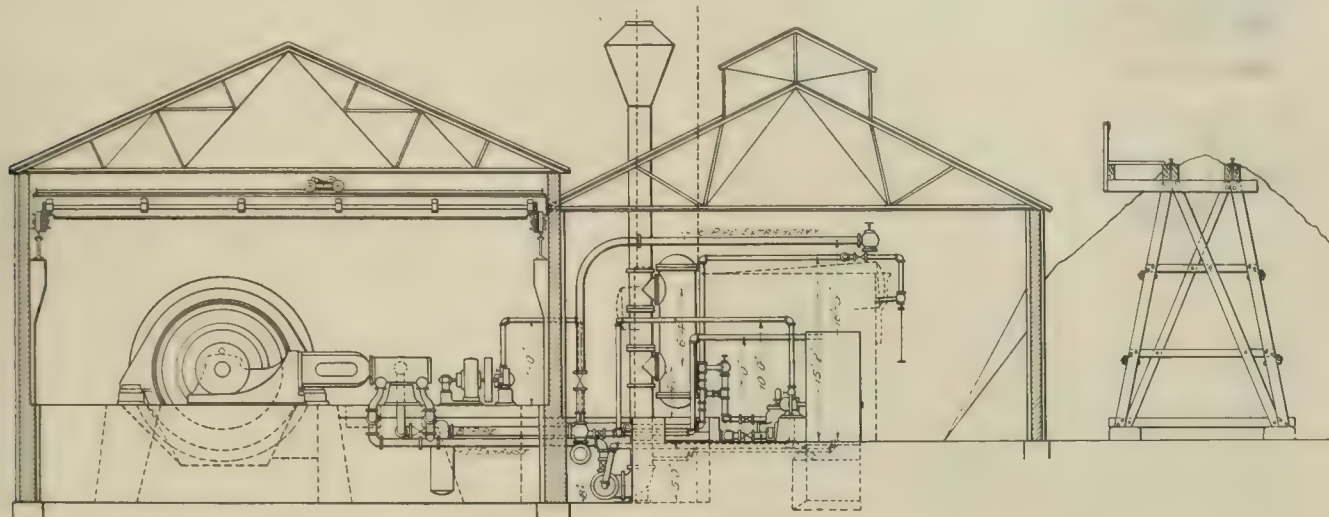
The power house is located 8.35 miles from the Hazelton end of the line, where suitable feed water is found. The general layout is upon the unit system, following closely the standard lines which have been found best in power-house practice, and which most readily permit of extensions. It is expected to increase the power plant to double its present capacity in the near future. A coal trestle delivers coal at the side, so that it flows right into the boiler room ready for stoking. Ashes are removed by being dropped into a car which runs underneath the floor in front of the boilers. The boilers were supplied by the Heine Safety Boiler Co. and contain 2,600 ft. of heating surface. The grates contain 85 sq. ft. of working surface. The length of grate bars is 7 ft., thus making an easy grate to clean.

The boilers are grouped six in a nest, as is possible with Heine setting, with a 5-ft. steel stack on the division wall between each pair of boilers. In addition to the stacks a blower capable of developing $2\frac{1}{2}$ in. of forced draught is installed. The boilers are operated under 125 lb. pressure. The furnace and grates of these boilers were designed to burn rice anthracite coal. The setting is

high enough to permit the utilization of stokers should the same become desirable, and leaves a distance of 6 ft. between the grates and water tubes. Some question was raised as to the good judgment of this distance between grate and tubes, but results have proved that it is all right. The bridge wall first installed, however, was found too high and was lowered, too much heat being concentrated on the tubes over the grate by a sort of blast action. These boilers were installed during the summer of 1902, when the coal strike was on, and only bituminous coal was to be had. The writer was very much interested in the action of these furnaces as

extremely wide and violent fluctuations of load, these engines operate very nicely and regulate within very reasonable limits. The economic performance at full load of 600 i. h. p. is 23.9 lb. of steam.

Three phase current of 3,000 alternations is in use on this system. All electrical apparatus used for delivering power to the third rail was supplied by the Westinghouse Electric and Manufacturing Co. The power house contains three 400-kw. direct connected alternators, which normally deliver current at 390 volts to the switch-board bus bars, from whence it is fed to the converters and step-up transformers. The transformers step the voltage up to 15,000 volts



CROSS SECTION OF POWER HOUSE.

regards smokeless combustion of soft coal. Making inquiry as regards the coal in use, he was told that it came from the coal fields of Western Pennsylvania, and was usually rather smoky. Combustion in these furnaces, however, seemed nearly perfect. Rarely was smoke seen coming from the stacks, except at such times as the furnace doors were open for stoking. In considering the cause of these facts the writer concluded that a large combustion chamber and some distance to travel before the gases could encounter tubes to cool them, was accountable, and so reported at the time. In Heine boilers the lowest row of water tubes over the grates is entirely inclosed with C tile bricks from the front waterleg to within about 4 ft. of the rear waterleg, this tiling, as is well known, also serving as a baffling to conduct the gases to the rear of the boiler before entering among the tubes. The distance of 6 ft. from the grates to the tile-covered tubes, in addition to the distance to the rear end, apparently leads to a very high furnace efficiency, although the writer in the test he made of these boilers, did not have apparatus at hand sufficient to determine this definitely. During a six hour test with rice anthracite coal, 22.6 per cent ash, they developed 40 per cent overload (10 ft. rating) with an evaporation of 7.54 lb. of water from and at 212° per lb. of coal. During the intermediate four hours of the test, approximately 70 per cent overload was carried, the boilers delivering steam containing 1.3 per cent of moisture. The coal burned per sq. foot of grate averaged 20.8 lb. The piping is arranged to permit any section to be cut out for repairs and is extra heavy throughout.

Brown engines, made by C. H. Brown, of Fitchburg, Mass., are in use. They consist of three pairs of 18 x 36-in. cross connected engines direct connected to 400-kw. alternators. Each pair develops normally 600 i. h. p. and revolves at 115 r. p. m. These engines are handsomely finished and are massive looking machines. In plants where an extremely fluctuating load occurs, compound engines are found to be not much more economical in steam consumption than simple engines; neither are they so quick to catch a load. These facts together with cheap coal and simplicity of plant led to the adoption of single expansion non-condensing engines. It was decided, however, in the interest of parallel operation to connect to each alternator two engines, with cranks 90° apart, rather than one, in order to obtain a more uniform turning moment. Flywheels 15 ft. in diameter and weighing 60,000 lb. were used to assist parallel operation and decrease the shock on engines when, as often occurs, 50 per cent overload is suddenly thrown on or off. In spite of the

for delivery to the sub-stations where it is stepped down to 390 volts. All switching is done on the low tension side of the transformers. The transformers are connected permanently to the line, and may be considered a part of the line, although each can be disconnected by means of bayonet switches and flexible leads. In the district where the road is located lightning discharges are very severe. Both ends of the line are protected by choke coils and low equivalent arresters, and the transformers add a further protection to the generators and converters. The transmission line is made up of

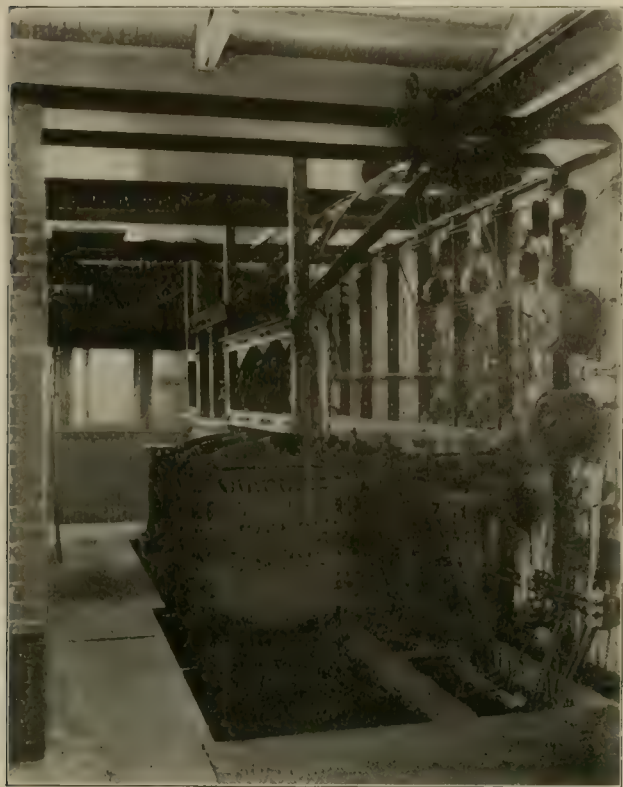


COAL TRESTLE.

three bare copper wires No. 4 B & S gage, forming a triangle with 30-in. sides. The insulators are glass, with a double petticoat, of which the larger one measures 7 in. in diameter. The insulators are supported by locustwood pins 7 in. long above the cross-arm and 2 in. in diameter in the shank. The pins are boiled in paraffine. This line has been thoroughly reliable and has never given the slightest trouble since it started in operation, nearly a year ago.

Two permanent sub-stations are at present provided, one at the power house and one at Nuangola, each equipped with one 400-kw. converter and foundations for one additional. These converters deliver current at 625 volts to the contact rail and are compounded

to maintain constant voltage and approximately unity power factor. In addition to the permanent sub-stations is a portable 400 kw plant which is usually located in the power house on tracks provided for it, as the heaviest demands for current occur at this point, due to a passing point in front of the station. This portable plant which was designed to care for special conditions and emer-



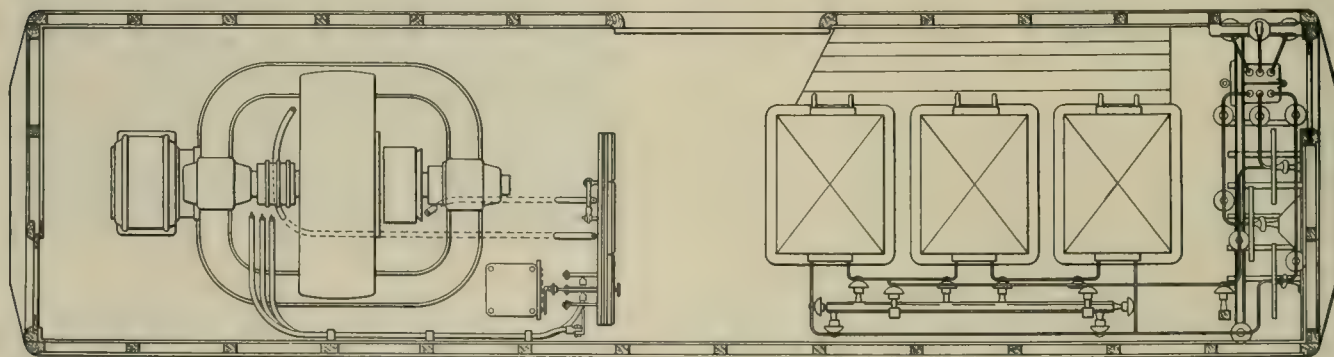
BACK OF LOW-TENSION SWITCHBOARD.

gencies, has already demonstrated its usefulness in an emergency, and will be further described. Including a constant load on the converters at St. Johns of 160 amperes, which will be explained later, the average load on these rotary converters is approximately 165 kw. or 41 per cent of the capacity of the machine. The maximum demand approaches 100 per cent overload, and some general instructions regarding running have to be given to operators on cars to prevent exceeding 100 per cent overload on the sub-station at Nuangola and causing the circuit breakers to open. The

cent of the maximum swings. The regular schedule consists of a car each way every hour and calls into use three cars. A 5-car service giving a car each way every half hour has been put into operation with great success. The maximum demands on the converters at St. Johns were not materially increased. At Nuangola sub-station the maximum demands were increased about 20 per cent. This may seem surprising, but a glance at the profile will give a very fair explanation of it. The average load on the two generator units that are normally used was very much improved. Of course, overloads occurred, but the generators generally carried about full load and the fuel economy of the station was very much improved. The management is contemplating the immediate addition of another converter at St. Johns and Nuangola and the erection of a complete new sub-station near Ashley on a proposed extension. This will permit the operation of two motor cars in a train when desirable.

A feature of this system, namely, the portable sub-station of 400 kw. capacity, intended to care for special conditions, such as excursions and emergencies, is very interesting. The layout of this car is illustrated. The plant is installed on a car especially designed for the purpose, and is equipped from an operative standpoint exactly similar to the other sub-stations. The rotary converter, switchboard and lightning arresters are the same with slight modifications to suit the conditions. The length of the car is 36 ft., width 9 ft. 6 in. Sections of the roof over the transformers and rotary converter come off to enable the machinery to be handled by the crane in the power house. The distribution of the apparatus leaves ample room for the attendant to examine the machinery and move freely about the car, although, of course, no room is wasted. The total weight of the machinery is about 51,000 lb. The transformer cases are made very high to prevent oil overflowing and running out on the floor on account of the movement of the car. Long poles are provided to hook connection onto the transmission lines at any point alongside of the track. Bayonet switches complete the connection to the car and an oil break switch furnishes a reliable means of opening or closing the connection between the transformers and the high tension line.

From Ashley to Nuangola the distance is 6.5 miles. From Nuangola to St. Johns the distance is 10.8 miles. The contact rail between these last two points is continuous and the converters at the respective points feed into each end of the rail. The voltage at the Hazelton end of the line, which is 8.35 miles distant from St. Johns power house, is held up by tying into the Lehigh Traction system at Hazel Park until a proposed sub-station to be located at that point is completed. This latter sub-station will, when completed, care for the local traction system, and the present power plant, which is d. c., will be dismantled and sold. A rather interesting bit of operating experience is covered in the tying of these two plants together electrically. The schedule of the local traction system comprises usually about 8 cars operating



PLAN OF PORTABLE SUB-STATION CAR.

objection to running converters with the circuit breaker set at 100 to 125 per cent overload is when a real short circuit occurs on the line the circuit breakers come out with such a rush of current that the machine is sometimes thrown out of step and the polarity reversed. Some delay then, of course, occurs in getting back into circuit. In connection with this fact is a very important point for the engineer to consider in systems where the average load is such a small per

under a pressure of 525 volts. As often occurs with a small number of cars, some are standing and the others are drifting. The generated potential at St. Johns power house is 625 volts, and it was feared that under these conditions the St. Johns plant would motorize the Hazelton plant when moments of no load occurred, and the attempt to tie the two systems together was made with some caution. Strange to say, the Hazelton generators were

found to be able to stand just enough current, without racing, to cause the line to drop to equalize the voltages of the two plants. Occasionally the generators show evidence of motorizing current when not expected, due to throwing off the load, but never to any injurious extent. The operators at Hazelton know when to expect heavy loads from the big cars on the Wilkesbarre & Hazelton road, and are on the alert to pull their machines out if necessary. When the last car from Wilkesbarre reaches Hazelton at 12:30 a. m., all the Lehigh Traction cars are in, and the operator at Hazelton has to stand ready to pull his machine out when the car shuts off power at Hazel Park, else the higher voltage at St. Johns coupled with the inductive kick of the rails on the inter-urban line may cause trouble. The crew of the car open the switch tying the systems together, and continue into town. The St. Johns plant usually carries about 160 amperes, as already mentioned, of the load on the Hazelton plant, thereby helping the latter pull the big cars in and out of town. The operative results of tying the two plants together have been very satisfactory. A little trouble sometimes experienced with the controllers on the cars of the Lehigh Traction Co., when operating near Hazel Park, is the only objection.

A telephone system is installed, which includes a special portable outfit in each car, and plug-in boxes are placed every quarter of a mile along the line. The telephone line is No. 10 hard drawn copper wire run on separate poles and transposed to meet requirements. Separate poles were deemed advisable because of the danger to operators from broken lines, should the telephone circuit be on the same poles with the high tension line. Heavy gongs are placed at each siding in order that cars passing over the line can be reached by signal from the office.

The management has not yet decided upon the block signal system to be installed. As already mentioned, it is the purpose to provide every possible safeguard for the operation of the road at high speeds without jeopardizing life or property of patrons, and a careful investigation of the practical operation of several systems is being made by the engineers of the company.

As soon as an efficient signal system has been installed the telephone system will be made use of to control the movements of cars out on the line. In the meantime cars operate by schedule and are allowed to pass each other only at scheduled passing points. This is very safe railroad practice, but of course lacks flexibility, as one late car can throw the whole schedule late. Regular duplicated orders are given operator and conductor. Future telephone dispatches will be received on the same regular form in triplicate, signed by the conductor and motorman or engineer, each retaining a copy, and the third being sent to the dispatcher's office.

With the exception of the first 10 miles, the country traversed by this route is rather sparsely settled, and the road was originally developed as a through passenger scheme. Considerable local passenger traffic has developed together with a continually growing freight business. Freight will be handled by a locomotive until the business warrants electric equipment. Freight connections are made at Hazelton with the Lehigh Valley and the Pennsylvania Railroads, and can also be made with the Central Railroad of New Jersey, the Delaware, Lackawanna & Western and the Delaware & Hudson, at Wilkesbarre. A traffic agreement now exists whereby passengers are exchanged with the Lehigh Valley Railroad. Baggage rooms and express and ticket offices are provided at both ends of the route. As there are no agents at intermediate points, express matter is prepaid and delivered on the platform at owner's risk.

As previously mentioned, some extensions, including a new sub-station at Ashley, are contemplated which will enable the company to independently control the movement of its cars from one end of the route to the other. In the not distant future a spur about a mile long will be constructed from a point near Nuangola to Triangular Lake. The latter is a beautiful sheet of water up among the hills, and although in the past it has been quite inaccessible, is quite a summer resort.

Mr. Alvin Markle, president and general manager of the Lehigh Traction Co., of Hazelton, also of the system here described, gave the road much personal attention. L. B. Stillwell, consulting engineer, of New York, as chief engineer of the company, was responsible for all designs and equipment, and the entire road was built under his direction. The other officers of the company are: George Thompson, general superintendent; A. F. Hargar, traffic manager, and C. A. B. Houck, superintendent of motive power and machin-

ery. During the construction period, the writer was much associated with Mr. Houck and to him many thanks are due for assistance in preparing this article.

Fuses and Circuit Breakers in Transmission Lines.*

ALTON D. ADAMS.

Fuses and circuit breakers alike are intended to break connections without the intervention of human agency under certain predetermined conditions. In the fuse the heat generated by a certain current is sufficient to melt or vaporize a short length of special conductor. In the circuit-breaker a certain current gives a magnet or motor sufficient strength to overcome the pressure of a spring, and contact pieces through which the current is passing are pulled apart. The primary object of both the fuse and the circuit breaker is thus to open connections and stop the flow of energy when more than a certain current passes. When any current passes through a circuit in the reverse of its regular direction the circuit breaker can be arranged to break the connections, though the fuse cannot. A fuse must carry the current at which it is designed to melt during some seconds before enough heat is developed to destroy it, and the exact number of seconds for any particular case is made a little uncertain by the possibility of loose connections at the fuse tips which develop additional heat and also by the heat conducting power of its connecting terminals. A circuit breaker may be set so as to open its connections in one or more seconds after a certain current begins to flow, with a high degree of accuracy. When connections are broken by a fuse the molten or vaporized metal forms a path that an arc may easily follow. A circuit breaker with its contacts under oil offers a much smaller opportunity than a fuse for the maintenance of an arc. These qualities of fuses and circuit breakers form the basis of their general availability and comparative advantages in transmission circuits.

Much variation exists in practice as to the use of fuses and circuit breakers on transmission circuits. One view often followed is that fuses and circuit breakers should be entirely omitted from the generator and transmission lines. The argument in favor of this practice is that temporary short circuits due to birds that fly against the lines or to sticks and loose wires that are thrown onto them will interrupt all or a large part of the transmission service if fuses or circuit breakers that operate instantly are employed. On the other hand, it may be said that if fuses and circuit breakers are omitted from the generator and transmission circuits a lasting short circuit will make it necessary to shut down an entire plant in some cases until it can be removed. Electric transmission at high voltages became important before magnetic circuit breakers competent to open overloaded circuits at such voltages were developed. Consequently the early question was whether a transmission line and the generators that fed it should be provided with fuses or be solidly connected from generators to the distribution circuits of sub-stations. The original tendency was strong to use fuses in accord with the practice at low voltages. The great importance of continuous service from transmission systems and the many interruptions caused by temporary short circuits where fuses were used led to their abandonment in some cases. An example of this sort may be seen at the first Niagara station. In 1893, when this station was equipped, no magnetic circuit breaker was available for circuits of either 11,000 or 2,200 volts, carrying currents of several thousand horse power, and fuses were employed in lines at both these pressures (*XVIII* A. I. E. E. 495, 497). The fuses adopted in this case were the same for both the 2,200 and the 11,000-volt lines and were of the expulsive type. Each complete fuse consisted of two lignum-vitæ blocks that were hinged together at one end and were secured when closed at the other. In these blocks three parallel grooves for fuses were cut and in each groove a strip of aluminum was laid and connected to suitable terminals at each end. Vents were provided for the grooves in which the aluminum strips were placed so that the expanding gas when a fuse was blown would escape. When these fuse blocks were new and the blocks of lignum-vitæ made tight joints the metallic vapor produced when a fuse was blown was forced out at the vents and the connection of the line was thus

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broken. After a time, however, when the joints between the blocks were no longer tight because of shrinkage the expanding gas of the fuse would reach the terminals and an arc would continue after the fuse had blown. These aluminum fuses which were adopted about 1893 were abandoned at the Niagara plant in 1898. Since this later date the 2,200-volt feeders from the No. 1 power house to the local consumers have had no fuses at the power house, nor have circuit breakers been installed there in the place of the fuses that were removed. At the large manufacturing plants supplied through these local Niagara feeders, the feeders formerly terminated in fuses, but these have since been displaced by circuit breakers. In the second Niagara power station, completed in 1902, the local 2,200-volt feeders are provided with circuit breakers, but no fuses. Between the generators and bus bars of the first Niagara plant the circuits were provided with neither fuses nor automatic circuit breakers and this practice continues there to the present time.

Besides the aluminum fuses in the 11,000-volt transmission line at the first Niagara station there were lead fuses in the 2,200-volt primary circuits of the step-up transformers that supplied these lines. At the other end of these lines, in the Buffalo sub-station, another set of aluminum fuses was inserted before connection was made with the step-down transformers. Between the secondary coils of these transformers and the 550-volt converters there were no fuses, but these converters were connected to the railway bus bars through direct current circuit breakers. These lead fuses, which contained much more metal than those of aluminum, when blown set up arcs that lasted until power was cut off by opening a switch and usually destroyed their terminals. An effort was made to so adjust the sizes of the fuses in this transmission system that in case of a short circuit in distribution lines at Buffalo only the fuses in the sub-station would be blown, leaving those at Niagara entire. This plan did not prove effective, however, and a severe overload on the distribution lines in Buffalo would blow out fuses clear back to the generator bus bars at the Niagara station.

In order to accomplish the opening of overloaded circuits with greater certainty, to delay such opening a little where the overload might be of only a momentary nature, and to confine the open circuit to the lines where the overload exists, automatic circuit breakers were substituted for the fuses named in the Niagara and Buffalo transmission system. This system was also changed from 11,000 to 22,000 volts on the transmission lines, thus rendering the requirements as to circuit opening devices more severe. These circuit breakers were fitted with time-limit attachments so that any breaker could be set to open at end of any number of seconds after the current flowing through it reached a certain amount. A circuit breaker with such a time-limit attachment will not open until the time for which it is set, after the amperes flowing through it reach a certain figure, has elapsed, no matter how great the current may be. Moreover, if the overload is removed from a line before the number of seconds for which its time-limit circuit breaker is set have elapsed, the circuit breaker resets itself automatically and does not open the connections. If a circuit breaker is set to open a line after an interval of say three seconds from the time when its current reaches the limit, the line will not be opened by a mere momentary overload such as would blow out a fuse. By setting the time-limit relays of circuit breakers in transmission lines to actuate the opening mechanism after three seconds from the time that an overload comes on, and then leaving the breakers on distribution lines to operate without a time limit, it seems that the opening of breakers on the distribution lines should free the system from an overload there before the breakers on the transmission lines have time to act. Such a result is very desirable in order that the entire service of a transmission system may not be interrupted every time there is a fault or short circuit on one of its distribution lines. This plan was followed in the Niagara and Buffalo system. In the 22,000-volt lines at the Niagara station the time relays were set to actuate the breakers after three seconds, at the terminal house in Buffalo, where the transformers step down from 22,000 to 10,000 volts, the circuit breakers in the 11,000-volt lines to sub-stations had their relays set to open in one second. Finally the circuit breakers in the distribution lines from the several sub-stations were left to operate without any time limit. By these means it was expected that a short circuit in one of the distribution circuits from a sub-station would not cause the connections of the underground cable between that sub-station and the terminal house to be broken, because of the instant action of

the circuit breaker at the sub-station. Furthermore, it was expected that a short circuit in one of the underground cables between the terminal house and a sub-station would be disconnected from the transmission line at that house and would not cause the circuit breakers at the Niagara station to operate. It is reported that the foregoing arrangement of circuit breakers with time relays failed of its object because the breakers did not clear their circuits quick enough and that the time limit attachments on the 22,000 and 11,000-volt lines are no longer in use (*XVIII A. I. E. E. 500.*). As the circuits under consideration convey thousands of horse power at 11,000 and 22,000 volts it seems probable that time limit devices with circuit breakers would give good results under less exacting conditions. Time limit relays are no doubt an important aid toward reliable operation of transmission systems, but they are subject to the objection that no matter how great the overload they will not open the circuit until the time for which they are set has run. In the case of a short circuit the time limit relay may lead to a prolonged drop in voltage throughout the system which is very undesirable for the lighting service and also allows all synchronous apparatus to fall out of step. With a mere momentary drop in voltage the inertia of the rotating parts of synchronous apparatus will keep them in step. For these reasons it is desirable to have circuit breakers that will act immediately to open a line on which there is a short circuit or very great overload, but will open the line only after an interval of one or more seconds when the overload is not of a very extreme nature. This action on the part of circuit breakers at the second Niagara power station was obtained by the attachment of a dash pot to the tripping plunger of each circuit breaker (*XIX A. I. E. E. 543*). With moderate overloads of a very temporary nature this dash pot so retards the action of the tripping plunger that the circuit breaker does not open. When a short circuit or great overload comes onto a line the pull on the tripping plunger of the circuit breaker on that line is so great that the resistance of the dash pot to the movement is overcome at once and the line is disconnected from the remainder of the system.

The fact that a circuit breaker may be designed to open the line which it connects, whenever the direction from which the flow of energy takes place is reversed, is taken advantage of at some sub-stations to guard against a flow of energy from a sub-station back towards the generating station. By this means a flow of energy from a sub-station to a short circuit in the line or cable connecting it with the generating plant is prevented.

Alternating Current Railway Motor.

An interesting description of a new alternating current street-railway motor has been reported by Consul General Mason, of Berlin, who states that in that city there has recently been in daily operation a car driven by a new motor built by the Union Electric Co., of Berlin. This motor derives its energy from a single phase alternating current of 6,000 volts carried on a single overhead trolley wire, the current being delivered to the motor without conversion to a lower voltage or to a continuous current. The report states that this experimental car is of the ordinary size and can be run at any desirable degree of speed, and that it does not require any conduit or expensive regulating devices.

The question of extreme high speed is not involved in this experiment, but rather the transmission of a single phase alternating current at a voltage (6,000 volts in this case) sufficient to carry it over a long line on a small-sized wire and the direct use of the current without transformation by a motor capable of running economically at any desirable speed and which fulfills all the requirements for electric traction. The feature demonstrated by the tests mentioned is the effectiveness of the new motor for electric railway work; no sparking or other technical difficulties have thus far developed. Such a system, of course, eliminates the use of sub-stations, with their heavy initial outlay and operating expenses, and may apparently be applied to lines several hundred miles in length. The present tests are over lines three or four miles in length, and it is believed that the new motor will open the way to economical long distance electric traction on railways of standard capacities.

The Muncie, Hartford & Fort Wayne Traction Co. has increased the wages of conductors and motormen according to length of service.

Some Features of the Butte, Mont., Electric Ry.

BY J. R. WHARTON, GENERAL MANAGER.

The Butte Electric Railway Co. is a reorganization made in 1901 of the Butte Consolidated Railway Co., which in 1891 effected a consolidation of the then existing electric railways of Butte—the Butte City Street Ry. which was started as a horse and cable road in 1887 and changed to electricity in 1889, and the Metropolitan Ry., an electric line built in 1889. The company at present has 11.57 miles of single track, 6.27 miles of double track, and .30 mile of sidings, making a total of 24.41 miles, measured as single track.

Butte is a city of 57,000 population and is recognized as the

The fare is 5 cents, except on the Columbia Gardens line where it is 10 cents, and heretofore no transfer privileges have been extended. It is the belief of the management that transfers would increase traffic to such an extent as to make their use profitable, and it has been decided to offer universal transfers as soon as a satisfactory form of ticket is chosen, possibly by December 1st.

The passenger equipment of the company includes two closed double truck cars with 24 ft. bodies mounted on Taylor trucks, equipped with four Sprague motors; four open 16 bench double



VIEW OF BUTTE FROM BIG BUTTE, LOOKING SOUTHEAST SPRING OF 1902

"greatest mining town in the world"; it is the only "brick mining camp" and lies in the north half of a crater just west of the "Continental Divide." The central point of the city, Main and Park Sts., where all cars of the street railway pass is 5,700 ft. above sea level, and thence the town extends up hill to the north, down hill to the south, and both up and down hill to the east and west.

The electric railway lines are all comparatively short measured from this central point, the longest haul being to Columbia Gardens, 3.48 miles, to the east. The central portion of the city has car tracks on three east and west streets and on four north and south streets; two lines extend north to portions of the city known as Centerville and Walkerville, respectively, the terminus in Walkerville being 6,172 ft. above sea level, a rise of 472 ft. to be overcome in about three miles of track, and these routes are fully as crooked as they are steep; south there are three lines to reach the Butte Reduction Works, the Colorado Concentrator, the principal cemeteries and the race course, and cross connections give more than one route to several of these points.

truck cars 37 ft. over all with four G. E. 52 motors each; 19 closed single truck cars, 12 with 16-ft. bodies and 7 with 18-ft. bodies, and 11 single truck open cars. Two of the large open cars were rebuilt from steam dummies and two were built by the company in its own shops. The motors on the smaller cars are G. E. 52 except on five of the closed cars which have G. E. 1,000. The trucks except for the large closed cars were built by the company.

One of the accompanying illustrations shows the double truck of this type, which differs very slightly in general design from the single truck. This engraving also shows the toggle brake that is applied to all passenger car trucks, the toggle arms for the single truck brake are longer so that the adjustment can be made by a turn buckle instead of having to disconnect the arm from the brake shoe as in the drawing shown.

Ordinarily about 17 cars are operated, giving cars at intervals of 10 to 20 minutes during the busy part of the day and about half as frequently during the forenoon when traffic is lighter.

While the company has a power plant located in the southern

part of the city, adjacent to the shops, current is purchased from the Butte Lighting & Power Co. at prices that effect a saving of approximately \$1,000 per month as compared with the operation of a steam plant. The steam plant has five 200 h. p. boilers, and a 26 x

the switchboard is the only portion of the plant used in operating the railway; eight circuits (one for the car house and shops) are fed from this board, and a ninth is fed direct from the lighting and power station.



SUMMER CAR BUILT BY BUTTE ELECTRIC RY.

48-in. Hamilton-Corliss engine direct connected to a 500-kw. Siemens-Halske generator and a double 18 x 42-in. simple engine to which was formerly connected by rope drive a 225-kw. General



INTERIOR OF CAR HOUSE

The electric railway system of Butte, Mont., is perhaps best known by reason of two features, the hauling of copper ore down a grade that in places is steeper than 10 per cent, and the Columbia Gardens, the company's pleasure resort. Both of these features



COLUMBIA GARDENS

Electric generator. The smaller generator has been removed to the plant of the power company.

Save a portion of the boiled plant used for heating the shops,

have been mentioned in the "Review" but one cannot appreciate the Columbia Gardens and what they mean to the people of Butte without knowing the contrast they present to the surroundings.

The sombre background furnished by Butte and vicinity is something that has not been dwelt upon in connection with former references to the Gardens.

The Gardens were opened as a beer garden about 1882 and were purchased by the railway company in 1890, since which date

Butte and even the surrounding mountains can show but little except a few stunted pine trees and sage brush. While the markets of Butte have everything that grows nothing is raised at home.

Columbia Gardens have been developed with the idea of providing not only a pleasure resort for the adult population but also an educational institution for the children who otherwise would have only the vaguest idea of how vegetables, fruits and flowers appear while growing.

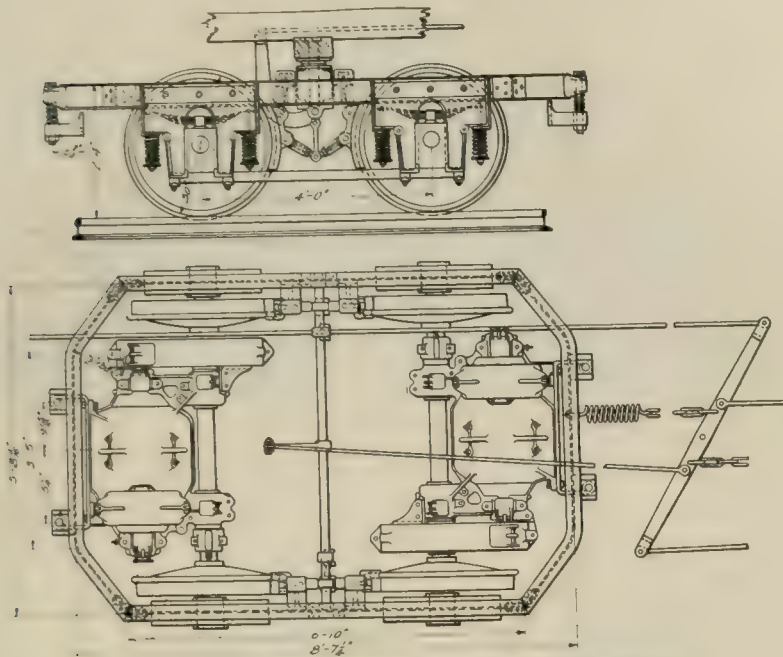
Senator Wm. A. Clark, the president and principal stockholder of the Butte Electric Railway Co., has taken a keen personal interest in the Gardens, and encouraged what would be called extravagance in the management, were this a money-making enterprise.

The principal building at the Gardens is the pavilion, with the front view of which the readers of the "Review" are familiar. The most recent addition is an athletic field, with the finest baseball grounds and grandstand in the West.

At the main pavilion is a dancing hall in the upper floor, and below an "amusement parlor" which is rented as a concession, where are various slot machine attractions; one wing of the lower floor is leased for a high-grade cafe (in the matter of restaurants Butte demands the best). The company has expended large sums in making a collection of minerals and has what is without doubt the finest such collection in the state; this is arranged in cases located on the main floor of the pavilion, and is carefully cataloged.

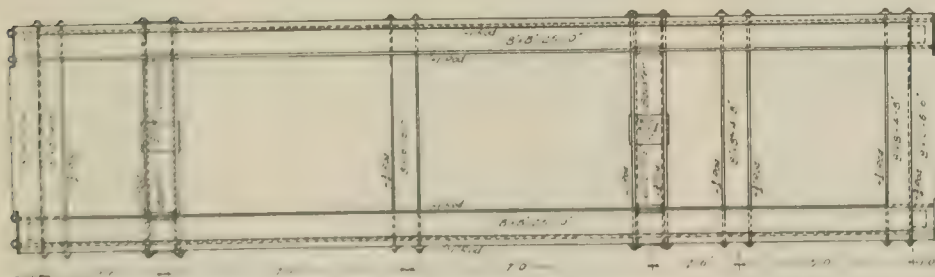
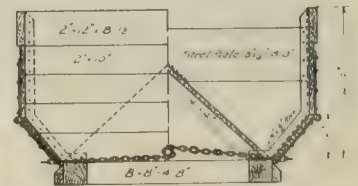
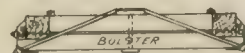
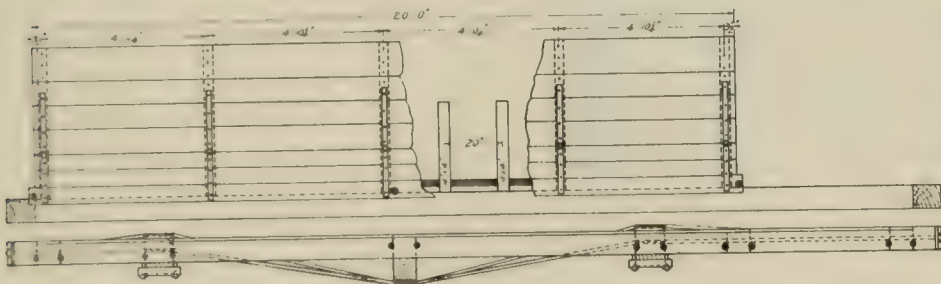
Near the railway terminal is the animal house with wolves, coyotes, badgers, porcupines, foxes and other native animals, and in nearby enclosures are deer, goats, rabbits, elk, bears and various species of native birds.

In the rear of the pavilion are the greenhouses having in the aggregate 10,000 sq. ft. under glass, where are started the flowers, which when transplanted to the outdoor beds, make the Gardens so



STANDARD DOUBLE TRUCK WITH TOGGLE BRAKE.

A great deal of money has been spent in purchasing additional ground and in improvements. The present Gardens comprise about 75 acres lying at the base of the mountain, 3 1/2 miles from the



PLAN AND ELEVATION OF ORE CAR

center of Butte. There is a double track line with a loop terminal in the ground.

Because of the light rainfall and the presence in the valley of the ore matter, there is almost absolutely no vegetation of any kind in

beautiful in summer. Roses, carnations and pansies are especial favorites and do exceedingly well, the pansies attaining a diameter of 3 1/2 in.

The treasure of the Gardens is a small stream of water which

flows down the mountain and is hoarded in an artificial basin, and made to do repeated service in the fountains on the grounds and used for irrigating the lawns and flowers.

Admission to the Gardens is free, and no charge other than for transportation is made by the railway company, the ball games being under the auspices of the League, which charges an admission fee of 25 cents to the ball park.

Arbor Day, a day designated by the governor, usually early in May, is a special holiday for the school children of Silver Bow County, all of whom, by courtesy of the Butte Electric Ry. and the steam railroads entering Butte, are carried from their homes to the Gardens and back free of charge. Appropriate exercises are held and then follow a ball game and sports of different kinds, including ludicrous prize contests designed to furnish the maximum of amusement to the children. On Arbor Day in 1903 over 8,000 children were at the Gardens.

During July and August the management sets apart one day, usually Thursday or Friday, as "Children's Day," when all children of school age in Butte are carried to the Gardens and back for 5 cents each, which also includes entrance to the ball game. Perhaps the most gratifying thing in connection with the operation of the park is the fact that the children appreciate what the company is trying to do for them, and thousands of children are given the freedom of the grounds and greenhouses with the assurance

During the season of 1903 some 400,000 passengers were carried on the Gardens line. The record for the quick handling of traffic was made on October 13th when 6,500 men were hauled two miles in 70 minutes, only 20 cars being in service.



POWER HOUSE, CAR HOUSE AND SHOPS.

The Butte Electric Ry. carries ore from three mines, Clark's Original, the Stewart and the West Stewart, down hill to the smelter; the distance is $1\frac{1}{2}$ miles, and the average grade 6 per cent, being $11\frac{1}{2}$ per cent for one block. At the instance of the city most of the ore hauling is done during the night. For this traffic there have been used eight single truck cars, about 10 tons capacity, equipped with two Sprague motors each; these are operated in trains of three with one man on each car.

There have just been completed three new ore cars built after the plans of Mr. J. S. Wathey, superintendent of the company. These cars are of 60,000 lb. capacity, mounted on Taylor double trucks and equipped with four G. E. 52 motors, Christensen air brakes. These three cars will be operated in one train, with the Type M control, the front and rear cars each having a motorman's cab.

The plan of covering a street car with signs and placing a band inside and running it through the streets for advertising purposes is in vogue in several cities, but last summer Mr. Adolph Heilbronner, the company's advertising agent, introduced an improvement, which has made the Butte advertising car more popular with advertising patrons and cheaper to operate. The change was to substitute for the band a merry-go-round organ driven by a 2-h. p. electric motor.

The big day in the history of the company was when "Bryan was



BALL PARK—COLUMBIA GARDENS.

that no harm will be done to trees or flowers. Towards the close of the summer, the latter part of September, free flower days are instituted and visitors are at liberty to carry away with them all the flowers they care to take. Signs are displayed which read: "Pick all the flowers you want but do not destroy the others."

On Sundays and holidays the Boston and Montana Band, an



TERMINAL LOOP AT COLUMBIA GARDENS.

organization of national reputation, formed by employees of the Clark mines, furnishes music.



A CHILDREN'S DAY AT BUTTE.

in Butte" in 1896, and all comparisons are made with that day. In 1902, 5,314,002 passengers were carried and 259,500 tons of ore

hauled to the smelter. Receipts from passengers were \$277,634.76; from freight, \$50,405.20; total, \$334,030.00.

The officers of the Butte Electric Railway Co. are: President,



FREE FLOWERS AT COLUMBIA GARDENS.

W. A. Clark; vice-president, Francis E. Sargent; secretary and treasurer, J. C. Kennedy; general manager, J. R. Wharton; superintendent, J. S. Wathey.

Car Repairs.

BY W. E. PARTRIDGE.

When the subject of car repairing comes up for discussion before the general manager, one important question is generally disregarded, because it is taken for granted that the answer is in the affirmative. That question is, "Have we cars enough to repair?" In other words, are there cars enough on the road so that one, or any number that may be necessary, can be sent to the shops for overhauling? The road which every day uses every car it owns during the rush hours has not cars enough to enable it to successfully keep its rolling stock in repair. It makes no difference whether the number be four or four hundred, having none to spare from its daily service, it has an insufficient number to enable it to do repairs. Ordinarily the reply to this is there are two complete equipments of cars, the open for summer, the closed for winter, and every car has the opportunity to go into the shop once a year. This is partly true, but on many large systems there are branches where one set of cars are used the year round, and where each car is in service every day. If the two equipments are barely sufficient to operate the road during the rush hours, the rule holds good in spite of the fact that the cars may be taken in every season.

Elegantly equipped repair shops are very desirable, but in some cases the money they cost can be better invested in the purchase of spare cars. One of the finest repair equipments in the country is merely an ornamental appendage to a very extensive system, because there is practically no spare rolling stock. In winter nearly every closed car sees service every day and on some of its lines every car is operated every day in the year. This road has repeatedly been forced to buy new cars to replace those that could have been kept in service by overhauling at proper times. A surprisingly large number of street railways are in such a condition that judicious repairs are out of the question. The superintendent who can take in all his cars into the shop at the moment when they need an overhauling, regardless of the time of the year, is an exception rather than a rule. Of course it is to be understood that such repairs as take ten or twelve hours are not to be considered. These can be put through between night and morning or perhaps between morning and evening.

The ideal condition of the street railway is to have such a number of cars that whenever it is necessary to take one from service that it can go into the shops for sufficient length of time to put it in a sound condition. This, of course, requires a considerable number of cars over and above those necessary for the rush hour, and until this service is obtained, the repair plant is somewhat of sec-

ondary consideration. Car bodies permanently go out of service for one of four reasons. They may wear out, they may be injured by accident, they may be destroyed or they may go to pieces on account of poor workmanship and repairs. Wearing out is a purely theoretical reason because electric cars have not been in service long enough to determine what their length of life will be. Well-cared for horse car bodies, after years of service have been fitted with motors and trolley poles and are still in good condition, apparently as good for service mechanically as they were twenty years ago. Such cars offer the best possible proof that repairs thoroughly executed at the time when needed practically eliminate depreciation of the structure. There seems to be no probability that they ever will wear out. When they disappear it will be for other reasons. Accident destroys a small proportion of our closed car bodies. The results of poor workmanship can be avoided by the most careful repairing, but decay, which is the great enemy of the street car, can be completely taken care of by prompt repairs. The origin of decay in the street car is moisture—the one great enemy of all wood construction, and when from any cause moisture gains access to the frame work of the street car, the damage is almost beyond repair. One of the primary objects is to prevent entrance of water. One of the advantages of a large storage capacity in the car barn is to keep cars when out of service protected against the weather, especially against driving rains. No matter how careful the rules may be made relative to the closing of cars left out doors instead of in proper storage, it is found that moisture enters, and that head-linings and framing become saturated when standing. When standing still the damage is very much greater than it is when the cars are in operation.

Clamor of the master painter to be allowed to take cars into the paint shop, when he considers them in need of paint or varnish or touching up, is not founded so much on the appearance of the paint or the condition of the varnish, as on the knowledge that both paint and varnish are open at seams and points and permit water to reach the frame.

When cars are never housed their destruction is unaccountably rapid. A few ventilators carelessly left open may cause the destruction of the ceiling in a storm of a single night.

Rigid roofing inspection and frequent painting are needed not because there are leaks which the passenger notices, but to insure the absolute tightness of the roof and protection of the frame. Under no conditions should moisture be allowed to penetrate to the interior. The highly seasoned woods used in our car construction are extremely sensitive to moisture. Tightly fitted joints when wet swell, compress and crush their fibers. Their strength is reduced and at the same time decay follows rapidly. The reason why the car should be watched so closely is because frames are elastic, yielding to a certain extent in all directions. Frequently, after a few months of use, paint and varnish cease to be sufficiently elastic to resist movements at the joints, and cracking begins at the edge of the panel strips, etc. For this reason, the painters' services are frequently needed. Paint and varnish, however, do not follow any regular rules. It is impossible to say that every car can be safely kept in service for so many months. When the paint gives way is the time that repair is necessary. Then is the time cars require immediate attention. It is no excuse to say that the body has just left the shop. A blow upon a corner post may have opened a joint and the repair is needed as soon as an opening appears through which the water may enter. There are numerous accidents mechanically trivial which demand immediate repair, not that the car cannot be run for months without attending to it, but if the body is to retain its full strength, the work must be done before decay sets in, or before the frame has had time to change its shape or lose its strength.

"It may be the natural thing to do to call a newsboy on the car when you want a paper and the boy being a boy, is always ready to take the risk. But please do not do it. In the first place there is a city ordinance which forbids newsboys riding on the cars. It is a highly dangerous game and the accidents of the past are what suggested the ordinance and made its passage necessary. The conductors of the company are ordered impressively to see that this ordinance is rigidly enforced and they are called to account for any violation thereof. The boys will come if they are called. So don't call them. Buy your paper before boarding the car."—Extract from Detroit United Weekly. Issued by Detroit United Ry.

Street Railways in Lima, Peru.

In order to encourage patronage a curious fare system has been put into effect in Lima, Peru, by the Compañia del Ferrocarril Urbano de Lima. A conductor is given a number of books containing 100 tickets each and is charged with the amount represented by the number of books received. On payment of a fare the passenger is presented a ticket which is in reality a lottery ticket having a chance



OFFICE AND BARNS, URBAN STREET RY., LIMA, PERU.

of winning £50 or less at the prize drawing held at the end of the current month. The back of the ticket is used for advertising purposes, which brings in a handsome revenue to the company. Each passenger is entitled to either a ticket or a transfer, but not to both



CINCO CENTAVOS

AGOSTO

TICKETS AND TRANSFERS USED IN LIMA. (SIZE OF ORIGINALS 2 X 3½ IN.)

The system serves the purpose of a fare register, or a check on the honesty of the conductor, of inducing patronage by the use of the lottery ticket, and of producing revenue by the advertising feature. As will be seen by the accompanying illustrations, the date of use



CAR NEAR DESCALZOS PARK, LIMA

of the ticket is shown by the usual punch mark. The hour of the day is shown on the transfer by a slit torn in the margin of the ticket. Tickets are also issued to passengers in book form at reduced rates. This ticket is taken up by the conductor instead of

the usual fare, but the stub bearing the lottery number remains in the passenger's keeping.

Lima is a city of about 14,000 population, situated nine miles



FRONT OF EXPOSITION BUILDING, LIMA, PERU.

from the coast on an extensive plain elevated 561 ft. above the ocean. The city is built in the form of a triangle, the longest side lying along the bank of the river Rimac. It is said to be the handsomest city in South America. The streets are at right angles with each other and cars run the full length of the city, returning on the next parallel street. Free transfers are given to cross-town lines; the fare is cinco centavos, or about 2½ cents.

An electric line is now in course of construction between Lima



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and its seaport, Callao, a distance of nine miles. It is being built by the Compañia Ferrocarril Electrico de Lima y Callao, of Lima, which was recently organized with a capital of £100,000. There will be seven miles of double track and three miles of single track. The grading was begun about the middle of August by Messrs. Bolan & Dillon, of Lima. The contract for the track material and equipment has been awarded to W. R. Grace & Co., also of Lima. The electric equipment will be furnished by the General Electric Co. The cars are to be of the closed type, each with a seating capacity of 40 persons, and are being built by the J. G. Brill Co. The power will be furnished by the hydro-electric plant of the Empresa Electrica de Santa Rosa, Lda., of Lima. This company is constructing its power plant at Chosica, 26 miles from Lima on the Rimac River. It is expected that the road will be in operation in January, 1904.

The officers of the company are: President, Giobatta Isola; general manager, Mariano Prado; chief engineer, A. L. Kenyon.

Embarrassing Stunts.

"When one enters the front door of a car and starts sauntering down the aisle for a seat, there is apt to be a bit of unannounced comedy. The car starts in the opposite direction from that in which one is walking. Then one takes steps ten feet long, grabs at picture-hats and derbies, and when one has a fair collection of assorted headgear one is apt to sit in some one else's lap, usually of the opposite sex. All that is diverting to the passengers, but embarrassing to the performer. It is easily avoided. Stand still and hold your equilibrium by a support until the car has gathered its headway—that's all."—Extract from Detroit United Weekly, Issued by Detroit United Ry.

Recent Street Railway Decisions.

EDITED BY J. L. ROSENBERGER, ATTORNEY AT LAW, CHICAGO

DUTY TO ASCERTAIN AND REMOVE CAUSES WHICH MIGHT DERAIL CARS.

Louisville Railway Co. vs. Hartlege (Ky.), 74 S. W. Rep. 742.
June 4, 1903. "Not to be officially reported."

The law requires carriers of passengers by rail, the court of appeals of Kentucky holds, to know, or exercise, the highest degree of care consistent with the proper and prudent conduct of their business to ascertain, and remove, causes which might derail their cars and injure their passengers.

REQUIRING SEPARATE ACCOMMODATIONS FOR WHITE AND COLORED PASSENGERS.

State vs. Pearson (La.), 34 So. Rep. 575. Mar. 10, 1903. Rehearing denied May 14, 1903.

The supreme court of Louisiana holds that it was competent for the general assembly to require street railway companies to provide separate but equal accommodations for white and colored passengers using their cars, and to enforce same by penalties imposed upon the officers of such companies in case of their neglect of this legal duty.

RISK OF FALLING ACCOUNT OF WEAKNESS OF OLD POLES ASSUMED BY LINEMAN—NO DUTY OF INSPECTION ON COMPANY.

Kellogg vs. Denver City Tramway Co. (Colo. App.), 72 Pac. Rep. 609. May 11, 1903.

The risk of falling on account of the weakness of old poles, the court of appeals of Colorado holds, was a risk of the business, which the plaintiff assumed by his contract to work as a lineman for the defendant; and, as between the plaintiff and the defendant, the defendant was under no obligation to inspect the poles to see whether they were decayed and unsafe.

DUTY OF MOTORMAN IN CHARGE OF CAR TO LISTEN FOR SIGNALS TO STOP—EVIDENCE OF MOTORMAN BEING ANGRY WITH PASSENGER ADMISSIBLE.

Fuller vs. Denison & Sherman Railway Co. (Tex. Civ. App.), 74 S. W. Rep. 940. May 2, 1903. May 30, 1903.

Where there was no conductor on a car, but the motorman was in charge, the court of civil appeals of Texas holds that it was the duty of the motorman to use reasonable care in listening for the usual signal to stop the car and give passengers an opportunity to alight, and his failure to perform this duty would constitute negligence. It also holds that testimony as to the motorman demanding fare from the passenger after it had been paid and getting angry with him was relevant, as tending to show that there was ground for the passenger's belief that the motorman would carry him downtown unless he got off at the time he did, while the car was in motion, the company having pleaded that he was guilty of contributory negligence in leaving the car at the time and in the manner he did.

MUNICIPALITY CANNOT QUESTION VALIDITY OF LEASE BY COMPANY AUTHORIZED TO LAY TRACKS WITHOUT ITS CONSENT.

Minersville Borough vs. Schuylkill Electric Railway Co. (Pa.), 54 Atl. Rep. 669. Apr. 27, 1903.

Where a railway company was chartered by act of assembly and had the right to lay its tracks in the borough, without municipal consent, the supreme court of Pennsylvania holds that the question of whether it had a company which had been using its tracks by agreement had no effect upon its power, in entering into an agreement

for the use or lease of the tracks could be raised only by the commonwealth. In other words, it says that it was properly held that whether any of the above companies exceeded their lawful authority by becoming a party to the contracts entered into was a question of excessive exercise of power by a corporation, for which it was amenable to the commonwealth, but not to a private suitor or another corporation, unless such suitor had sustained a private injury, or such corporation had had its rights and franchises invaded; and that this plaintiff had not sustained such injury.

STEPPING FROM BEHIND OBSTACLE ONTO TRACK—DOCTRINE OF PRESUMPTION FROM INSTINCT OF SELF-PRESERVATION.

Ames vs. Waterloo & C. E. Rapid Transit Co. (Ia.), 95 N. W. Rep. 161. May 25, 1903.

Where five or six covered wagons, described as "movers' wagons," followed one after the other close to the street railway track, and a man stepped from behind the last of the wagons toward the track, without taking any precaution whatever to anticipate or avoid the danger incident to his own act, and was struck by a car, the supreme court of Iowa holds that he was conclusively guilty of negligence. It says that had there been no evidence whatever as to the circumstances surrounding him at the time his injury was received, or as to how the accident occurred, the presumption would have been entertained that, prompted by the instinct of self-preservation, he was taking reasonable precautions for his own safety. But several witnesses saw him just as he stepped forward from behind the moving wagon and was struck by the car, and the fact that there was such evidence as to what occurred prevented the presumption which would otherwise have been drawn from the instinct of self-preservation from being entertained. In other words, where there is direct evidence as to the circumstances of the accident the presumption is not to be entertained.

SALE TO ANOTHER COMPANY PARTLY FOR BENEFIT OF DIRECTORS FRAUDULENT AND VOID AS AGAINST CREDITORS—PRESIDENT TAKING BONUS HOLDS SAME IN TRUST—PROVISION AGAINST CONSOLIDATION OF COMPETING RAILROADS NOT APPLICABLE TO STREET RAILWAYS.

Scott vs. Farmers' & Merchants' National Bank (Tex.); 75 S. W. Rep. 7. June 15, 1903.

It appearing that the directors of a street railway company, or at least some of them, owned lands near the terminus of the railway, and that a part of the consideration of the sale of the company to another company was the promise on the part of the purchaser to operate a street railway to that point for the term of five years, and it further appearing that this stipulation was made for the benefit of the directors of the first company, which was at the time insolvent, the supreme court of Texas holds that the conveyance was fraudulent and void as against the creditors of the first company.

If the president of a company, who was also its promoter, without salary or other compensation, rendered services in the advancement of the enterprise, and if he furnished his own money to construct the road, the court says that this may have entitled him to compensation by the company, but it did not entitle him to take and hold the property of the corporation as his own, unless authorized to do so by the corporation itself. And it holds that where he took title to property the consideration for the conveyance of which was the construction and operation of the railway he held it in trust for the company.

Section 5 of article 10 of the constitution of Texas, which provides that no railroad or other corporation, or the lessees, purchasers or managers of any railroad corporation, shall consolidate the

stock, property or franchises of such corporation with, or lease or purchase the works or franchises of, or in any way control any railroad corporation owning or having under its control a parallel or competing line, etc., the court is of the opinion applies to railroads proper, and not to street railways. It says that section 7 of that articles does apply to street railways, and there they are specifically named. Ordinarily, when we speak of a "railroad," we mean a railroad over which freight and passengers are transported from one town or city to another; when we speak of those roads on which passengers are transported over the streets of a town or city, we call them "street railways."

INSUFFICIENT LOCATION OF RAILWAY TO GIVE AUTHORITY FOR OCCUPATION OF STREET FOR CONSTRUCTION PURPOSES.

Lenox vs. Dover, Somersworth & Rochester Street Railway (N. H.), 54 Atl. Rep. 1022. Feb. 5, 1903.

Where a company's charter required that the questions of whether the public good required the construction of the railway upon a particular street, and, if so, where upon the street, should be determined "in like manner as highways are laid out," and one of the provisions as to the laying out of highways was that the selectmen should make their decision in writing, and cause the same to be recorded, which decision should be of no force until this was done, the supreme court of New Hampshire holds that the requirements of the charter had not been complied with, and the company was not authorized to occupy the street for construction purposes, the vote of the selectmen or corresponding municipal authority of the city in terms having granted nothing more than a "general location," while the subsequent votes and conduct of the city council showed conclusively that there was no location or record thereof, within the meaning of the statute, until long after the time in question, when the plaintiff was injured.

DUTY OF DEAF PERSON WALKING ON TRACK TO LOOK BACK—RIGHT OF MOTORMAN TO ASSUME THAT PERSON ON TRACK WILL HEAR WARNING BELL AND STEP ASIDE—DUTY TO PERSON OBLIVIOUS OF DANGER OR UNABLE TO SAVE HIMSELF.

Shanks vs. Springfield Traction Co. (Mo. App.), 74 S. W. Rep. 386. Apr. 28, 1903.

The court of appeals at St. Louis, Mo., says that the plaintiff was undoubtedly guilty of negligence in walking on the car track, when he was deaf, without looking back frequently to see if a car was coming; but, in view of the recent decisions on the last-chance doctrine, it was for the jury to say whether the motorman discerned that the plaintiff was likely to remain on the track, and in danger of being run over, soon enough to stop the car before it overtook him.

Ordinarily a motorman or locomotive engineer is justified in assuming that a person on a railway track will hear a warning bell or whistle, and step aside in time to escape harm from an approaching car or train. But measures must be taken to save an individual in that situation as soon as his behavior or any other circumstance signifies that he is oblivious of the danger, and cannot be aroused in time to save himself, or that he is conscious of the danger, but unable to save himself. As to just when it becomes the duty of a motorman or engineer to begin to put his car or engine under control, is the essential question in every such case, and is commonly one for the jury to answer, as is the further question of whether that duty was performed with reasonable diligence.

RULES FOR ASSESSING A COMPANY'S REAL ESTATE FOR PAVING.

Chicago Union Traction Co. vs. City of Chicago (Ill.), 67 N. E. Rep., 383. April 24, 1903. Rehearing denied June 5, 1903.

The position was recognized in this case as being correct that certain lots, parts of lots, and blocks owned by the company, against which it was asked that a special assessment for paving be confirmed, were held and owned by the company only for railroad purposes and uses, and that the company could not lawfully apply said property to any other use or purpose than such as was necessary to the operation

and maintenance of its railway, and that, in this view, on the question of whether the property had been assessed more than it would be benefited by the proposed improvement the evidence should be confined to the proof of benefit which the improvement would confer to the property for the special use to which it was restricted. But as to lots which the company had leased out for manufacturing purposes the supreme court of Illinois holds that evidence of benefits not based on the restricted or limited use of the property by the company was correctly admitted. The leases contained clauses authorizing the company to cancel them upon six months' notice, but the court is unable to see that the right to so cancel the leases established that the property was only temporarily devoted to private business uses and purposes. Land taken in satisfaction of debts due a corporation, or held in violation of law, not for corporate use, the court says, may be benefited by an improvement, and, if so, should be required to bear its ratable burden of making the improvement. Furthermore, in arriving at an opinion as to the benefits which would accrue to the company's property by the construction of the proposed pavement, the court holds that there was no error in admitting testimony as to the benefit which would accrue from enabling the firemen of the city, with their engines, to more speedily reach the hydrant or fire plug in front of the company's car barn.

INJURY TO BOY RIDING ON SIDE STEPS OF FREIGHT CAR ON TRACK CLOSE TO STREET RAILWAY—FAILURE OF MOTORMAN CONFRONTED BY SUDDEN DANGER TO FOLLOW WISEST COURSE.

Ackerman vs. Union Traction Co. (Pa.), 55 Atl. Rep. 16. May 4, 1903.

A motorman as soon as he saw a boy riding on the side steps of a freight car, where the tracks of the two roads were parallel and so close that there was a space of only a few inches between the sides of the cars as they passed, called to the boy and made gestures to indicate that he should jump off the step, or climb on the bumper at the end of the car, which was one foot from the step. This warning was disregarded. The boy attempted to avoid injury by straightening his body and keeping close to the side of the car. He was struck on the shoulder, thrown to the narrow space between the tracks, and injured by the wheels of both cars. In this situation the supreme court of Pennsylvania finds nothing from which negligence on the part of the motorman could fairly be inferred. It says that he first saw the boy when the distance between them was 150 feet, and they were approaching each other at the rate of at least 15 or 20 miles an hour. With a clear understanding that the boy would be injured unless he got out of the way of the electric car, the motorman called and motioned to him to jump off or climb on the bumper. Possibly, under the circumstances, it would have been better to stop the car, and thus lessen the injury, than attempt to avert it altogether; but, since he was confronted by a sudden and unexpected danger, and had but a moment in which to act, the motorman could not be held liable for failure to see and follow what might appear on reflection to have been the wiser course.

SUSPENSION OF OPERATION OF FENDER LAW BY COMMISSION INVALID—FAILURE TO PROVIDE FENDERS OR OTHER VIOLATION OF STATUTE OR ORDINANCE EVIDENCE OF NEGLIGENCE.

Henderson vs. Durham Traction Co. (N. C.), 44 S. E. Rep., 598. June 6, 1903.

Conceding for the purpose of this opinion, only, that the portion of the North Carolina act of 1901 requiring fenders which authorizes the state corporation commission to make exemptions from the provisions thereof in such cases as in their judgment the enforcement of the same is unnecessary is constitutional, the supreme court of North Carolina says that it thinks, by a proper construction, the extent of the power conferred upon the commission is one of exemption, and not of suspension, and that an order exempting all street railway companies from the provisions of the act as to fenders, until otherwise ordered by the commission, operated, if valid, to suspend the statute, and exceeded the power conferred by the statute, and was therefore invalid. This left the act in force, and the duty of the street railway companies to provide fenders as prescribed by the act. The failure to do so, the court goes on to say, was evidence

proper to be submitted to the jury upon the question of negligence, and as to the proximate cause of the injury. If the jury should so find, as a fact, that the failure to have the fender was the proximate cause of the injury (that is to say, that the plaintiff would not have been injured if the defendant had provided its cars with fenders), and that the plaintiff was guilty of contributory negligence, or, if guilty, that the defendant had the last clear chance to prevent the injury, the plaintiff would be entitled to recover. After a careful examination of a number of authorities, the court is of the opinion that the sound doctrine is that a violation of the public statute or a city ordinance is evidence of negligence, to be submitted to the jury.

DUTY OF CONDUCTOR GETTING ON MOVING CAR TO AVOID COMING IN CONTACT WITH PASSENGER ON STEPS.

Fleming vs. St. Louis & Suburban Railway Co. (Mo. App.), 74 S. W. Rep. 382. Mar. 3, 1903. Rehearing denied April 28, 1903.

The evidence for the plaintiff tended to show that when a car on which he was a passenger reached a railroad crossing it stopped about a minute, at a point where cars going in that direction always stopped, where there was a platform and where passengers regularly got on and off the cars, and that on this occasion a number of people got off, and he was in the act of getting off, when the car was started up with a jerk and moved ahead rapidly, in consequence of which he concluded to wait until the railroad tracks were passed before getting off, and remained on the steps of the platform, holding to the car, when, as the car was passing over the railroad tracks, the conductor who had gone ahead at the crossing and signaled the motorman, boarded the car at the rear platform, and in doing so collided with the plaintiff, and his legs became entangled with those of the plaintiff, causing the latter to be thrown to the ground and injured. The court of appeals at St. Louis, Mo., holds that the jury would have been warranted in finding the conductor guilty of negligence from the circumstance that in getting on the car he both struck the plaintiff and so interfered with his footing on the steps as to throw him to the ground. It says that the plaintiff's position on the steps of the rear platform while the car was moving rapidly was perilous. His position was seen by the conductor, and it was negligence in him to increase the plaintiff's peril by coming in contact with him as he mounted the steps. His duty was to avoid contact with the plaintiff, and, if he could not mount the steps without colliding with the plaintiff, then he should have remained off the car, or boarded it at some other place of ingress.

LIABILITY FOR INJURY TO PASSENGER FROM ROTTEN PLANK IN PLATFORM BUILT BY THIRD PARTIES—ONE MAY ASSUME OFFICIALS HAVE TAKEN PRECAUTIONS TO INSURE SAFETY—BURDEN OF PROOF WHERE INJURY OCCURS FROM BREAKING OF APPLIANCE—DUTY TO KNOW EFFECT OF TIME AND WEATHER ON APPLIANCES AND TO INSPECT AND RENEW SAME.

Leveret vs. Shreveport Belt Railway Co. (La.), 34 So. Rep., 579. April 13, 1903. Rehearing denied May 25, 1903.

This action was brought to recover from the defendant, a street railway corporation, for injuries which the plaintiff sustained by the giving way of a rotten plank in a covered platform used as a station. This platform or pavilion was built by real estate agents interested in the sale of suburban property, and the railway company contended that it was therefore not liable for the injuries received. But the supreme court of Louisiana holds that parties embarking on or alighting from railway trains upon the invitation, express or implied, of its officials, are justified in acting upon the assumption that the officials have taken proper precautions to insure their safety. Where an accident happens to a passenger by the breaking of one of the railway company's appliances, the burden is upon it to show affirmatively a condition of things which would exonerate it from liability. A railway company is bound to know of the effect of time and weather upon its appliances. It should, by proper inspection, and timely changes and renewals, keep them safe. Even should a railway company be under no direct obligation to repair or keep in good condition the bridges or streets along its line of way, it should avoid stopping its cars at places where it is not safe for passengers to em-

bark or alight. It should either stop its cars short, or pass them beyond the danger point. A railway company which uses as a station for embarking or disembarking its passengers a pavilion constructed upon a street, is liable to a passenger for injuries received from the breaking of a rotten plank in the steps leading to the cars, whether the station was constructed by it or not. It is liable as a licensee.

DUTY TO CHECK SPEED OR STOP CAR TO PREVENT COLLISION WITH PERSON ON OR NEAR TRACK LIMIT TO RAPID-TRANSIT RIGHTS OF PUBLIC.

Schaefstette vs. St. Louis & Meramec River Railroad Co. (Mo.), 74 S. W. Rep., 826. April 1, 1903. Rehearing denied May 27, 1903.

It is true, the supreme court of Missouri, division No. 1, says, that street cars are not compelled to check up every time a person approaches a track, but it is equally true that if a person is on or so near a track that a car cannot pass without a collision, and the operative of the car sees, or by the exercise of ordinary care can see, the condition of danger of such person, it is his duty to check the speed of the car, or even to stop the car entirely, to prevent injury to the person. This duty is just the same as between street cars and a citizen as it is between any two citizens when using a street.

The traveling public has no right to demand such rapid transit on streets of a city as to amount to negligence in the running of the car. The citizen who is not in such a hurry, but is exercising ordinary care while upon the street, has rights that are just as sacred in the eye of the law as those of the hurrying crowds who demand such rapid transit, and if a street car company heeds the demands of the latter class, and thereby negligently injures the former, it must stand the consequences.

It is not true, as a matter of law, and *prima facie* cannot be true as a matter of fact, the court more specifically holds, that it is negligence for a citizen to cross or drive upon and along a street car track when a street car is 500 feet away, although it may be coming in the same direction, and running at the speed of 5, 10, or even more miles an hour, when the track is straight, and the operative of the car can easily and plainly see that such person is in such a position. In such case, particularly where the citizen turns onto the track and drives upon or close to it, with his back to the approaching car, it is the duty of the operative to check the car and avoid the accident, and if a collision occurs it is *prima facie*, if not altogether, owing to the negligence of the operative of the car.

VALIDITY OF CONDITIONING GRANT ON BUILDING OF BRANCH—POWER TO IMPOSE REASONABLE CONDITIONS IMPLIED—DELAY IN COMMENCING PROCEEDINGS FOR FORFEITURE NO BAR THERETO.

Minersville Borough vs. Schuylkill Electric Railway Co. (Pa.), 54 Atl. Rep., 1050. April 20, 1903.

The grant of the right to the railway company to occupy a street was on condition that within one year the company should construct and operate a branch railway from such street. The ordinance contained the following provisions: "The right above granted to the said company to construct and lay a track on Sunbury street or maintain the same where already constructed shall be forfeited by said company and its successors unless a track is constructed, maintained and operated into and along Heckersville Valley to Scott's Store, in Glen Carbon, within one year of the acceptance of this ordinance by the Schuylkill Electric Railway Company." "All rights and franchises heretofore and hereby granted on any of the streets of said borough to said railway company shall be void unless the said company shall construct, maintain and operate a railway on Sunbury street and a branch into Heckersville Valley to Glen Carbon under the rights and franchises granted by the said borough."

The supreme court of Pennsylvania holds that the condition imposed by the ordinance was a reasonable one. It says that this condition was expressly accepted by the railway company, and it became a contract between the parties, by which the right to occupy the street was regulated, and it was binding upon the defendants. The power of the borough to give or refuse consent to the occupa-

tion of its streets was unqualified, and the power to impose reasonable conditions was necessarily implied. The company having failed, without adequate reason, to perform a condition on which the grant was made, the court affirms a decree declaring the right to use the street forfeited, etc., with leave to the court of common pleas to fix such a time for the removal of the tracks of the railway company, and the restoration of the street to the condition it was in before they were laid, as, under the circumstances, might be deemed reasonable and just. The officers of the borough having given notice that they would insist upon the building of the branch road, the supreme court holds that delay in commencing proceedings was indulgence, only, which led to no prejudicial change in the situation, and did not give rise to an estoppel.

NEGLIGENCE IN RIDING ON PLATFORM OF INTERURBAN CAR IN OPEN COUNTRY SAME AS ON STEAM RAILROAD—NO RECOVERY IN CASE OF DERAILMENT—RULE NOT ALLOWING PASSENGERS ON PLATFORM REASONABLE—NO LIABILITY FOR INJURY TO PASSENGER PURPOSELY VIOLATING RULE.

Cincinnati, Lawrenceburg & Aurora Electric Street Railroad Co. vs. Lohe (Ohio), 67 N. E. Rep. 161. Mar. 2, 1903.

The law of negligence, or, rather, of contributory negligence, of one riding upon a platform of a street railroad car, the supreme court of Ohio says, is not the same as of one riding upon the platform of a steam railroad car. An interurban electric railroad is classed as a street railroad by the statutes of Ohio. It seems reasonably clear that, while operating the cars of an interurban railroad within a municipality, the regulations and powers of a street railroad company are applicable; but when it comes to running cars of such railroads in the open country, upon a track substantially the same as the track of a steam railroad, and at a high rate of speed, it would seem that the same rules as to negligence and contributory negligence should prevail as are applicable to steam railroads, and that a passenger standing upon the platform of an interurban car in the open country should be held to the same rules as if he were standing on the platform of a steam car. The danger is the same in either case, and where there is no difference in danger there should be no difference in the care required, nor in the rights and liabilities flowing from the neglect to observe the proper care.

So the court holds that while interurban electric railroad companies are subject to the same regulations and have all the powers of street railroad companies, so far as applicable, the law of negligence governing the standing on a platform of a moving street car in a municipality is not applicable to the case of standing on such platform of a moving interurban car in the open country. The law of negligence governing the standing on a platform of a moving interurban car outside of a municipality is the same as in the case of steam cars; and where a rule of the company prohibits passengers from standing on the platform, and notice thereof is properly posted, or where the passengers, upon request, refuse to enter the car, there being in either case vacant seats, they remain on the platform at their peril.

Again, the court says that for an injury received by a passenger on a steam railroad by reason of a collision or derailment while standing upon the platform, in violation of the known rules of the company, there being vacant seats in the car, there can be no recovery against the railroad company. The authorities as to this seem to be uniform. In the present case the passenger was ordered into the car by the conductor, and requested to go in by the assistant conductor; there were vacant seats inside; a sign was up, "Passengers not allowed on the platform;" and yet he remained on the platform because he wanted to smoke a cigar. He remained there at his peril, and, even though the company may have been negligent in not preventing a derailment, he was also negligent in standing upon the platform. Those inside the car escaped without injury, and, if he had gone inside when ordered to do so, the presumption was that he, too, would have escaped. It was a case where it required the negligence of both himself and the company to bring about the disaster, and, where the injury is brought about by the combined negligence of both, both are without remedy.

Another reason why there could be no recovery in this case

upon the facts appearing in the record, the court says, was that the action was for a violation of the contract of safe carriage, and such a contract has implied therein that the passenger will obey the reasonable rules of the carrier. The rule against standing on the platform was a reasonable one, and this the passenger deliberately, persistently, and purposely violated, and that violation aided in causing the injury of which complaint was made. Having himself first violated the contract, and that violation having brought about the injury, he had no cause of action against the company for violating a contract by the terms of which he first refused to be bound.

CUTTING OFF ACCESS TO PRIVATE PROPERTY BY RAISING TRACKS ABOVE GRADE OF HIGHWAY—MEASURE OF DAMAGES—ABUTTER'S RIGHT OF ACCESS TO PROPERTY INVIOLEABLE.

Farrar vs. Midland Electric Railway Co. (Mo. App.), 74 S. W. Rep., 500. May 12, 1903.

The plaintiff alleged that subsequent to the time that he became the owner of certain real estate the defendant constructed and then maintained a street railway along the full frontage of his property, with the track and roadbed from four to six feet higher than the grade of the highway, and located on the side immediately adjoining the sidewalk line in front of his property, to the deterioration in value of the property, by obstructing ingress to and egress from it. The court of appeals at St. Louis, Mo., holds that the fact that the defendant's predecessor had constructed originally a track on the grade of the highway, which the defendant raised, and therefrom operated its railroad above the grade, did not require the plaintiff to aver that such latter work was a reconstruction or a change of a prior existing grade of its roadbed and track thereon; nor, in the absence of such allegations, was there any departure from the cause of action pleaded in the testimony that the defendant had constructed and then maintained its railway by elevating the roadbed above the established grade in the manner described.

The true measure of damages was clearly expressed in the instructions as the difference between the fair market value of the property immediately before the tracks of the railway were so raised, elevated, and maintained, and its fair market value after such tracks were so changed. Testimony, sought to be elicited by expressions of judgment by witnesses, real estate experts, of the probable value of the property without any railroad, was not admissible. Such evidence related to no issue presented, and any benefit from the railroad to the property involved was a general benefit common to all other property in the vicinity, which could not be deducted from the damages thereto; and no special benefit to the property affected was claimed or shown.

The right of the plaintiff, as an owner of property abutting on the public highway, to have free and undisturbed access to his property over the adjacent highway, was as inviolable and as sacred as his right to the property itself. The use of the adjoining highway was a property right of which he could not be deprived without just compensation. Although the defendant or its predecessor had received authority from the county court to locate and build its track on the highway, yet if, in constructing its roadbed thereon in front of the plaintiff's property, by making its roadbed and the grade of its track above the grade or level of the public thoroughfare, it impaired the usefulness of the highway to the plaintiff's ground by interfering with access thereto, the defendant was responsible for the loss to the plaintiff in the diminished value of his property.

According to reports in Pittsburg papers, the Pennsylvania R. R. is endeavoring to secure control of the Pittsburg Railways Co. Mr. J. H. Reed, vice-president of the Pittsburg Railways Co. and president of the Philadelphia Co., denies the possibility of such a change in ownership.

The executive committee of the American Railway Master Mechanics' Association has awarded the Joseph T. Ryerson & Son Scholarship in Purdue University to Arthur B. Marsh, of Boston, Mass. Seventeen candidates submitted to the prescribed examination, and Mr. Marsh was certified to by the University authority as having obtained the best results in his examination.

Car Shops of the St. Louis Transit Co.

The St. Louis Transit Co. has recently completed extensive new car shops located at the corner of Park and Vandeventer avenues which are unique in both design and engineering appliances. The most noticeable features of these shops and the ones which will be of the greatest interest to street railway master mechanics are the peculiar design of the building which provides a good even light over the entire area of the shops, the method of handling materials by means of overhead travelers and air hoists, the system of car hoists and the extensive use of compressed air through the shops for numerous operations.

These shops are used primarily as repair shops, but they are also to be considered as a complete manufacturing plant, as the company is constantly doing a large amount of work in the manufacturing of new trucks, special summer cars, etc., and has also made heavy electric locomotives. The new shops have only been com-

pleted and are specially convenient and are, we believe, in some respects unique. At each of the 27 sliding doors along this side of the building is a track, over the center of which is a channel iron forming a continuation of the trolley wire, which extends out to meet a similar channel running across the top of the transfer table. These channel irons are slightly flared where they come together, so as to avoid any possibility of the trolley jumping off at the junction. A trolley wire, from which the transfer table is operated, runs along the top of the channels on the building at their outer edge and is fastened on top of each channel by means of an ordinary trolley ear, which is inverted and fastened upon the channel iron. The transfer table trolley consists of two short arms running on top of this trolley wire, which are hinged together, forming an inverted V, and the two arms are connected by springs, which secure the necessary tension between the trolley wheel and the wire.



VIEW ALONG ONE SIDE OF SHOP SHOWING TRANSFER TABLE.

pleted a short time, and the machinery, which has been installed but about six weeks, was largely taken from nine other shops scattered about different parts of the city, all but two of which have been since abandoned as repair shops, thus concentrating all the work at one central point. The two other remaining shops will also be abandoned as soon as the rush of special work preparatory to the World's Fair next summer has been finished.

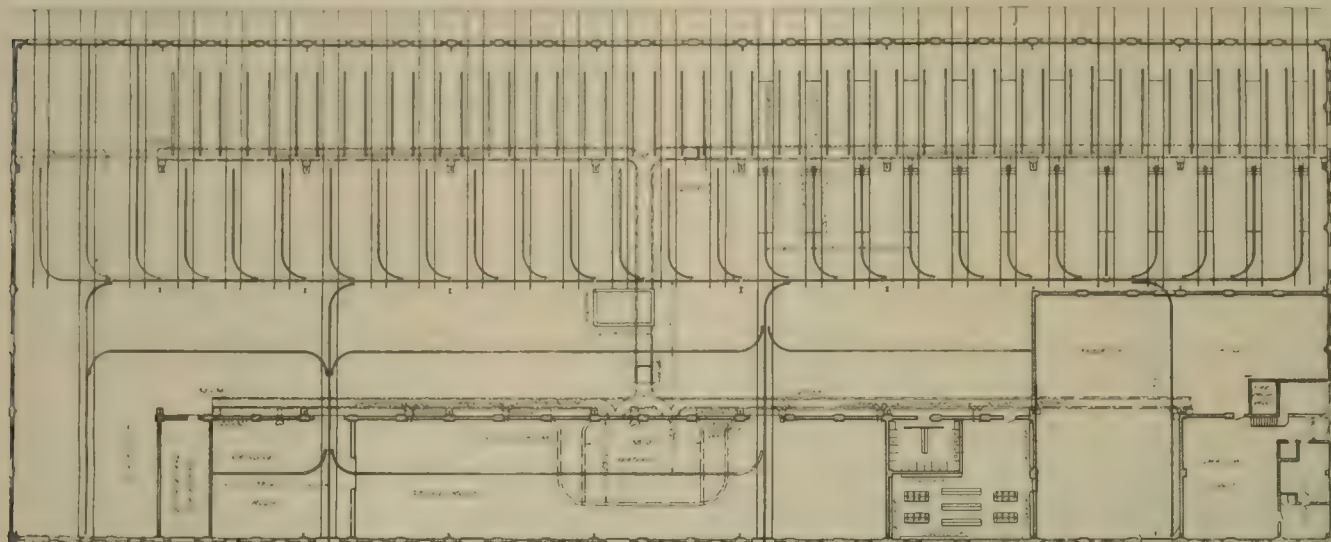
The new shop building is a large rectangular brick structure, 432 ft. long and 165 ft. wide, the general appearance of which is shown in the accompanying illustration. The roof, which is rather low, is of the saw-tooth pattern, which permits of rows of windows running crosswise of the building, thus securing an even distribution of light over the whole area. On one side of the building are three parallel tracks on which two long transfer tables capable of carrying the largest size car travel, and these are used for transferring the cars between 27 tracks, which extend for 80 ft. transversely across the building. The arrangement by which the transfer table is oper-

ated is by means of this arrangement cars are taken from the outside tracks at either end of the building and run onto any of the car house tracks without handling or paying any attention whatever to the trolleys on the car. The channel on top of the turntable is brought directly opposite the end of the overhead trolley wire when the transfer table tracks are brought into their proper position, and the car is then run onto the transfer table by means of its own trolley, which bears upon its flanges when it enters the overhead channel. When the transfer table is moved along to another track the car is simply backed out, its trolley running along the channel irons and thence passing onto the overhead lines inside of the barn without being handled in any way. The two transfer tables are identical in design and are each operated by a G. E.-54 motor and K-11 controller and are equipped with hand brakes. The transfer table is supported on three pairs of wheels, the two outside pairs being geared to a counter shaft which extends between the gears on the two axles. These wheels, axles, gears and journal

boxes are all of the same standard sizes that are used on the cars, and any of the parts can consequently be replaced at short notice in case of accident.

The general arrangement of the interior of the building is shown on the accompanying plan. The shop is divided by columns and

will obtain a better class of employees. Beyond this wash room is a long store room, in which new motors, repair parts, etc., are kept in stock and underneath this room is a basement in which the heating system for the plant is installed. Next to the store room comes the grinding room, in which the car wheels are bored and

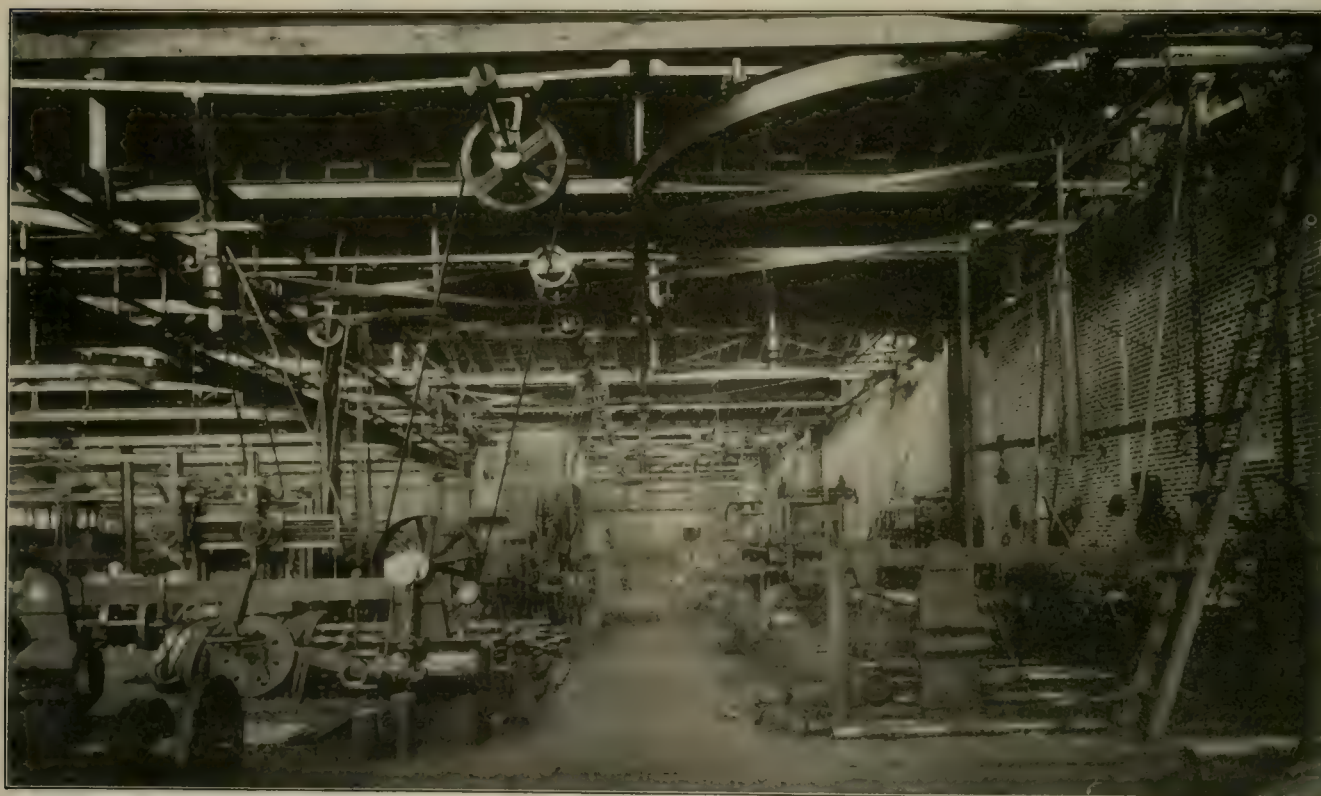


PLAN OF NEW SHOP OF THE ST. LOUIS TRANSIT CO.

a division wall into four main bays running the entire length of the building. One corner of the building contains the master mechanic's and clerks' office; beyond this comes an L from the armature room, next to which is a wash room and toilet room. The wash room contains rows of expanded metal lockers and enameled iron wash

basins fitted with open plumbing. Shower baths are also provided for the men in this department, it being the theory of the management that by providing opportunities for all the men to wash themselves thoroughly and present a neat appearance after leaving their work the men will have more self-respect and the company

various grinding operations are performed, next to which is a room containing the blower and exhaust fans for the heating system and the air pumps which supply the compressed air for operating many of the shop tools. The blower and exhaust fan were built by the Buffalo Forge Co., and are both mounted on the same shaft and



GENERAL VIEW IN MACHINE SHOP.

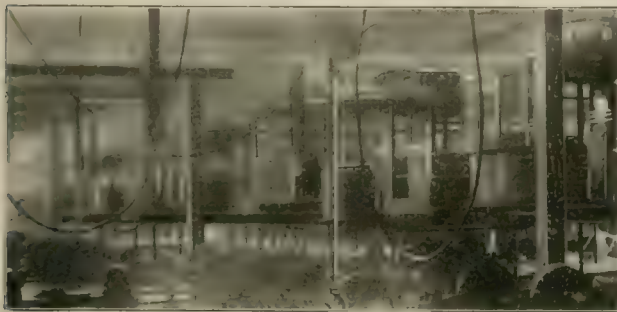
basins fitted with open plumbing. Shower baths are also provided for the men in this department, it being the theory of the management that by providing opportunities for all the men to wash themselves thoroughly and present a neat appearance after leaving their work the men will have more self-respect and the company

driven by an electric motor. The air compressors were made by the Rand Drill Co. and are 50-h. p. machines operating at 150 r. p. m. The air is compressed at about 125 lb. pressure. At the end of the shop beyond the blower and air pump room is an L from the blacksmith shop which extends out into the next parallel bay. The shop

contains nine forges, all of the down-draft type, several oil furnaces for heating large size parts and two Bement-Niles air hammers, one of 1,100 lb. blow and the other of 600 lb. The next bay on this building is used as a machine shop throughout its entire length. A general view of this portion of the shops is shown in one of the accompanying illustrations. In the foreground of this illustration will be seen some of the heavier machinery, such as machines for pressing wheels on axles, for bending the frames of trucks, for straightening axles and other heavy work. Most of these operations are performed by means of compressed air. The heavy planers and shapers are driven by individual motors, which are geared by means of chain drives. These have been found highly satisfactory and operate with practically no noise. The lathes and smaller machinery are generally driven from line shafting, one main shaft extending for the greater part of this bay and driven by an old-style Edison two-pole motor.

In the rear of this illustration is shown the department for controller repairs, and also that for the repairing of armature cores and other lighter parts. In the controller department the repair parts are all made by the company, the segments and contact fingers being stamped out of $\frac{1}{4}$ -in. stock, bent and drilled in jigs.

The next bay of the shop contains no machinery and is devoted to overhauling and assembling trucks, motors, etc., which are taken from the cars which stand on rows of jacks located along the last bay. This latter bay contains 27 tracks on 16-ft. centers, 24 of which are provided with special hoists, which will be described later. Twelve of these tracks are provided with pits, although it is the company's policy to eliminate pit work as far as possible, for the reason that work will be done more thoroughly and in less time by



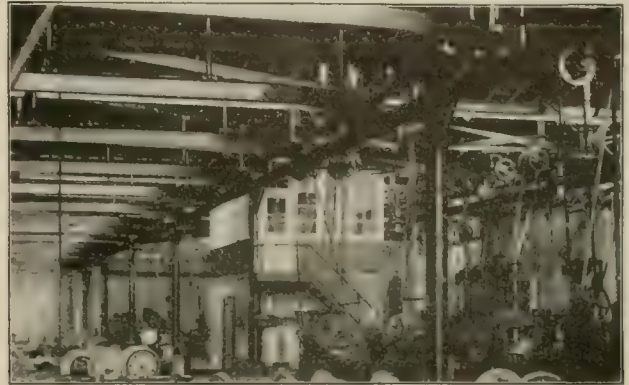
CARS ON CAR HOISTS.

removing the trucks and handling them from above than can be done where a man has to work looking upward and in the constrained positions which he must necessarily assume in working in a pit. These pits have floors on two levels, the end of the pit nearest the side wall of the building being 2 ft. deep and the other end being 5 ft. deep. The two levels are connected by cement steps and the whole of the pit is cement lined. In the deeper section of the pits the company is installing air hoists, by means of which the wheels and motors may be lifted from the cars and carried out in the clear section of the shop, where they will be picked up by other air hoists suspended from the overhead travelers and laid on the shop floor, where the repairs will be carried on. These pit air hoists are mounted on platforms, which in turn are carried on tracks along the bottom of the pit. The hoists also travel on transverse tracks on top of the platforms, which gives them a side play of about 1 ft. in order to make them adjustable under various parts of the cars. The pit tracks are also provided with car hoists.

Car Hoist.

There are 27 car hoists along one side of the building, and these devices form an important part of the equipment of this shop. The hoists are composed of two parallel 12-in. I-beams set on each side of the track which are slightly longer than the longest cars. Each of these I-beams is supported on two posts set near either end of the beam, the upper end of which is slotted to receive the web of the beam after the lower flanges have been cut away. The lower part of the posts are threaded and are provided with a nut which forms the fulcrum of the lever wheel. A fifth sprocket wheel, which is a driving wheel, is located in a pit between the tracks and is driven by a Springer motor car motor turned up on end. This

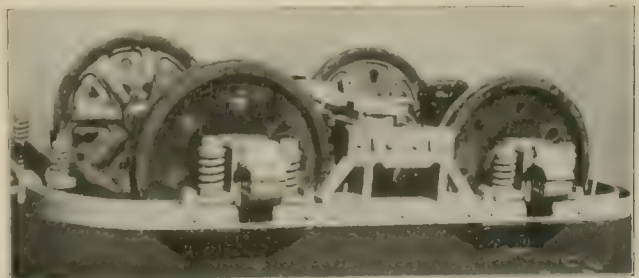
motor is mounted on a sliding frame to take up the slack of the chain. These five sprocket wheels are all connected with a sprocket chain, and the motor is operated by a type K street car controller set against the wall of the building adjacent to the hoist which it operates. When the sprocket chain is set in motion it turns the



PART OF OVERHEAD TRAVELER SYSTEM.

nuts on all of the four posts of the hoist at the same time, thus securing a perfectly even elevation of the hoist. The sprocket wheels are 4 ft. 6 in. below the floor line, allowing for a car elevation of about 4 ft., and the posts which are 5 in. in diameter are threaded at the lower end only, so that when the hoist is in its highest position the threads do not extend above the floor. When the hoist is lowered the lower ends of the posts go down into pipes closed at one end which are partially filled with oil. As the screw travels down in this pipe the oil rises around the nut in the sprocket wheel, thus making the device self lubricating. The sprocket wheels are equipped with ball bearings. The operation of these hoists is extremely smooth, and the car bodies can be raised to the full limit of the hoists in less than a minute. To support the cars on the hoists short pieces of old rail are passed underneath the car bodies, the ends of the rail resting on the I-beams. Should it become necessary to tilt a car, which is seldom required, this is easily effected by means of altering the position of the cross pieces on which the car rests. One of the illustrations shows a view of a number of cars raised up upon these hoists.

On one track at one end of the building, in line with the car hoists, the company is installing a special device for the grinding of flat wheels. This consists of a special car hoist composed of four columns which will support the truck directly under the journal. The car will be brought onto this track and raised just sufficiently to have its wheels clear the rail. A small section of about 12 in. of rail under each wheel will be removed and in these spaces will be placed emery wheels connected at either end of the shaft of an electric motor. The car wheels will then be run free



DUPONT TRUCK BUILT BY ST. LOUIS TRANSIT CO.

and the grinder will be brought up in contact with them, the motor driving the emery wheels being adjustable within a few inches, so as to thoroughly true up the wheels. In this way the wheels can be ground absolutely true, as they revolve on their own bearings, the same as when in use.

Overhead Traveler

Another important feature of these shops, and one which tends greatly to economy in handling material, is the overhead traveler

system part of which is shown in one of the illustrations. This system consists of main beams which are suspended from the roof of the building and upon the lower flange of which the travelers run. The installation of this overhead system is very com-



ELECTRIC LOCOMOTIVE BUILT BY ST. LOUIS TRANSIT CO.

plete, the tracks serving almost every portion of the shop floor. The main track of the overhead system runs the full length of the overhauling and erecting bay, and from this main track branch tracks lead to either side of the building, branches being located over each car track and over all of the heavy machines. The switches at each branch are controlled by means of chains which hang down just within the reach of the workmen. On the main track articles are generally raised on the travelers by means of blocks and falls, but on all of the branch lines air hoists are connected to the travelers and heavy parts are picked up by these air hoists and carried around from place to place in the shop by one or two men without the expenditure of practically any muscular energy. The practical utility and labor saving of this device is apparent when one man is seen to pick up a complete car motor or a pair of wheels and axle and carry them from one part of the shop to any other part with ease and in much less time than an overhead crane could be brought into play. It also has the added advantage of being independent of any floor tracks, so that at times when the entire floor is covered with trucks, motors, wheels, etc., any of the parts may be lifted up to clear whatever else is on the floor and be transported to any part of the shop without the necessity of moving any of the other machinery or apparatus on the floor. The switches in the overhead system lock automatically when they are in position, and stops are provided so that a traveler



"MOONLIGHT" CAR BUILT BY ST. LOUIS TRANSIT CO.

cannot possibly run off the track at an open switch. This system is in use for mounting heavy work on the lathes, planers and other machines, as well as for transferring it around the shops, and branches have been arranged with a view to serving this heavy machinery.

Shop Methods.

In addition to the usual repairs the company builds considerable new equipment complete, and is at present extremely busy in preparation for the unusual demands which will be occasioned by the World's Fair next summer. Four hundred and fifty new double truck car bodies are being built for the company by the St. Louis Car Co., and the trucks for these cars are being built in the new shops. These 900 trucks are being made at the rate of six per day, and it is noticeable in the building of these trucks that they have been so designed and the work has been so systematized as to require the minimum of manual labor. All of the rivet holes are punched in jigs or templates and the frames and other wrought iron parts are bent in special bending machines or in bulldozers and upsetting machines. There is practically no hand forging whatever in the construction of these trucks, nor any drilling or laying out of the work. Most all of this work is done with a single stroke of the machine. When the parts are assembled the frame is temporarily held together by driving taper pins through the rivet holes, by means of which the various parts are brought into position, where they are held by pneumatic clamps. The rivets are then heated in an oil furnace and one at a time the taper pins are driven out and the rivets inserted. The riveting is done by means of a pneumatic riveter, which is in reality a pneumatic press rather than a hammer. This riveter is carried on an air hoist by an overhead traveler and can be located in a moment wherever the work is to be done. When the air is admitted to the riveter the piston does the riveting in one stroke; this upsets the rivet and holds the work so tightly in place that loose rivets are impossible. The twelve rivets which are used in assembling the truck bolster can be all



FINISHING AND TESTING DEPARTMENT OF ARMATURE SHOP.

heated in the oil furnace, put in place and headed down in less than five minutes. The type of Dupont truck which is used by this company is shown in one of the illustrations, and the capacity of the shop may be judged from the fact that six of these trucks are being built per day in addition to the ordinary repair work of the shop and the assembling of new equipments for the 450 new cars. The company has also built an electric locomotive, shown in one of the accompanying illustrations, which is used in hauling coal cars to its power house. This locomotive is equipped with four motors and the G. E. type M control.

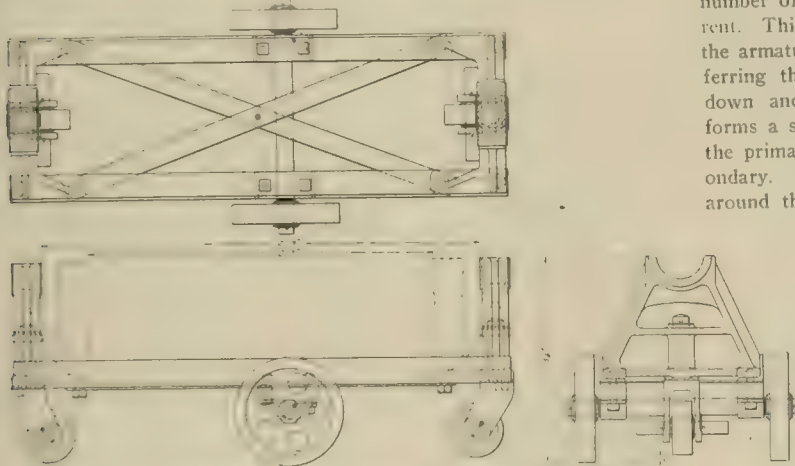
The company has also built a number of roofless cars, known as "Moonlight" cars, which have proved very popular. These cars have an overhead structure in the shape of arched iron pipes 1 in. in diameter which are fastened to wooden poles at the ends of the seats on each side of the car. The trolley board is of the ordinary size, but beneath it is a wooden channel $5\frac{3}{4} \times 5\frac{1}{2}$ in. in section, into which the canvas roof can roll after the manner of an awning. Canvas is laced onto the ends of the car, forming a hood at each end, and a rope on each side at the rear of the car controls the rolling and unrolling of the roof. The company has built ten of the cars, which operate both during the day and at night on the Creve Coeur line from Fourth and Olive Sts. to Creve Coeur Lake.

A new system is being developed in the repair department whereby a record of the mileage of each car is kept and cars are to be brought into the shop for general overhauling after they have made a certain number of miles. Heretofore it has been the custom to

leave cars out for a certain length of time regardless of the mileage made, and this has been found unsatisfactory, due to the fact that while some of the cars would be almost constantly in operation others would be used as trippers during the morning and evening rush hours and would, therefore, make but a comparatively small mileage during the same amount of time. The greater part of the repairs are necessitated by the wear in the bearings of the armature shafts, allowing the armatures to come in contact with the lower pole pieces, causing grounds and short circuits. By bringing in the cars for overhauling after they have run a certain mileage this difficulty of worn journal boxes and the attendant evils can be very largely eliminated. The company pours its own babbitt shells for both motor bearings and car journals. The new shop records which the company now has in course of preparation will include an accurate record of each car as it leaves the machine shop, will show the condition of all the different parts of the equipment, and also what work has been done and what renewals have been made when the car was last in the shop.

Armature Department.

The department in which the field and armature windings and testing is carried on is one of the most interesting departments of this shop, both on account of the amount and diversity of the work carried on here and the labor-saving devices and testing methods to be found in this department. The armature room is L-shaped, one part of it being chiefly devoted to the winding of field and armature coils on formers and the insulating and taping of these

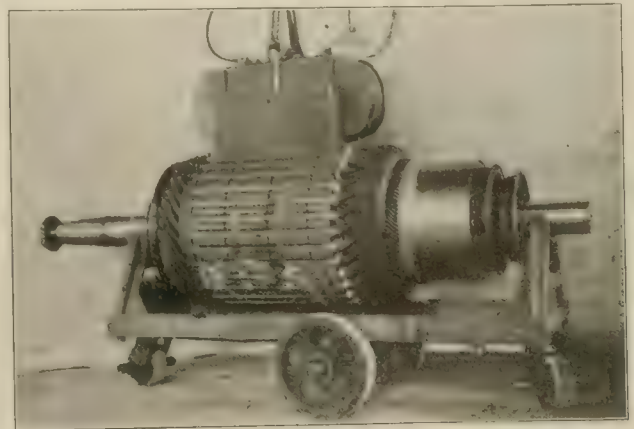


PLAN AND ELEVATION OF ARMATURE TRUCK.

coils, and the other part of the room containing the apparatus for the assembling and finishing of the armatures and the apparatus for testing. The company uses a large variety of equipments, which requires the use of a great many different coil formers, and in connection with all of the winding machines there is used a clutch mechanism which greatly facilitates the work of winding both the field and armature coils and of putting the bands on the assembled armatures. This device consists of a worm gear belted to the line shaft, between which is a friction clutch which is manipulated by the foot. The worm gear which drives the coil formers is brought into play by simply pressing a treadle which throws the clutch into action. As the reduction in speed of the worm gear is very large, the coil formers can be rotated as much or as little as desirable, a motion of an inch or two being readily made by simply touching the treadle for a moment. The device is extremely convenient, as the motion of the coil formers is regulated entirely by the foot, leaving the workman with both hands at liberty to handle his wires and tie up the coils. As the worm gear prevents any reverse motion of the coil formers, the wires are always kept taut.

After the coils are formed they are next passed to another bench, on which are a number of presses fitted with special templates for putting on fiber insulation. This is already cut in strips of proper sizes, is folded over the sides of the coil in the press, after which the edges are raised up and glued and again held firmly in place in the press. The coils are then passed on to the taping machines, where they are rapidly taped, this operation requiring less than a minute for each coil. When the armatures are assembled and

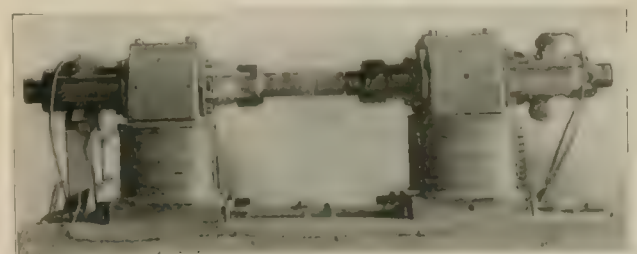
ready to have the bands put on they are put into a machine which is operated by one of the worm gear devices with friction clutch, already described. Before being taken to the testing machines for a prony brake test the armatures are subjected to the transformer



ARMATURE TESTING MACHINE.

test, which is shown in one of the accompanying illustrations. A block of metal, the under side of which is bored out at a radius the same as the outside radius of the armature, is wound with a number of turns of wire connected to a source of alternating current. This block of iron is suspended from a pulley, so that when the armature is laid upon one of the special trucks used for transferring the armatures about the room this block may be pulled down and laid upon the surface of the armature. The device forms a sort of transformer, in which the winding on the block is the primary circuit and the armature winding itself forms the secondary. When the current is turned on the tester simply feels around the side of the armature with a small piece of iron and any short circuit in the winding is at once noticeable by the fluttering of the iron over the faulty coil. The block with the primary circuit covers several of the armature coils at once and can be used around the whole surface of the armature in six or eight operations, the whole test taking three or four minutes. The value of this test lies in the fact that a short circuited coil can be detected and removed before any damage is done, whereas if the armature was put into its fields and the brake test applied considerable damage might result to the whole winding. The final brake tests are carried on in that

part of the armature room shown herewith. A crane spans this part of the room and the armatures are lifted by means of a kind of ice tongs, the ends of which take hold at the center holes in the ends of the shaft. It is then picked up by the crane and put into one of a row of motor frames which extend along one side of the room. These frames are fitted up with com-



MOTOR DYNAMO TESTING SET.

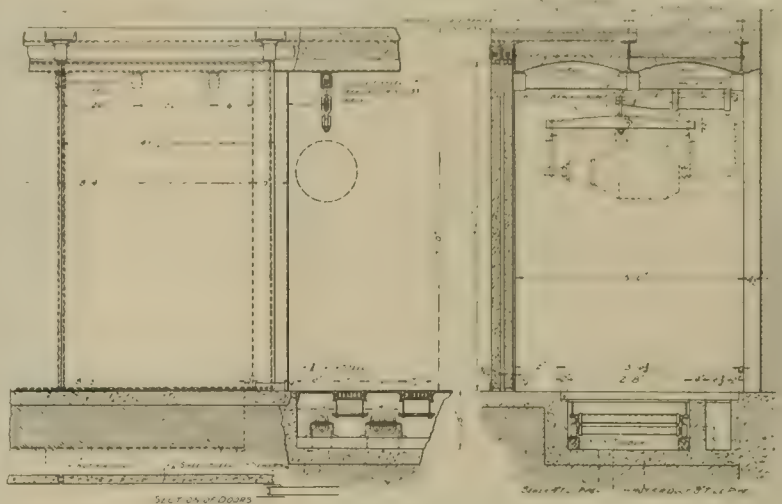
mon shafts, one end of which carry pulleys mounted in prony brakes and the pressure is brought upon the brakes by means of hand screws. Each armature is tested in this manner until it draws from 125 to 150 amperes.

The armature trucks which are used in this department are very convenient for transporting the armatures about, and the general assembly of one of these trucks is shown herewith. The armature

shaft rests on bearings at either end of the truck, so that the armature can be turned on its shaft while in the truck, the commutator and windings examined and minor repairs made without removing it from the truck. As a number of different makes of armatures are used, the end castings of this truck carrying the bearings are made reversible, thus changing the length between the bearings, so as to be adaptable to armatures of different lengths.

In repairing burnt out fields the company adopts a very simple method. The old fields are suspended on horizontal bars and are pulled apart sufficiently to allow the old insulation to be scraped off. This is done, however, without spoiling the general form of the winding. When the old wires are cleaned they are simply taped over, which can be done with very cheap labor, and the coils are again bunched up and tied in their proper form, thus avoiding any straightening out and rewinding of the field wire. After the coil has been tied up in its finished form it is given a kind of transformer test very similar to that described for the armatures. The device with which this testing is accomplished is illustrated herewith. A U-shaped block of iron built up of laminated sheets is used as the core of a transformer and a keeper block covers over the open end of this field, completing the closed magnetic circuit. One leg of this magnet is permanently wound with a primary circuit connected to a source of alternating current, and the field coil is then slipped over the other leg of the magnet, forming the secondary winding of the transformer. When the alternating current is turned on to the primary circuit there is a very loud, humming noise if the insulation of the secondary is good, but in case of short circuit in the winding of the field coil this noise disappears almost entirely. The alternating current used in these tests is obtained from a General Electric motor generator set which was recently installed in the new shops. Previous to this installation, however, the company used a home-made device which answered the same purpose. This consisted of two old Sprague motors, one arranged as an a. c. generator, the shafts of the two machines

these channels on the floor are wooden gratings, underneath which are drip pans to catch the varnish which drains from the coils which are hung in the oven. The method of suspending armatures is shown in the illustration, and for drying out the individual coils when first varnished racks are provided from which a large number



ELECTRIC OVENS IN WINDING DEPARTMENT.

of these coils can be suspended at once. The company is also building a tank to contain insulating varnish, so that a whole row of these suspended coils may be dipped into the varnish at one time instead of being handled each one separately, as they are at present.

The ovens are built with sliding doors in front, and both the iron doors and walls are filled in with non-conducting material. The temperature of the ovens is about 200° F. As will be seen from the illustration, the racks from which the armature and coil frames are suspended are so arranged that when the oven door is opened these may be drawn entirely outside of the oven, permitting the contents of the oven to be picked up by the overhead crane.

Heating System.

The shops are heated by a hot air system which is carried through ducts under the floor and which have outlets at regular intervals along the partition wall and adjacent to the supporting pillars of the building. These outlets rise about 10 ft. in the air, where the ends are turned over, discharging the hot air in a downward direction. Another system of inlets is supplied for cold air, which is carried in ducts to the heater room beneath the store room. Here the cold air passes through a system of steam coils which are heated by means of exhaust steam from the power house in the immediate vicinity, and this air after it is heated up passes out again through the hot air ducts, thus keeping up a constant circulation of hot air to the shops and cold air returning to the heating coils.

Elevated Traffic in Chicago.

Elevated traffic in Chicago during October showed a gain over that of last year for the same period, the increase on the Metropolitan West Side Elevated being 1.21 per cent, South Side Elevated 3.02 per cent, and the Northwestern Elevated 2.96 per cent. The Metropolitan carried 117,387 passengers, an increase of 1,407; the South Side carried 85,788 passengers, an increase of 2,676, and the Northwestern carried 71,617 passengers, an increase of 2,055.

Beginning November 15th, express trolleys are run between Jersey City and Trenton, N. J., over the lines of the Public Service Corporation, the Middlesex & Somerset Traction Co., and the Trenton "fast line."

The Lake Shore Electric Railway Co., of Cleveland, has leased a building in Norwalk, O., into which have been removed the offices of the general manager, auditor, superintendent of construction, roadmaster and claim agent of the company.



FIELD TESTING MACHINE.

being directly coupled together. This device, which can be very cheaply installed, is illustrated herewith.

Another interesting device in connection with the winding department is the system of ovens, the general design of which is shown in the accompanying illustration. These ovens are heated by means of electric coils placed beneath the floor and which are covered by inverted channels forming part of the floor. Between

Removing Boiler Scale.

Editor "Review":

As I believe all engineers have more or less trouble with boiler scale, I will give my experience in dealing with this trouble, which may be of interest to some one, and which may bring out the experience of others:

In the first place, I believe we can all agree on the fact that the best cure for scale is the use of some means of water purification to remove the scale-forming substances from the water before it enters the boiler. The removal of scale after it once gets into the boiler is a difficult matter, especially when the number of different types of boilers is taken into consideration. Numerous compounds are advertised, any one of which is said to be just the right thing for removing scale and preventing new scale from forming. I have no doubt but this is true, and some of them would remove the boiler also if given a fair trial. These are good when properly compounded; in other words, compounds to be of any service and at the same time not to be injurious to the boilers, should be prepared only after making a careful analysis of the feed water and scale, or both. A compound cannot be made to suit every case and at the same time not be injurious to the iron or steel with which it comes in contact.

Mechanical cleaners for the successful removing of scale from the tubes of water tube boilers have been in use nearly as long as this type of boiler, but the cleaner that will remove scale from the water side of return tubular boiler tubes is a production of the past few years. The latter fills a long-felt want, as it not only lessens the labor connected with the cleaning of this type of boiler, but insures clean tubes throughout.

Cleaning return tubular boilers by hand does not amount to much at best. Of course the particles of scale and mud that may have collected on the bottom can be removed, but when it comes to the tubes, about the best one can do is to tap the bottom and top rows with a hammer, by which means most of the scale can be removed. But what about the rest of the tubes? Even the lower row cannot be treated in this way when the size of the boiler does not permit of a manhole below the tubes. It is under these conditions that the makers of compounds claim that scale solvents and removers are found valuable. Let us see if this is the case. A brother engineer recently told me that he had tried several different compounds and thought he had finally found the right one for his case until one day he was induced to try a mechanical tube cleaner. The scale that came off those tubes was surprising, and the saving in fuel thereafter was marked. There are devices for removing impurities in boilers, known as boiler skimmers, of which there are several different makes. While I have not used any of them, those who have tell me that they are great labor savers, as the boilers do not have to be cleaned half as often as they did before the skimmers were in use.

My experience has been that no hard and fast rules can be laid down for operating boiler plants located in various localities. Of course general theories and principles are laid down governing the operation of all boilers, but the man in charge must use a great deal of good judgment in applying these principles. I have found many of the compounds advertised are good, as are also the mechanical cleaners, and I have also found if a good compound is used in connection with mechanical cleaners, the work of cleaning is facilitated very much, for the following reasons: If a boiler is badly scaled and compound is used alone it will take a long time, a great deal of compound, and will be an item of considerable expense to remove the scale. If a very strong compound is used, it is liable to injure the boiler. On the other hand, if tube cleaners are used in the same case without first using some compound, the work will take a long time and the cutters in the cleaner will be in a very bad condition. If a small quantity of compound is used, it will soften the scale somewhat and if the mechanical cleaner is used after this, the time consumed in cleaning will be only about half as long, the wear on the cleaner will not be great, and the cost of the compound will be small. The ultimate cost of the combination of a compound and mechanical cleaner will not be as much as it will be if either one is used alone. While this applies more especially to water tube boilers, it will be found that if some compound is used in return tubular boilers before the mechanical cleaner is applied, a similar saving in time and labor will result.

A. K. VRADENBURG

Lloyd, N. Y.

Chicago City Railway Strike.

Train-service men of the Chicago City Railway Co. went on strike at 4 a. m. November 12th, after the company had made every reasonable appeal to its employees that it could formulate. Almost immediately after the strike began mobs inaugurated a season of wild disorder, which for a day at least assumed unusually serious aspects. For a time the company had to suspend operation of its cars, although it had enough of its old employees to man them, but the second day arrangements were made to have part of the cars and the routes properly policed, with the result that the service was partially resumed.

The trouble which led up to the strike began with the expiration of the contract between the company and its men on September 30th. The men submitted a new form of contract for the ensuing year in which demands were made for an increase of pay for men in the electric train departments, a reduction in hours for the car house and repair men, and the employment of union men only. To this demand the general manager, Mr. Robert McCulloch, made answer in writing that the company was willing to renew the old contract, but that it could not grant more pay, nor would it agree to the "closed shop" policy.

The company also issued in pamphlet form the demand of the union, the company's answer, and the company's proposition, and caused a copy of the pamphlet to be placed in the hands of every employe. The more pertinent portions of the company's answer, as contained in the pamphlet, were the following:

"The first clause in your proposition relates exclusively to an increase in wages. This question was adjudicated a year ago by a board of arbitration, which awarded substantial advances. Manufacturing and steam transportation companies and business concerns generally have provided for increases in wages by advancing their rates and the prices of their commodities; the rate at which this company must sell its product is fixed and it can make no such provision, but must provide for increase in expense solely through increase in business. All its increase in business has been more than absorbed by the increase in wages awarded a year ago, and there is nothing in the financial affairs of the company to justify or warrant or allow a further increase in wages."

In answer to the demand for the exclusive employment of union men the pamphlet stated:

"The fourth clause gives your association complete and absolute control of the selection, employment, retention in service and discipline of all men. Under prevailing laws and customs the company is responsible and liable to the public for the acts of its employes while on duty, and, precedent to any discussion of this clause, your association must give the company ample and acceptable security that it can and will assume and take care of said responsibility and liability of the company to the public, since it proposes to assume the absolute control of the selection, employment, retention in service and discipline of all employees."

In the company's proposition incorporated in the pamphlet it was stated the company was willing to agree not to discriminate for or against men who belong to the union, or men who do not choose to belong to it, but all employes to be allowed to exercise their pleasure in the matter; the general plan of operation of cars, hours of work and rate of wages then prevailing (October 7th) to remain the same; the company was willing to receive the union's grievance committees, and the company was further willing to submit to arbitration all questions that could not be settled between it and the grievance committees.

October 10th the employes met and voted to reject the company's reply, and October 12th the committee waited upon Mr. McCulloch again. They were told that the company had not changed its mind, and would not. Thereupon the men stated that they would appeal to the president, Mr. D. G. Hamilton.

October 31st Mr. Hamilton met the union officials and informed them that the board of directors had indorsed the action of General Manager McCulloch in refusing the union's demands.

The union then ordered the employes to ballot upon the advisability of ordering a strike, and the voting occurred between 4 a. m. November 5th and 4 a. m. November 6th, after which it was announced that out of 2,150 members of the association 1,803 voted for strike and 153 were opposed. Then began a second series of conferences between the union and the company, and finally the union offered to submit all its demands to arbitration. Mr. McCul-

loch made answer that he would consult his superiors and give the union a definite reply November 14th. The delay did not suit the union officials, who sent an "ultimatum" to Mr. McCulloch that if the answer were not forthcoming by 6 p. m. November 11th the strike would be ordered on the 12th. The strike was ordered and a communication was sent to the company to the effect that the members of the union had determined "to suspend the operation" of the company's lines until the company should see fit to accede to the demands made upon it by the union.

The first day of the strike the company made several attempts to run cars on the Wentworth Ave. (electric) and Cottage Grove Ave. (cable) lines, but the attempts were abandoned for the day about 3 p. m., owing to the attitude of the mobs, who had virtually wrecked several cars, injured a dozen men, plugged the cable conduit and otherwise hindered the company. Anticipating that the mobs would not delay their demonstrations, Mayor Carter Harrison issued a proclamation at the outset requesting citizens to remain away from the troublous sections. In the meantime the unions gave it out that there would be no rioting, but that this strike was to be a peaceable one in every respect.

November 13th it was decided to make no attempt to run cars upon other than the Wentworth Ave. line at first, and arrangements were made with the mayor and chief of police to give the company all the protection necessary. As a result the company succeeded in sending the cars on three trips over the entire line, the route being well policed and policemen riding on each car. The greatest annoyance was caused by teamsters who caused many blockades. A number of teamsters were arrested.

On the afternoon of November 14th the firemen and engineers employed in the company's shops, about 160 in number, went on strike, but their places were soon filled. In fact, it appears that the company has had no difficulty whatever about hiring non-union men, who only stipulate that they shall be protected from deadly assault. The firemen and engineers who struck had just signed a new agreement with the company, in which they agreed not to go out on a sympathetic strike during the year. Their repudiation of this agreement led Mr. McCulloch to state that an agreement with a union is not worth the paper it is written on.

Sunday, November 15th, the Wentworth Ave. cars were operated practically upon regular schedule, but with the police guard still in force. The police made 30 arrests. The cars began to be better patronized, however, and it was announced that in a short time that line would be practically able to take care of itself. It was also stated that the cable splicers and electricians had gone out, but the company was in nowise crippled by their action. The union electric linemen and horseshoers also voted to strike.

November 16th more progress was made on the Wentworth Ave. line and very little rioting was attempted during the day. At night, however, after the police had withdrawn the hoodlum element began operations.

November 17th the Cottage Grove Ave. line was opened under police protection and no rioting of consequence was reported.

Governor Yates personally visited Chicago to investigate, with the adjutant general, the prospects of the need of the state militia being called out, which it is feared may have to be done, it being admitted that the police force is too small to adequately protect all the company's lines.

The total number of motormen, gripmen and conductors employed by the company before the strike was 3,300; the estimated number of passengers carried daily was 500,000; the total number of cars operated, 1,007; miles of track, 320.

Apropos of the demand for higher wages the company pointed out to the men that their wages were raised last year 3 cents an hour—a yearly aggregate of about \$300,000—and that this has absorbed the entire increase in net earnings in that time. To grant the new demands would mean to add \$400,000 more to the payrolls. It is further shown that the company has spent \$1,500,000 in improvements, that the increase in the cost of coal and teaming had added \$20,000 to the expenses every 12 months, and that the company has been forced to build a new \$250,000 power plant to meet the growth in traffic. The wage now asked for is 28 cents an hour, instead of 24 cents.

The Chicago City Railway Co. has a contract with the government to carry mails, and so far no attempt has been made to block the transit of the mail cars, although they have frequently been delayed on account of the blockades to the regular cars. The city

council, on November 17th, authorized the mayor to appoint a committee of eight aldermen to try and bring about a settlement. The State Board of Arbitration is also working to that end.

Improvements at Everett, Wash.

The Everett (Wash.) Railway & Electric Co. has just completed the erection of a trolley wire over a branch line of the Northern Pacific Railway Co. between Everett and Snohomish, Wash., a distance of 9 miles, and will henceforth conduct the passenger, baggage and express business of this branch; the Northern Pacific will continue to handle freight.

Other improvements recently effected by the Everett Railway & Electric Co. (which is one of the many Everett interests owned by the Everett Improvement Co.) include the extension of its lighting lines $3\frac{1}{2}$ miles to Marysville and the building of one mile of new track in Everett.

The company this year has built three cars in its own shops under the direction of Mr. J. F. Reardon, master mechanic. The last of these is a double truck car 44 ft. long over all, which is as handsome and well-built a piece of rolling stock as is to be found in the country. This car has rounded front vestibules, with steps on one side only of each platform. It is mounted on Brill 21 E trucks, with 6-ft. wheel base, and equipped with four Westinghouse No. 49 motors, K6 controllers, Westinghouse air brakes, and Christensen motor-compressor. The interior finish of the car is extremely simple, all scroll work, carving and beading being avoided, which we consider an admirable style.

Two cars of similar type are now being built for Everett by the J. G. Brill Co.

Our readers will recall the interesting article descriptive of the power plant of the Everett company by Mr. E. P. Burch, which was published in the "Review" for May 20, 1903.

The president and treasurer of the Everett Railway & Electric Co. is Mr. J. T. McChesney, who has had charge of the property since it was acquired by the Everett Improvement Co. two and one-half years ago.

Another Interurban for Los Angeles.

Another interurban electric railway, making the fourth entering the city of Los Angeles, Cal., is being rapidly pushed. The new road, the Los Angeles & Glendale Electric Ry., is about nine miles long and runs from Glendale through Tropico to Los Angeles. Entering the city from the north the road runs along Lake Shore Boulevard to Figueroa St., then down Figueroa to Sixth St., thence to the Southern Pacific depot.

The road will be first class in all respects, being standard gage and double track the entire distance. After leaving the city limits of Los Angeles, the road is for the most part over private right of way and is being built with the expectation of running at high speeds. The grades are light, being mostly one per cent, or under, and in no case exceeding two per cent. The rolling stock will be similar to that used by the Pacific Electric Railway Co. on its Long Beach line: 48-ft. combination cars, equipped with four 75-h. p. motors.

After leaving Los Angeles the road follows a somewhat winding but very picturesque route around the hills and through groves of live oaks; the last three miles, however, are perfectly straight. The company will not erect a power house at present, but will purchase its power from the Pacific Light & Power Co., of Los Angeles, and will convert from high tension alternating to direct current by means of sub-stations.

The company has secured the privilege of carrying strawberries and this concession will be of great benefit to the road and the country which it serves. The franchise requires the company to sell commutation tickets at the rate of 10 cents per trip. The regular round-trip rate will be 25 cents. It is expected to have the road in complete running order in four or five months.

L. C. Brand is president, W. H. Holliday, secretary and treasurer, and C. C. Sroufe, chief engineer.

The Indianapolis Northern Traction Co. is to build a large intermediate station at Kokomo, Ind., the building to cover an entire block and be four stories high. It will be the only large station between Chicago and Indianapolis.

Street Railway Legislation for 1903.

Maine.

AN ACT TO PROHIBIT SPITTING UPON THE FLOORS OF STREET CARS.

Chapter 139 of the Public Laws of Maine of 1903 provides: Section 1. Whoever spits upon the floor of any street car shall be fined not less than two nor more than ten dollars to be recovered on complaint. Section 2. The officers of all street railroad companies shall cause a copy of the preceding section to be posted in their several street cars.

CANCELLATION AND CHANGING OF LOCATION.

Chapter 86 of the Public Laws of Maine of 1903 provides that wherever a location for a street railroad upon any street, road or way has been approved under the general law or any special act with no actual occupation thereof by the rails of such company, such location in whole or in part may be canceled at any time by the municipal officers of the town where so located upon the petition of the directors of the corporation entitled to the same. Any street railroad corporation, under the direction of the railroad commissioners, may make any changes in the location of its road which it deems necessary or expedient and such changes shall be recorded where the original location was required by law to be recorded.

EXTENSION OF SUNDRY PROVISIONS OF RAILROAD LAW TO STREET RAILWAYS.

Chapter 19 of the Public Laws of Maine of 1903 further amends section 10 of chapter 268 of the public laws of 1893, as amended by section 3 of chapter 249 of the public laws of 1897, extending sundry existing provisions as to railroads to street railways, so far as applicable. The provisions referred to authorize railroad companies to build branch tracks to mills, mines, quarries, gravel pits and factories. They provide for cattle guards and passes to be maintained by the company; that, on failure, the company may be compelled or enjoined, or the injured party may recover double damages. They also relate to punishment for evading payment of fare, loitering in cars, posting this last section, foreclosure of mortgage given to trustees, powers of commissioners as to taking of land, and damages therefor. References to a provision with regard to punishment of negligence of company or its servants causing death is stricken out.

ENLARGEMENT OF POWERS OF RAILROAD COMMISSIONERS.

Chapter 15 of the Public Laws of Maine of 1903 amends section 11 of chapter 268 of the public laws of 1893 by striking therefrom the words: "If the tracks of a street railway cross any steam railroad and a dispute arises in any way in regard to the manner of crossing, the board of railroad commissioners shall upon hearing decide and determine in writing in what manner the crossing shall be made and it shall be made accordingly." It then adds a new sentence, making the section now read: Said railways shall be constructed and maintained in such form and manner and with such rails and upon such grade as the municipal officers of the cities and towns where the same are located may direct, and whenever in the judgment of such corporation it shall be necessary to alter the grade of any city, town, or country road said alterations shall be made at the sole expense of said corporation with the assent and in accordance with the directions of said municipal officers. The said corporation may at any time appeal from the decision of said municipal officers determining the form and manner of the construction and maintenance of its railroad and the kind of rail to be used to the board of railroad commissioners, who shall upon notice hear the parties and finally determine the question raised by said appeal. Section 15, giving the municipal officers of any town power to make regulations as to the mode of use of tracks, the rate of speed, and

the removal of snow and ice, is amended by providing for an appeal to the board of railroad commissioners, who shall upon notice hear the parties and finally determine the questions raised by the appeal.

AN ACT TO ENLARGE THE POWERS OF STREET RAILROADS IN TAKING LANDS.

Chapter 25 of the Public Laws of Maine of 1903 provides that any street railroad corporation may purchase or take and hold, as for public uses, land for burrow and gravel pits, spur tracks thereto, side tracks, turnouts, stations, car barns, pole lines, wires, installing and maintaining power plants, double tracking its road, improving the alignment thereof, changing or avoiding grade, or for avoiding grade crossings of any railroad; but if the owner of said land does not consent thereto, or if the parties do not agree as to the necessity therefor or the area necessary to be taken, the corporation may make written application to the railroad commissioners, describing the estate and naming the persons supposed to be interested; the commissioners shall thereupon appoint a time for the meeting near the premises, and require notices to be given to the persons so interested as they may direct fourteen days at least before said time; and shall then view the premises, hear the parties, and determine how much, if any, of such real estate is necessary for the reasonable accommodation of the traffic and appropriate business of the corporation. If they find that any of it is so necessary, they shall furnish the corporation with a certificate containing a definite description thereof; and when it is filed with the clerk of courts in the county where the land lies, it shall be deemed and treated as taken; provided, however, that when land is held by a tenant for life and the reversion is contingent as to the persons in whom it may vest on the termination of the life estate, such fact shall be stated in an application and the commissioners shall, in addition to the notice to the tenant for life, give notice by publication to all others interested in such matter as they deem proper. The land taken under the foregoing shall not be entered except to make surveys before the certificate aforesaid has been filed with the clerk of courts. All damages shall be determined and paid as provided by chapter 52 of the revised statutes for lands taken by railroads, etc. No meeting house, dwelling house, public or private burying grounds shall be so taken without consent of the owners. Nothing herein contained shall authorize the taking of lands already devoted to railroad uses except in cases where the railroad commissioners determine that such lands may be crossed in such manner as to avoid grade crossings with railroads.

Massachusetts.

AS TO EQUIPMENT OF CARS.

Chapter 134 of the Acts of Massachusetts of 1903 amends section 52 of chapter 112 of the Revised Laws to read: A street railway company shall equip its cars, when in use, unless propelled by horse power, with such fenders and wheel guards, "brakes and emergency tools in such cases" as may be required by the board, and the board may, from time to time, modify its requirements; the change in the section being in the words in quotation marks being inserted.

SPEED AND MODE OF USE OF TRACKS TO BE REGULATED.

Chapter 143 of the Acts of Massachusetts of 1903 amends section 40 of chapter 112 of the Revised Laws so that it reads that the board of aldermen or selectmen "shall" (instead of "may") from time to time establish such regulations as to the rate of speed and as to the mode of use of the tracks within their city or town as the interest and convenience of the public may require, "subject to the approval, revision or alteration of the board of railroad commissioners," etc.

TO GIVE NOTICE OF ACCIDENTS.

Chapter 297 of the Acts of Massachusetts of 1903 amends section 203 of chapter 111 of the Revised Laws by inserting after the word "railroad," in the first line, the words "and street railway," so that it reads: Every railroad "and street railway" corporation shall give immediate notice of an accident on its road, which results in a loss of life, to the medical examiner of the county who resides nearest to the place of accident, and shall also, within twenty-four hours, give notice to the board of any such accident or of any accident of the description of accidents of which the board may require notice to be given. For each omission to give such notice the corporation shall forfeit not more than \$100.

AUTHORITY TO CARRY BAGGAGE AND FREIGHT.

Chapter 202 of the Acts of Massachusetts of 1903 authorizes street railway companies to act as common carriers of baggage and freight; provided, however, that no such company shall so act in any city or town until, after public notice and a public hearing, it has obtained the consent of the board of aldermen or selectmen, or of those exercising the powers of such boards, and also a certificate of the board of railroad commissioners to the effect that public necessity and convenience so require; and provided, further, that said companies shall be subject to such regulations and restrictions as may from time to time be made by the local authorities aforesaid, with the approval of the board of railroad commissioners, and shall also be subject to the provisions of all laws now or hereafter in force relating to common carriers.

AUTHORITY TO TAKE LAND TO AVOID DANGEROUS CURVES OR GRADES.

Chapter 476 of the Acts of Massachusetts of 1903 provides that any street railway company, organized under the laws of the commonwealth, may apply to the board of aldermen of any city or to the selectmen of any town in which it desires to take land, for an adjudication that public necessity and convenience require that certain land or interests in land, as described in its petition and for the specific purpose therein stated, be taken by such company, to enable it, in constructing its street railway or a branch or extension thereof, to avoid dangerous curves or grades existing in the highways, or for other similar purposes incident to and not inconsistent with its corporate franchise of operating a railway to accommodate public travel in public ways. If the board to which application is made finds in favor of the petitioner, after such public notice and hearing as are required by law in the case of the grant of locations for street railways in public ways, the company may, upon complying with certain provisions, apply to the board of railroad commissioners for a certificate that public necessity and convenience require the construction of the proposed railway between the termini and substantially in the route fixed by the agreement of association in case of a company organized under the general laws and by the charter of a company created by special statute, or of the proposed branch or extension substantially on the location already duly granted therefor, and for approval of the adjudication of the aldermen or selectmen as to the necessity and reasons for taking land or rights in land in every city or town in which such adjudication has been made. If said commissioners, after public notice and a hearing at which all persons or corporations alleging that they would be injured by the construction of the proposed railway shall be deemed to be interested parties and entitled to be heard, grant the certificate as prayed for, the petitioner may take in any city or town, in the manner provided in certain provisions of law which are to apply, any land or rights in land the taking of which has so been approved by said commissioners.

A street railway company authorized to construct its railway at grade across a public way in any place where such crossing is not a part of the crossing of such way by another public way, and incident to the construction of the street railway longitudinally within the limits of such other public way, shall, in any proceedings hereafter begun for the abolition of such grade crossing, be considered as a railroad corporation, etc., if such company has taken any land or other property under authority of this act; and it may bring a petition or be made a respondent to a petition brought, etc., in the same way and be subject to the same liabilities as if it were a railroad corporation.

This act shall not enlarge the extent or purposes for which a street railway may be constructed or operated outside the limits of public ways.

New Hampshire.

SPITTING PROHIBITED.

Chapter 2 of the Laws of New Hampshire of 1903 makes it unlawful for any person to spit in any railway station or in any street or steam railway car other than smoking cars, except into spittoons or other receptacles provided for that purpose. The penalty for a violation of the provisions of this act is a fine not exceeding \$10.

CONCERNING CARE OF HIGHWAY.

Chapter 94 of the Laws of New Hampshire of 1903 amends section 7 of chapter 27 of the laws of 1895, so that it now provides, among other things, that the boards of mayor and aldermen of cities and selectmen of towns, respectively, may from time to time make such reasonable orders, rules, and regulations with reference to that portion of the street railway occupying the public highway as to rate of speed, etc., "and the care of such highway" as the interest or convenience of the public may require, etc., the words in quotation marks being inserted. Section 10 of said chapter 27, requiring street railways to keep highways in repair, etc., is amended by incorporating the provision that every street railway neglecting to comply with any of the requirements named in this section shall, after due notice from the person having charge of the streets, forfeit to the use of the city or town the sum of \$50 for each day during such neglect.

CONCERNING REPORTS AND INCREASE OF STOCK AND BONDS OF CORPORATIONS OWNING STOCK IN RAILWAYS.

Chapter 55 of the Laws of New Hampshire of 1903 provides that all corporations owning a majority of the stock, or operating, under lease or otherwise, railways in the state, shall make returns and furnish information to the board of railroad commissioners as to all their properties and business, and the provision of the public statutes respecting reports and information concerning railroads shall be held to apply to all properties and business owned, leased, or managed by such corporations, whether used or employed in railway transportation or otherwise. The provisions of sections 17 and 18 of chapter 27 of the laws of 1895 and of sections 1 to 4 inclusive of chapter 19 of the laws of 1897, in relation to the increase and issue of capital stock and bonds and the authority and duty of the railroad commissioners in relation to such increase and issue of capital stock and bonds, shall be applicable to and observed by all corporations holding stock as provided in the preceding section. (The above is indexed under "street railways," in the laws of 1903.)

RESTRICTIONS ON SALE OF BONDS AND APPLICATION OF PROCEEDS.

Chapter 22 of the Laws of New Hampshire of 1903 provides that no bonds, coupon notes, or other evidences of indebtedness payable at periods of more than twelve months from the date thereof, and issued in accordance with the provisions of any special charter or general law, shall be sold or disposed of by a street railway or other railroad company for a less sum to be paid to said company in cash than the face value thereof. All such bonds, coupon notes, and other evidences of indebtedness shall be issued and sold to bona fide purchasers in such manner and subject to such restrictions as the board of railroad commissioners may prescribe, and no such street railway or other railroad company shall apply any part of the proceeds of said bonds for the original construction, or original equipment of its plant, except in accordance with the approval of the railroad commissioners. Any director or officer of a street railway or other railroad company who knowingly violates or disregards any of the provisions of this act shall be punishable by a fine not exceeding \$1,000 or by imprisonment not exceeding one year, or by both fine and imprisonment.

Question Box of the Pennsylvania Street Railway Association.*

Continued.

252. What average life can be expected from bonds put in according to the most modern methods? In what way is the maintenance expense for bonding handled to provide for general overhauling and renewal?

A protected bond, of the proper design, length and cross-section, applied under the plate of any modern T or girder rail should last not less than five years. If the joints are kept up in strictly first-class condition, a "Protected" bond will last as long as the rail.—A. H. Englund.

I have tested bonds which, at the end of five years, showed practically no depreciation, less than one-fifth of 1 per cent of them being defective. The elements surrounding the installation of a bond largely affect the life of that bond, poor track foundations, defective ties, and splice bars which do not fit the rail, and too short a bond to allow for the expansion and contraction of the rail, are causes which contribute to bonds succeeding in one installation and failing in another, which are identical in construction and application.

I find the same bond in pavements with concrete construction and the rail well grouted, gives much longer service than the interurban track when ballasted according to the Pennsylvania R. R. specifications. Moreover, a longer bond must be used in exposed rails and nothing under a 6-in. expansion should be used in a concealed type of bond, as the contraction and expansion of the rails are passed through the fish plate and more latitude must be given at joints for expansion and contraction than theoretical considerations would dictate. I believe the test for maintaining bonds are best made by means of pressure wires; in any city where the railroad owns its own telephone system, these wires can be used with pressure wires by placing the telephone wire upon the track, plugging around the exchange by means of the station telephone wires and connecting to the negative bus. This gives the aggregate drop including the rail and all the bonds and a criterion of the condition of the ground returns. If a railroad company took these records once a month on each line, they would be in a position to say with surety on what lines their re-bonding should be done with the greatest profit and the saving of energy delivered to the cars. When it has been decided to re-bond a road, the bonding foreman should be instructed thoroughly in the use of the milli-voltmeter and should determine for himself the condition of every bond and renew those which show a rail length greater than that which would be determined in applying the rule in answer to question 250, and the most economical maintenance of the bonding of railway return is by continuous tests and inspection of these bonds from month to month as an aggregate, by the method described above.—A. B. Herrick.

After two or three years' use of compressed terminal bonds we found no bad joints in the bonds. Where bonds are compressed and ball joints kept in first-class condition, the bond should last as long as the rail.—P. F. Gerhart.

Average life depends on soil, traffic and various other conditions.—R. E. Moore.

253. For new work, are short flexible bonds either under the fish plates or base of rail more durable than the solid bonds outside the fish plates?

The fact that flat wire flexible bonds placed under joint plates, or on the base of rail have almost entirely replaced solid bonds outside of the plates, must argue that they are equally durable, and more so.—A. H. Englund.

Flexible bonds under the fish plate over 6 in. long are more durable relative to their conductivity and less liable to be stolen than exposed bonds. Bonds under the fish plate give better life than those under the base of the rail.—A. B. Herrick.

We use flexible bonds on tram and under the fish plates, and have found them most durable.—P. F. Gerhart.

Yes.—R. E. Moore.

254. Are soldered bonds as satisfactory as the expanded terminal or compressed terminal type?

It is hard to say, but I believe that a copper bond can be

soldered to a steel rail, and make a permanent contact, having the efficiency one year after installed equal to that when applied?—A. H. Englund.

Soldered bonds where the edges of the lammations are soldered to the rail, and soldered in such a position that the blow on the rail is given vertically to the lamination, show less drop in their connection as compared with their cross section than expanded terminals, and the total drop across the bond in this type of bond is less than the compressed terminal.—A. B. Herrick.

We have used only the compressed bonds and have found them to meet our requirements in all cases.—P. F. Gerhart.

No.—R. E. Moore.

255. Can a pin-expanded bond terminal be installed so as to maintain, during a period of five years or the life of the bond if longer, as reliable and as low resistance contact with the rails as a solid copper terminal bond expanded by a hand or hydraulic compressor?

In a pin-expanded bond terminal, it would be absolutely necessary, in order to make a perfect contact, to have the diameter of the terminal exact, and the hole in the rail reamed to exact size to fit the terminal. Under this condition, the full limit of the expansion of the pin would be obtained, and a good job would result. In practice, however, it is found that hardly any two terminals are exactly of the same diameter, and it is a well-known fact that in rails bored at the mill, there are no two holes exactly the same diameter; and further, many of the holes are not round. To clean out the holes, in order to get them round and free from rust, they are enlarged to such an extent that the bond terminal fits too loosely, and as the expansion of the terminal in the hole is limited to the maximum taper of the pin, it follows that the average contact in pin-expanded terminals is bad. The compressed terminal can always be made to fill the hole, as compression need not stop until the hole is filled.—A. H. Englund.

The comparison of the different modes of connecting bonds to rails rest so largely with the man putting the bond in and his ability to do honest work, that under practical operation bonds show such an enormous difference in their conductivity in the different parts of the country, that it is extremely hard to differentiate between bonds as to their adaptability to the purpose for which they are intended, but a large amount of the trouble in the past has risen from ignorant and cheap labor installing the bonding, and not being instructed in the method of testing the results of their work.—A. B. Herrick.

We have been using the expanded terminal bond for about two years and on making a test on track that had been bonded with them a few months ago we found the terminals had become loose in the rail and made very poor contact, and have replaced them with compressed bonds.—P. F. Gerhart.

Yes.—R. E. Moore.

256. Of what value is treating bond holes and bonds with Edison plastic alloy? Will such methods prevent the deterioration of contact surfaces and reduce contact resistance?

The application of Edison plastic alloy to a bond where the bond service is rough is an improvement, and seals and prevents the access of moisture, which will by capillary action eat around the terminal when interstices are left between the shank of the bond and the hole in which it is inserted; but with a smooth shank to a bond and the use of a compressor its use is not to be advised.—A. B. Herrick.

According to our experience treating bond holes and bonds with Edison Plastic Alloy is of no value.—R. E. Moore.

257. Have any of the types of Edison plastic bonds proved commercially satisfactory?

258. What is the best method of covering, coating or otherwise protecting bonds against corrosion?

A good weatherproof and insulating paint is a desirable coating for copper rail bonds, providing such paint does not possess ingredients that will deteriorate the copper. Such compounds as "Monarch," "M. I. C." or "Sterling" are proper.—A. H. Englund
Any good asphalt will do it.—R. E. Moore.

The bond under the fish plate does not need any protection. The exposed bond, if painted with hot asphalt paint, has its life greatly prolonged; but coating with coal tar compounds is a detriment. Some roads practice the method of boxing the bonds where the soil conditions show active corrosive qualities. They groove one

* Answers signed Editor are by the Editor of the Question Box.

piece of board long enough to contain the straight portion of the exposed bond, fill with hot asphalt and nail on a half-inch capping. The soil conditions that corrode the bond when of copper are where the filling has organic matter in it and exposed to moisture from sub-surface sources.—A. B. Herrick.

259. How frequently should tracks be cross-bonded?

Cross-bonding should be done, according to the amount of current carried. By using No. 0000 bonds, the usual and most satisfactory method is as follows:

For 150 amperes, cross bond each 1,200 ft.

For 250 amperes, cross bond each 1,000 ft.

For 500 amperes, cross bond each 900 ft.

For 1,000 amperes, cross bond each 540 ft.

For 1,500 amperes, cross bond each 360 ft.

For 2,000 amperes, cross bond each 240 ft.—A. H. Englund.

In interurban work cross-bonding should be practiced on single tracks a great deal more than it is, and for a four-motor (50-h. p.) equipment, at least five times a mile, especially where sub-stations and rotary transformers are used, for if the bonding is defective near the sub-stations, it throws the load unequally on sub-stations. I have recently found two sub-stations adjacent to each other, one operating normally at one-half load and the other at 40 per cent overload. The whole cause of this unequal distribution between sub-stations was due to defective bonding and no cross-bonding.

The critical portions of an interurban road, where the bonding becomes defective, are at switches and turnouts, railway crossings and derailling switches, and the only satisfactory solution for bonding around this portion of the track is to bond in supplementaries having an aggregate section equal to the section of the bonds employed and completely surrounding the special work by the supplementary, tying the four tracks of the turnout together and the two tracks of the main line with this jumper, and at steam road crossings to connect the rail with electric road abutting the steel track. It is well to assume that the bonding between electric rail and steam rail cannot be maintained. Bridges are critical points and a supplementary wire or double bonding should be used across bridges; but do not use, in case of double bonding, two bonds of the same type. A concealed and an exposed bond in this location give better results with time than two bonds of the same kind.—A. B. Herrick.

Depends on the number of cars in service. Four to the mile will do for interurban work.—R. E. Moore.

260. What is the best practical method of testing condition of bonds?

The new T-pole testing instrument, made by Mr. R. W. Conant, is very popular and seems to meet all requirements for rapid and accurate bond testing. We think so much of it that we have invested in several ourselves, for the purpose of testing out bonds on such of the small roads as do not feel that they can afford to invest in one of the instruments. We have found it extremely satisfactory and entirely accurate.—A. H. Englund.

The aggregate drop method constitutes the best form of inspection of the bonding, but to locate the bonds which are bad and their condition, the milli-voltmeter method, comparing a length of rail with the joint, is effective and also the Conant method where it is certain that a current flows in the rail while making a test. It is very hard to determine whether a current always flows in the rail and neither system is useful where the rail is dead. Being very important in my work to determine these conditions, the method I use may be of interest.

On my test car, I use two brushes on each track to take the drop from the rail, as the car moves along about five miles an hour. I use a motor-dynamo transformer, which gives me about 100 amperes through each rail as the car moves along. I autographically record the movements of the Weston milli-voltmeters, one for each track, without touching the hands of the same, on a record which moves at the rate of one inch per hundred feet of track. I have in connection with the drop circuit also a very sensitive automatic, which can be adjusted to work for any relation between rail drop and joint drop. This relation being varied for different portions of the road, depending upon the current density in the rail. This automatic moves a pen on the record where a bond is passed over exceeding a fixed length of rail. In interurban work, when this pen moves, it also closes the circuit through an electrically controlled valve, and squirts paint on the track at the defective bond. All intersections of the streets, turnouts, private crossings,

are marked by a third pen on the record and a number telegraphed on the record corresponding to this intersection on the list. From this record the resistance of every bond is given, the current flows and its direction on the rail and any bond can be located by scaling from the last intersection or station at the scale of 1 in. to 100 ft. After testing over 1,000 miles of road in different parts of the country, with this test car, I find I can get the most reliable results and a permanent record, from which re-bonding can be done with surety. Another important object for getting up this apparatus was to get a record for the railroad companies in electrolysis cases which could be produced as a court record.—A. B. Herrick.

The Conant rail joint testing instrument is now being gradually conceded to be a very practical, rapid and accurate means of testing the condition of the bond and requires no special skill to operate it. With it, an ordinary man can test 100 joints per hour, which covers the ground as rapidly as ordinarily could be desired.—R. W. Conant.

A double milli-voltmeter as described in my reply to question 250.—P. F. Gerhart.

261. What is the cheapest method of drilling holes in rails for bonds or bolts? What lubricant do you find best for this class of drilling?

For drilling bond or bolt holes in the web of rails, under all ordinary conditions, we do not believe there is anything better or more economical than a good modern power hand drill, such as the Buda or Millers-Falls. Where there are a great many holes to drill, a power drill will no doubt prove more economical. If trolley current is available, an electric drilling plant is very satisfactory, but it is hardly economical for less than 5,000 holes, if the investment in the plant is to be charged up as part of the cost of drilling.—A. H. Englund.

For drilling holes for rail bonds, both soap, water and oil (heavy mineral oil) are generally used. I find that with either of these lubricants being used, that if the hole is carefully cleaned immediately after drilling, it does not affect the resistance or the life of the bond; but the bond should be inserted and fixed in its position as soon after the hole is drilled as possible. No drill hole should be left over night and this work should not be carried out in damp or foggy weather; as a film of oxide forms on the freshly drilled surface of iron almost immediately and seriously affects the resistance of contact between the bond surface and the rail.—A. B. Herrick.

For our work we use Sweet's hand drill, polish the terminal with sand paper, and insert and compress bond terminals immediately after drilling the holes. We use no lubricant of any kind.—P. F. Gerhart.

1st question: Any good track drill will do.

2nd question: Soap water.—R. E. Moore.

262. What is the best method of treating bondholes in order to be certain that contact surfaces are thoroughly dry and clean? Is there any merit in smearing bond terminals with thin white lead before inserting in bond holes?

No. Better clean the whole with gasoline.—R. E. Moore.

The best and surest way of getting a good contact for bonds is to ream the holes immediately before placing the bonds, care being taken that no oil or moisture is left on the walls of the holes. If the holes are round and smooth, but rusty, a simple way of removing the rust and getting a bright surface is to take coarse gunny-sack, cut into strips about four inches wide, twisting one of these into a rope. Insert one end of this through the hole, and pull the material back and forth rapidly all around the hole. This will produce a result almost the same as a file, and with much more ease and rapidity.—A. H. Englund.

In holes that have been bored or old holes to be rebonded, a reamer is the best method of cleaning this hole, and a reamer which has on it a miller which cleans the surface of the rail against which the head portion of the bond will be compressed, decreases the resistance of contact between the bond and the rail about 40 per cent. The importance of this additional contact is apparent when one considers that in a properly installed cast head concealed bond, 6 in. long, the resistance at the contacts of the two terminals of the bond average about 75 per cent of the total bond resistance of a No. 0000 stranded bond with $\frac{3}{8}$ in. shank. The application of white lead to the bond before inserting is not advisable and has been abandoned by the railroad companies who instituted it. Plastic alloy in the case of a rough bond being the only intermedi-

ary used between the shank and the hole that increases the conductivity of a bond. The alloy should never be used with a bond having anything but a pure copper head, as it will rot out any compound of copper with zinc or tin, as mercury in this case permeates into the body of the bond and destroys its mechanical structure.—A. B. Herrick.

263. What results have been obtained in welding bond terminals to the rails? What equipment is necessary and what precautions must be observed in operation? What is the cost per bond installed?

Welding bond terminals to the rail is the ideal method, especially in the case of electric weld, yet this method has been so surrounded by patents and litigations that the railroad companies are deprived of utilizing this method. The soldered bond can be applied to some rails and not others. The bond underneath the foot of the rail requires suspended joints and a number of the rail splices used are not adaptable to the use of this type of bond without a special joint being made for the purpose; but the type of soldered bond, soldered to the ball of the rail, gives the ideal method, and I understand the cost is about 35 cents per bond complete. This type of bond has the objection of being exposed and stolen, but I have suggested coating with a paint containing arsenic, so very little value can be obtained where this copper was melted for reduction.—A. B. Herrick.

264. Has practical experience with cast welded rail joints shown that separate rail bonds are unnecessary?

Cast weld joints since 1896 do not require any bond around them, as they average lower than the rail resistance itself. This is the case in Minneapolis, Milwaukee, Indianapolis, Rochester, N. Y., Grand Rapids and other towns where I have investigated this matter, and the same is true of the electric weld made since 1898. Bonding and cross bonding should both be employed where expansion joints are used, but with a concrete grouting rich in lime between the rail and adjacent pavement, assuming that there is a concrete base upon which the rail is laid, either beam or tie construction, no movement of the rail takes place with the temperature changes and expansion joints are unnecessary. Particular care should be taken to maintain the effectiveness of the cast weld rail return at special work by supplementaries at steam road crossings, for I frequently find more drop at a steam road crossing in a cast weld track than I have in 6,000 ft. of track adjacent to this crossing.—A. B. Herrick.

In most cases bonds are necessary.—R. E. Moore.

President Davis: I would ask Mr. Gerhart, who is in charge of the bonding department of the Harrisburg Company, to open the discussion on this subject.

Mr. Gerhart: We have been doing considerable bonding during the last several years, using the Protected Rail Bond altogether. As you are aware, this bond is of the compressed terminal type, and we use a hydraulic compressor on this work. Where we are re-bonding old tracks we are using the bonds in various lengths from 6-inch trams to 42-inch regular bonds. Wherever it is possible we try to use the 6-inch tram bond.

In new work we use bonds which are placed under the fish plate, but in repair work we frequently have to carry the bond around the fish plate. We do not run any separate return wire, but depend entirely upon thoroughly bonding the rails. We consider it a waste of time and money to run any return wire where bonding is properly done.

President Davis: How do you bond in and around special work?

Mr. Gerhart: That is one question I would like to hear discussed. I know of no way to place bonds properly in special work, particularly as this work is 8 to 12 inches through at points where it is desirable to bond. I see Mr. Hammett of the Mayer & Englund Company is here, and I would ask him to describe how his firm handles such work without running a special return wire to which various pieces of special work are connected by bonds.

Mr. Hammett: In every case that I have seen we have been able to use a cross bond and tie cross bonds together around the special work. You can set your cross bond back far enough to get into the single rail and a T splice, placed at the center of each cross bond, enables you to tie all the various sections together.

Mr. Gerhart: We do that. But the long bonds offer a higher resistance as compared to the rails. It seems to me that there should be some short bond device by which every joint in the special work

could be thoroughly bonded. With such short bonds at the joints and the addition of the long cross bonds properly cross connected, a great deal of the trouble with drop in the return circuit would be cut out.

Mr. Hammett: In my experience I have found that the majority of roads seem to prefer cross bonding and then tying the cross bonds together, as it is only a matter of placing sufficient copper to reduce the drop to desired limits. In this connection I would like to call attention to our special tram bond. With this bond it is only necessary to remove three Belgian blocks in the pavement. The bond hole is made in the tram of the rail with a hydraulic punch, which makes a tapered hole with the large end of the taper at the top of the rail. The bond is then compressed, using a hydraulic compressor giving about 40 tons. With this bond it is unnecessary to remove the fish plates, and the actual cost of installation, exclusive of the bond itself, is from 17 cents to 18 cents each.

President Davis: Does that cost include anything except labor?

Mr. Hammett: The cost covers removal of Belgian blocks and replacing them, and installation of bond.

President Davis: Mr. Gerhart, can you give us the cost of installing the tram bond?

Mr. Gerhart: With the 6-inch tram bond, where we have to open only a small space, the cost is just about 16 cents per joint for labor. This cost was possible where the paving was cobble stones and easily taken up and replaced. In other places it cost from 45 cents to 50 cents per bond, depending on the type of pavement and foundation of same.

President Davis: We have received some interesting data on the practical methods of testing bonds. Is it your practice, Mr. Gerhart, to test your bonds periodically?

Mr. Gerhart: We have a double milli-voltmeter that we use very successfully in testing bonds. We have a contact device that simultaneously connects the voltmeter terminals to 3 feet of solid rail and 3 feet in which the joint is included. If the instrument readings are the same, the bond section is equal in carrying capacity to the solid rail and is regarded as first-class. If the reading across the joint is three or four times as high as the reading on the 3 feet of solid rail, then the bonding is regarded as bad, and a new bond is put in.

Mr. Faller: I would ask why it is necessary to take a reading of the rail as well as the joint. I use a plain milli-voltmeter, and if the reading exceeds three or four milli-volts the bond is replaced. In connection with this test, we arrange to have a car run so that we are sure of getting current across the joint.

Mr. Hammett: Mr. Wendle spoke to me a short time ago relative to a special arrangement for insuring current when testing with the Conant instrument. What results were obtained with this scheme?

Mr. Wendle: We have been unable to complete our arrangement for making a complete test of our bond system, and I am unable to furnish any definite results. Our difficulty was the delay in getting current reading for test, and the uncertainty of the results when made by comparatively inexperienced men. We proposed to equip a small cart with a resistance which would give approximately 15 or 20 amperes when connected to the trolley circuit and the rail. The idea was to have one man observing with the Conant instrument and the other man was to make the trolley and rail connections. By this means there should be no delay in getting definite results, since current could be applied at the joint tested and the work could be pushed along without the expense of operating a special car back and forth near the test point and which would more or less interfere with the regular cars on single tracks.

Overhead Line Department.

300. How can trouble with sleet be overcome?

We use sleet wheels, tying them fast to the harp with wire to keep them from rotating. The wheels give longer life and better result. Water being a lubricant it does not injure the wire. Chas. H. Smith.

The Easton Transit Co., Easton, Pa., avoids the use of sleet cutting trolley wheels and trouble from sleet on the trolley wire by greasing the trolley wire late in the fall, which prevents the water from adhering to the wire. The grease is best applied by driving the construction wagon under the trolley wire and having

a man apply a stiff lubricating grease by dipping his gloved hands into the grease and letting the trolley wire slip through his hands as the wagon is driven along. In this way two men can cover about 10 miles of wire per day, and one application will last all winter and obviate all sleet troubles.

We use the regular ice cutting trolley wheel, although this is not entirely satisfactory. We tried greasing the wire some years ago, but found the grease held dust, etc., and gave poor contact at times when there was no sleet.—P. F. Gerhart.

With the trolley wire use sleet wheel; on the third rail use paste made for the purpose.—R. E. Moore.

301. Are any of the so-called preservative paints of any real value for preserving butts of poles? What method of treatment or setting will prolong the life of pole sufficiently to warrant the extra cost?

At present prices of chestnut poles, we have failed to find any treatment that warranted the expense. Our practice has been to use poles five feet higher than actually required, and after the butt has rotted badly, reset pole. On this plan we expect to get about five to six years more service, without changing any wires except span wires.

We have tried concreting from three feet below ground line to ground surface, but do not find that results, except in case of expensive junction poles, warrant the expense. Our pole life has been longest in clay soil, and in case large poles are set in gravelly ground, we consider it desirable to fill the space around butt thoroughly with clay, thoroughly tamped.—J. Shultz.

Tar is good.—R. E. Moore.

302. What are relative values of cedar, chestnut and cypress poles?

303. Does double galvanized seven-strand suspension cable last enough longer than single galvanized to warrant the added cost?

Our experience is that double galvanized pays.—J. Shultz.

Double galvanized pays.—P. F. Gerhart.

No.—R. E. Moore.

304. Does modern safe construction require a strain insulator in span wire on each side of trolley wire, where wooden poles are used?

Yes.—P. F. Gerhart.

305. What size span wire is regarded best practice?

Quarter-inch, 7-strand, No. 14 double galvanized wire.—P. F. Gerhart.

We use 5-16-inch, 7-strand, double galvanized wire.—J. Shultz.

306. Are metal-top trolley hangers or bells of the "West End" or "Keystone" type more durable than the cap and cone type?

Yes. There is not as much danger of hanger dropping from span wire and being carried off, as with caps and cones.—J. Shultz.

Yes, the Keystone type hanger is more durable, as the insulation is protected from the weather and bell cannot get loose from cross suspension.—P. F. Gerhart.

307. On single track interurban roads with turnouts, is the use of two separate trolley wires more satisfactory than a single wire of the same total carrying capacity, with turnout wires and overhead switches?

Yes, two wires are more satisfactory. The conductors do not have to bother with the trolley while entering or leaving turnouts. It also saves the extra cost of repairing trolley wires at overhead switches and the wear and tear on overhead switches.—P. F. Gerhart.

308. Is grooved or figure 8 trolley wire more durable than regular round wire of the same gage?

Figure 8 wire offers advantages in smooth running and in furnishing more contact with the usual narrow groove trolley wheel as compared with plain round wire. This surface contact amounts to about one-third more with figure 8 than round. By using U-shaped groove, the surface contact is further increased.—Editor.

Grooved wire best of all.—R. E. Moore.

309. Does the use of grooved or figure 8 trolley wire cause less wear on trolley wheels than round wire?

Yes.—R. E. Moore.

310. What type of ear is the most satisfactory for grooved or figure 8 trolley wire: Regular soldered; mechanical with paired halves screwed together; or mechanical with interlocking halves which are forced tight by special mechanical devices?

Two halves secured together.

311. What length of mechanical ear gives the best service on grooved or figure 8 wire?

We use a 9-inch ear on straight track and 2 short ears coupled together for curves. This combination holds 2-0 G. E. grooved wire without bad kinks and provides ample supporting surface.—J. Shultz.

Five to seven inches on a straight line; nine to twelve inches on curves.—R. E. Moore.

312. What are the relative advantages of plain malleable, galvanized malleable and brass for mechanical trolley ears?

Plain malleable ears rust and break; while brass stands exposure indefinitely without serious deterioration.—P. F. Gerhart.

313. In trolley hangers of the "West End" or "Keystone" type, are brass tops worth the excess cost over galvanized malleable tops?

We do not think so.—P. F. Gerhart.

No.—R. E. Moore.

314. How frequently should lightning arresters be placed on trolley lines?

We use four to the mile.—Chas. H. Smith.

Five to the mile is a safe number.—P. F. Gerhart.

315. What type of line lightning arrester has given the best service?

The Wurtz and G. E. MD type. We prefer the latter.—Anon.

The Garton arrester is giving us good results.—P. F. Gerhart.

Our experience has been principally with various types of Westinghouse and general electric arresters. With the Wurtz non-arcing arrester we have had difficulty with arcing across and grounding the system, but with the G. E. magnetic blowout type we have had no occasion to cut or replace arresters due to breakdown.—J. Shultz.

316. Are splicing ears as satisfactory as splicing sleeves for joints in trolley wire?

We find splicing sleeves to give better satisfaction than ears.—Chas. H. Smith.

No.—P. F. Gerhart.

With splicing ears we had trouble with the wire breaking at the upward bend in ear, due to bend somewhat and weakening of wire because of trolley wheel pounding it. We now use hard drawn copper splicing sleeves exclusively and find no difficulty with wire breaking or pulling out of sleeve. Further, the trolley wheel moves over the sleeve smoothly.—J. Shultz.

317. What is the best form of strain ear or hanger?

We are using the General Electric form of strain ear, with very good results.—P. F. Gerhart.

We have experimented some with the Strain Platetype made by the Ohio Brass Company, and so far our results have been satisfactory.—J. Shultz.

318. Which is the better practice in anchoring trolley wire at the ends of curves—anchor all four ways at each end or only two ways, both toward the curve, tending to hold all slack in curve?

We anchor our curves at ends of curves two ways, to hold the curves.—Chas. H. Smith.

On level track we anchor two ways toward the curve, keeping slack in the curve. On grades, we anchor all four ways, keeping slack in curve.—P. F. Gerhart.

319. How frequently should trolley wire be anchored on straight line?

Our lines are anchored every 10 poles, both ways.—Chas. H. Smith.

We anchor every half mile.—P. F. Gerhart.

Every 1,000 feet.—R. E. Moore.

320. What is the most accurate method for locating overhead switches?

We use a tower car for construction work on the lines, and test each switch location with the trolley on that car.—P. F. Gerhart.

The variation in length of poles, freedom of movement of trolley base, and other considerations in actual operation of cars, is so wide that cut-and-try is about the only practical method available. In the majority of cases we find it advantageous to cut off some of the pan end of the straight outgoing tongue of switch, leaving the side turnout tongue full length and giving the side tongue the advantage in catching the trolley wheel.—J. Shultz.

321. What type of section insulator is most satisfactory as regards durability and ease of renewal of wearing part?

We find the General Electric section insulator entirely satisfactory.—A. F. Rexroth.

We have tried the Macallen, General Electric and H. W. Jones' Philadelphia types, and find that the later type of Philadelphia section insulator meets our requirements and at less cost than any one of the other makes.—J. Shultz.

322. Of what value are systematic insulation tests on the overhead system?

We test frequently at night when all load is off the line, and are able to locate grounds, which, if allowed to go, would result in continuous loss of current.—P. F. Gerhart.

323. What is the relative cost per mile of iron poles as compared with wooden poles? What is relative depreciation on the two kinds?

The cost of placing iron poles is about five times greater than wooden poles. The life of wooden poles is about seven years. We have lately moved iron poles which have been in the ground eleven years, and there was no evidence of deterioration.—P. F. Gerhart.

324. Is it advisable to connect the various sections of trolley line together through 100 to 150 ampere fuses at section insulators? What difficulties are experienced?

I do not think it advisable. If any of the circuit breakers should open at the station, that section would take current through the fuses at section insulators, which would blow these fuses, rendering them useless.—P. F. Gerhart.

The advantage of inter-connecting various trolley sections is in obtaining the full benefit of all feeder copper. In our tests, we found that with a fuse of size sufficient to materially realize the advantages, when trouble came on any section, it resulted in pulling out the feeder and generator circuit breakers at the station. This condition we considered was due to the relatively small size of our generating plant. In a station with large units and ample power there should be no more difficulty in inter-connecting trolley wires than with Edison three-wire networks, especially if time limit circuit breakers are used on the generators.—Editor.

325. What is the most economical repair or construction equipment for line repair department on small roads, 20 to 30 cars?

I think a line construction car, with an adjustable tower platform, with a place to carry one mile of trolley wire, and equipped with ladders, pike poles and tools of all kinds, the most economical kind of construction and repair car.—P. F. Gerhart.

Management.

330. What is the experience relative to carrying United States mail? What is a proper basis of charge to ensure a fair return from this service?

The United States Government have adopted a uniform rate for carrying mail, which is very low, but in our case we handle two routes by simply carrying the pouch on the front platform, which causes us very little trouble.—P. F. Gerhart.

351. What is a fair annual charge per man to be made the Government for carrying mail carriers while on duty?

A contract was made to carry regular and substitute carriers, "while in uniform and on duty," for \$250 a year, and special delivery letter messengers for \$15 a year each, in a town of 35,000 population. During the year ending June 30th, 1903, 21 carriers and two special messengers used 26,386 tickets, or an average of 1,147 rides per employe per annum, at a charge of about one cent a ride. Evidently the contract has been abused. Contracts should be limited as to carriers to transportation while on duty and with mail pouch. From a business standpoint, it would be difficult to make a contract with the Government at profitable figures.—Ernest H. Davis.

352. Is there any reasonably cheap method by which the improper use or issuance of transfers can be checked and surely detected?

We have no system in daily use. Periodically, attempts have been made to check up transfers for three or four consecutive days with some benefit, but the results have not been very satisfactory.—Ernest H. Davis.

353. Should conductors be required to note on their reports at the end of each trip the number of transfers issued and the number of tickets, transfers and passes received? If so, why?

Yes. Conductors should be required to note on their reports at

the end of the last trip—the number of transfers issued and collected, and all transfers collected and deposited in envelopes at each trip end. In this way you can compare the number of cash fares on any particular trip with the number of transfers he issued.—P. F. Gerhart.

354. Should conductors be required to deposit at the end of each trip a bag or envelope containing all tickets, transfers and passes received during said trip? If so, how should checking be managed and what system provided for conductors running on lines not passing the receiving station?

This is not our practice. The method specified should be beneficial, especially if some cheap way of daily checking the transfers, etc., deposited per trip, could be enforced.—Ernest H. Davis.

Under our system every car on the line passes our office on each trip. The conductors deposit an envelope at the end of each trip, consecutively numbered, and marked with his car number, time trip ends, route and name. In this envelope he deposits all the transfers and tickets collected on the trip. In this way we are able to see if he accepts dead transfers.—F. B. Musser.

355. What conditions can a company agree to fulfill for a franchise in small cities and boroughs?

Depends upon local conditions. All companies are subject to the usual police regulations and taxes, which may amount to considerable. In addition, paving between the track, and to the ends of the ties, and keeping such parts in repair, should be the limit, except under unusual conditions.—Ernest H. Davis.

A fair consideration on the part of the company for a franchise in a small city or borough would be to keep in repair the part of street occupied by its tracks and ties; and perhaps a small tax per pole for all poles used.—F. B. Musser.

356. In interurban roads, less than 10 miles long, and running through a district not heavily populated, is a half-hourly service too much or too little?

Half-hour service is too often. We give hour service to suburban homes, except on special days, when we increase to half hour.—Chas. H. Smith.

I would say hourly service would be ample, except during the summer months, when half-hourly service would probably pay. This would depend upon the amount of traffic.—F. B. Musser.

357. Where interurban roads connect one or more towns, what provision, if any, has been found advisable to make for carrying packages, trunks, sample cases of traveling men, and similar articles?

We carry packages on regular cars, charging the usual fare.—Chas. H. Smith.

We do not carry packages except when accompanied by a passenger; but it would be profitable business for a company to do. I see no reason why this traffic cannot be properly handled by running a car, specially equipped for the purpose, every two or three hours.—F. B. Musser.

358. What additional expense, if any, should be incurred in the construction of an interurban road, to secure a private right of way in preference to the use of part of a highway?

As much as possible, private rights of way are preferable, especially if the road in time is likely to be part of a through system. The higher the speed, and the greater the mileage, the cheaper the operating expense, and the greater the receipts per car mile. The proportion of extra construction cost justifiable must be determined by local conditions.—E. H. Davis.

All would depend upon local conditions; but when a road can be kept upon a private right of way, adjacent to a highway, a fair price to pay for such right of way would be from \$1,000 to \$1,500 per mile of track.—F. B. Musser.

359. What maximum and average rate of speed is practicable or advisable on interurban systems operating on public highways?

360. In interurban roads, what should be the minimum rate of fare per mile based on the use of the entire system?

361. Is it customary or advisable to charge extra fare for late running cars? If so, how much and under what conditions?

We charge two dollars per car per hour besides the regular fare for cars after midnight.—Chas. H. Smith.

We make it a rule to charge double fare on cars that leave the city for suburban towns after 12:30 a. m.—F. B. Musser.

362. Is it better to punish an employe for breach of rules by suspension of fines, or to warn first and then discharge upon being satisfied as to his indifference or incompetency?

We suspend our men for breach of rules; they are discharged when reported too often.—Chas. H. Smith.

I think it better to warn first; then if no sign of improvement is shown, dismiss.—F. B. Musser.

363. Is the offering of premiums or extra pay conditioned on good service and freedom from accidents, conducive to satisfactory results? What has been your experience in this matter?

Our experience has not been very satisfactory. It is very difficult to keep the record of employes so as to avoid dissatisfaction on the part of those who do not share in the bonus, but who think they are entitled to. Give the employes longest in the service the best runs, and pay a fair rate of wages, is the practice we have adopted.—E. H. Davis.

364. Should conductors and motormen be rated according to length of service or quality of service? How should such rating be rewarded—more pay or better runs?

We promote our men to the best runs.—Chas. H. Smith.

I think men should be rated according to length of service and rewarded by graduated pay and selections of runs.—F. B. Musser.

365. What has been your experience with the Brown or other merit system of rating employes? How do you carry out system in practice?

We have never tried the Brown system.—F. B. Musser.

366. What is the maximum number of hours per day conductors and motormen should be called to work regularly?

Our cars work 18 hours each day. Three men to a car, each making 12 hours, allowing them to take their meals at home. Changes every week, i. e., their hours are changed.—Chas. H. Smith.

The men on best runs make about 10½ hours per day. We prefer to have our men on best runs work not more than 11 hours.—E. H. Davis.

367. What system does your company use to determine the competency of your conductors and motormen?

368. Is it advisable to charge an employe with damages caused by gross or ordinary carelessness? If so, to what amount in dollars?

Our men are held responsible for all damages caused by their neglect or carelessness.—Chas. H. Smith.

I do not think it advisable to charge an employe for damage, as it is apt to cause him to neglect to report accidents which might lead the company into lawsuits.—F. B. Musser.

369. In view of the recent increase in the rates of fire insurance, would it not be advisable for various companies to unite in having the combined insurance placed with one party so as to get, if possible, better rates on account of the larger amount of insurance placed?

370. To what extent are sprinkling systems used in car barns? Are the interest and maintenance charges on a sprinkler system greater than the saving in insurance?

Sprinkling systems have been applied to car barns with considerable reduction in insurance rates. This is a matter that I think can be profitably looked into.—E. H. Davis.

371. What are relative merits of slow-burning mill construction and steel-concrete fireproof construction for car barns?

High Speed Electric Traction at Berlin.

Apropos of the press report that a speed of 131½ miles an hour was achieved October 23d on the experimental electric railroad from Marienfelde to Zossen, Germany, the report of the United States consul general at Berlin, Mr. Frank H. Mason, in this connection will be of interest. The first part of Mr. Mason's report, which is dated Sept. 29, 1903, deals with the inception of these experiments, including the organization of a company in October, 1899, entitled "The Company for Experiments in Electric High-Speed Railways." Mr. Mason's report covering the first experiments, which occurred in October and November, 1901, was printed in full in the "Street Railway Review" for May, 1902, page 267.

The last report goes on to state that during the 22 months since the close of the first experiments the track from Marienfelde to Zossen has been taken up and relaid with new steel rails weighing 41 kilograms (86.1 lb.) per lineal meter, resting on heavy spruce

ties 22 in. from center to center and heavily ballasted with broken basalt. The rails are set on each tie in a steel chair, strongly bolted down, and are joined perpendicularly by beveled joints 7 in. in length, held firmly together by bolts passing horizontally through the fish plates, so that the effectiveness of a continuous rail is practically secured. The old light rails, which had failed in 1901 and were therefore taken up, have been laid down flat as guard rails, resting horizontally on special cast-iron chairs in such a way that the flat bottom flange of the rail stands vertically along the inside line of each heavy rail and about 2 in. distant from the inner edge of its face.

The track is a nearly level air line throughout its length, except one curve of 2,000 yd. radius near its southern extremity, and is in all respects up to the highest standard of modern railway construction. The motors have been likewise improved in various minor details, but the cars are substantially the same as when first constructed. Each is 22 meters (72.18 ft.) in length and weighs 90.5 metric tons, or about 200,000 lb. avoirdupois. Of this weight 48 metric tons comprise the body and running gear and 42.5 tons are made up by the motors, transformers, and other details of the electrical equipment. Each end of the car rests on a six-wheeled bogie truck of the American type, and the motors are four in number, one attached to the front and rear axle of each truck, the middle pair of wheels in each group running free. The wheels are 49 in. in diameter and are equipped with pneumatic brakes of the standard type.

The transformers, which are hung beneath the middle section of the car, weigh 12 tons, besides which a storage battery of 631 lb. weight supplies the current for lighting purposes. The interior of the car is provided with upholstered seats lengthwise along the sides, and an open railing incloses at each end the space occupied by the driver, who, standing behind a curved front of plate glass within easy touch of volt and ampere meters, gages which show the resistance of the air, and a dial that indicates and registers the speed, controls its movements by turning a pilot wheel.

The present series of trials began September 15th, where those of 1901 had ended, with a speed of 150 kilometers (93.2 miles) an hour, which has been gradually increased until September 26th, when the car built by Messrs. Siemens & Halske ran for miles at the unprecedented rate of 189 kilometers (117.32 miles) an hour—a small fraction under 2 miles per minute. The three-phase current from the power station registered 13,500 volts, and every part of the installation—transformers, motors, car, track, and recording instruments—worked to perfection; the swaying movement was scarcely noticeable, and, according to the verbal reports of those who were privileged to make the two trial trips from Marienfelde to Zossen and return, no discomfort from vibration, wind pressure, or other cause was experienced in greater degree than on an ordinary express train.

Careful examination since the trial fails to detect any sign of failure or deterioration in track, car, or transmission system, and it is thought that it is hardly too much to assume that the technical problem of electric-traction speed up to 100 miles and more per hour is successfully solved for all localities where straight and reasonably level and well-guarded railway lines can be provided.

The report concludes: These experiments show that the trolley-line voltage can be easily transformed on the motor car; while another series of tests now in progress on another line have proven that a single-phase alternating current of 6,000 volts can be carried to long distances along one small wire and used directly in a new high-voltage induction motor without transformation. Upon these two demonstrations, which the electricians of Berlin have made within a single month, will be based, more or less directly, future progress in high-speed traction, which becomes henceforth a commercial question, the technical difficulties of which have been, or certainly soon will be, successfully overcome.

The tests at Zossen show that with properly constructed track and car, high velocities are not only possible, but free from discomfort to passengers. The experiments at Oberschönweide show that the complications entailed by overhead wiring for polyphase currents, as well as the weight and cost of transformers, may be eliminated by the use of high-voltage, single-phase apparatus. It remains to be demonstrated to what extent the speed of public travel can be accelerated between large cities and through popu-

lous districts under conditions which will command public confidence and patronage.

The outward results of these experiments are to all appearances complete in their success, but their economics—the relation of cost to service rendered—are not yet disclosed. It remains only to be demonstrated to what limit high-speed transit is demanded by public utility, and will therefore be financially profitable in actual practice.

Canadian Notes.

At a meeting of the citizens of St. Mary's \$18,000 was pledged toward the construction of the St. Mary's, Embro and Woodstock radial road.

The water-power plant at Dashwood Falls, near Lac du Bonnet, owned by the Winnipeg Power Co., is being developed rapidly, and work is progressing on the long sluice which is being cut through solid rock to give the necessary head of water for generating electrical energy. The plant will cost nearly \$500,000. The Winnipeg Power Co. is controlled by the MacKenzie & Mann Corporation, and will be incorporated with the present Winnipeg Electric Street Railway Co.

The Hamilton, Grimsby & Beamsville Electric Railway Co. will issue first consolidated mortgage bonds, not to exceed \$10,000 a mile, for the whole length of the line, and secure the same by mortgage. Prior to this the directors have not had authority to issue bonds on that portion of the railway east of Beamsville.

The Hamilton Street Railway Co.'s receipts for the quarter ending September 30th increased \$1,241.77 over the corresponding quarter of last year.

The Berlin and Preston street railway promoters contemplate extending their road to Wellesley, Listowel and Goderich.

Bids for the erection of a brick and steel power house at De Cew Falls, near St. Catharines, have been taken by the Hamilton Cataract Power, Light & Traction Co. Four generators of about 7,000 h. p. will be installed in the new building, which is to be 300 x 80 ft. and 30 ft. high.

More power is needed on the west side of St. John, N. B., and the St. John Street Railway Co. is rushing the extension of its power house to supply this need. In the addition will be installed a new engine of about 900 h. p., and a generator of 600 kw. capacity, in addition to another combined unit of 400 h. p. Some of the smaller engines in the main power house will be removed and one 1,100-h. p. Laurie engine substituted.

November 2d Mayor White, of Port Hope, received a letter from Mr. A. E. Pond, of Boston, Mass., on behalf of the Ontario Electric Railway Co., which recently received a charter, and of which the Hon. Richard Cartwright is president, claiming that his company intends to build an electric line from Brockville to Toronto, and stating that it is the intention to commence construction in the spring, beginning at Trenton and building to Belleville. Eventually the road will be completed from Toronto to Belleville, where connection will be made with the Canadian Pacific Ry. Water power will be used.

At a meeting of the Street Railway Commissioners November 1d a draft containing the basis of the proposed agreement with the Stratford Radial Railway Co. was completed and has been submitted to City Solicitor Idington, of Stratford, and Mr. T. G. Meredith, city solicitor of London. The promoters contended strongly to be allowed to use the grooved steel rails, which would be laid on an improved girder rail. Guelph, St. Catharines, St. Thomas, Berlin, Woodstock and Galt use T-rails. Windsor has flat and "Jumbo" T-rails, London has groove girder rails and Toronto uses an improved steel girder rail.

The problem of Messrs. Cartwright and Pond's proposed radial railway problem that has been troubling the city so long. His plan was submitted November 7th to Mr. W. H. Moore, assistant to the president of the Toronto Railway Co., and Mr. Walter Barwick, K. C., solicitor for the Metropolitan Railway Co., and they approved it. The agreement was not made known, but the general plan was published in the press, and it was found that the arrangement at a narrow gauge. Only the Metropolitan tracks are on a standard gauge; the tracks of the three other radials will have to be narrowed. The Toronto street railway, however, is on a standard gauge.

The proposed road is to be built for passenger traffic only.

one from the north, one from the east and one from the west, centering at Front St. and the Market.

The radials shall carry passengers, light or package freight and express traffic only, and during limited hours other classes of freight, mostly coal, subject to the supervision and direction of the city engineer.

The tracks shall be standard gauge. (The gauge of the street railway tracks is four inches wider.)

The radial railways shall pick up no city passengers.

The radial companies shall pay for the privilege of the right of way a certain rate per cent on the cost to the city, to include a reasonable compensation for the use of the streets traversed. (The rate suggested is 5 per cent.)

The radial companies shall also pay a percentage on the fare for every passenger they bring into the city. (The Toronto Railway Co.'s average rate of fare is about 4 cents, and the city's percentage about 10 per cent, and the percentage to be paid by the radials will be calculated on that basis.)

These rights of way shall be available for all radials desiring to come into the city, but the right of other than the existing lines to use them shall be subjected to the approval of the city.

The radial railway companies covenant to build within four years at least 150 miles more of tracks. (They have now 150 miles.)

That the franchise shall be granted for 18 years, to be then renewable for 20 years and expire absolutely at the end of 40 years.

As the city limits extend the city shall have the right to purchase the right of way and roadbed to the boundary lines.

The city to purchase the right of way, construct the roadbed, and lease them to the company, the company laying the rails and doing the other construction work.

The Toronto Railway Co. has agreed to move its Front St. tracks to Wellington St. to make room for the radials on Front St. It is proposed that the radial terminals and yards be located near the foot of Bathurst St., with freight terminals at St. Lawrence Market.

Those having in hand the proposition to harness the Mississippi Falls, 45 miles north of Kingston, and carry electricity to Kingston, are securing right of way from the falls to the headland lake, 30 miles distant.

American Society of Mechanical Engineers.

The program of the annual meeting of the American Society of Mechanical Engineers, which is to be held in New York December 1-4 next, is in substance as follows: The opening session will be held at Society House Tuesday evening, December 1st, at 9 o'clock. The president, Mr. James M. Dodge, will deliver the annual address, the subject being, "The Value of an Engineering Education to a Young Man". The second session will be held Wednesday morning at the hall of the Mendelssohn Glee Club, 113 W. 40th St., it being a business session at which professional papers will also be presented. Following luncheon there will be excursions to various power houses and points of interest.

The third session will be held at the Carnegie Laboratory of the Stevens Institute Thursday forenoon, and lunch will be served at the Institute, followed by visits to points of interest in and around the grounds. Thursday evening there will be a reception for guests and friends at Sherry's, to be followed by dancing and supper. The closing session will take place at Society House Friday at 10 a. m.

Following are the nominating committees' recommendations of officers for the ensuing year to be voted upon at the December meeting: For president, Mr. Ambrose Swasey, of Cleveland, O. For vice-presidents, Prof. D. S. Jacobus, of Hoboken, N. J.; Mr. M. L. Holman, of St. Louis, Mo.; Mr. William J. Keep, of Detroit, Mich. For managers, Mr. George I. Rockwood, of Worcester, Mass.; Mr. John W. Lieb, jr., of New York City; Mr. Asa M. Matrice, of Pittsburg, Pa. For treasurer, Mr. William H. Wiley, of New York City.

It is announced that the tunnel under the North River between Jersey City and New York is now within 600 ft. of Manhattan.

Judge Peter S. Grosscup, acting as arbitrator of the Chicago Union Traction Co.'s affairs, recently decided that the pay of the employees of the road should be equalized, which gives most of them an increase of 20 per cent, to become effective next month.

Personal.

MR. W. J. FADE has resigned as general freight agent of the Rockford, Beloit & Janesville Railroad Co., to enter mercantile life.

MR. JOHN CLARK has been appointed general claim agent for the Cincinnati, Dayton & Toledo Traction Co., the claim department having been recently created.

MR. WILL. RICE has resigned as superintendent of the Portland & Brunswick (Me.) Street Ry., which position he had held since the opening of the road, in June, 1902.

MR. J. M. MARTIN has resigned as district sales agent at the Philadelphia office of the Nernst Lamp Co., and Mr. A. E. Baker has been appointed as his successor.

MR. MILLARD B. HERELY, for several years traffic manager of the Chicago Union Traction Co., has been appointed general superintendent of the company, vice Mr. T. A. Henderson, resigned.

MR. G. P. BULLIS has been appointed assistant manager of the Beaumont Traction Co., of Beaumont, Tex., with the duties and authority of the manager, Mr. Ben Johnson, who is on an indefinite leave of absence.

MR. R. L. POST, in addition to being secretary and treasurer of the Ithaca (N. Y.) Street Railway Co., of which he is also a director, has been appointed general manager of the company, vice Mr. H. A. Nicholl, resigned.

MR. CHARLES T. BISHOP, formerly with Ladenburg, Thalmann & Co., New York, and late paymaster of the United States naval service, has been appointed auditor of the H. W. Johns-Manville Co., 100 William St., New York.

THE SANDUSKY SOUTHWESTERN RAILWAY CO., at its annual meeting, November 9th, elected the following officers: President, John Van Sanfleet; vice-president and general manager, F. O. Oleson; secretary, G. A. Smith; treasurer, Lyman Means.

MR. HUBBELL ROBINSON has been appointed attorney in charge of claims and real estate by the Schenectady Railway Co. He was formerly connected with the claim department of the New York Central R. R., and the law department of the Brooklyn Heights Railroad Co.

MR. IRVING H. REYNOLDS will shortly retire from the Allis-Chalmers Co., and the duties of chief engineer will be assumed by the engineers in charge of the various departments, these engineers availing themselves of the advice of Mr. Edwin Reynolds, consulting engineer of the company.

MR. JOHN MAHONEY has been appointed general superintendent of the St. Louis & Suburban Railway Co., the appointment becoming effective November 1st. Mr. Mahoney has been in the street railway business since 1874, holding various positions, as foreman, superintendent and secretary and treasurer.

MR. CHARLES H. COX has been appointed general manager of the Lincoln (Neb.) Traction Co., vice Mr. J. H. Humpe, resigned. Mr. Cox is now manager of the Middleboro, Wareham & Buzzard's Bay Street Railway Co., of Middleboro, Mass. He will assume his new duties the middle of December.

MR. JOHN I. BEGGS, president of the Milwaukee Electric Railway & Light Co., has been appointed nominal manager during the World's Fair period of the Union Electric Co., of St. Louis, which has been awarded a contract to supply the World's Fair 10,000 h. p. of electric current, beginning May 1, 1904.

MR. J. P. CLARK, who was recently appointed general manager of the Fort Wayne, Logansport, Lafayette & Lima Traction Co., has resigned that position to accept another in the employ of the Indiana Union Traction Co., for which he will superintend the construction of a branch line from Marion to Huntington, Ind.

MR. CHARLES E. FIFE has been appointed superintendent of the Pittsburgh, McKeesport & Connellsville Railway Co.'s lines south of Connellsville, with headquarters at Uniontown. He was formerly in charge of the Connellsville division from Mt. Braddock as far north as Scottdale, including the Vanderbilt and Leisenring lines.

MR. IRA A. McCORMACK, formerly superintendent of the Cleveland Electric Railway Co. and more recently manager of the New York Central R. R. lines, with jurisdiction between the Grand Central depot, New York, and Mott Haven Junction, has been appointed manager of the Grand Central Depot, and also manager of the New York Central's Harlem division. His promotion became effective November 1st.

MR. H. G. TYRRELL, chief engineer of the Brackett Bridge Co., of Cincinnati, has just returned from an extensive trip, covering the country from Colorado to the Atlantic coast, in the interest of his company. Mr. Tyrrell is widely known as a journalist, who has contributed to the leading technical journals, in addition to being the author of several technical works, including "Bridge and Structural Index" and "Standard Roofs and Bridges."

THE PUBLIC SERVICE CORPORATION OF NEW JERSEY has announced the following changes in its street railway department, which became effective November 9th: Mr. A. J. Bliss has been appointed a division superintendent, vice Mr. Hugh Brooks, assigned to other duties; Mr. W. F. Revoire, division superintendent, in addition to his other duties, has been appointed to have charge of the lines hitherto managed by Mr. A. J. Bliss, transferred; Mr. Frank C. Southard, division superintendent, in addition to his present duties, appointed in charge of lines formerly in charge of Mr. John Sloane, resigned; Mr. James Smith, appointed division superintendent in place of Mr. John A. Campion and Mr. James McDonough, resigned; Mr. Frank H. Brown has been appointed a division superintendent; Mr. John J. Gettings, division superintendent, in addition to his present duties, to have charge of the lines formerly managed by Mr. William B. Taylor, resigned; Mr. Patrick McDermott, division superintendent, in addition to his present duties, in charge of the Kearney Line, heretofore in charge of Mr. John Sloane. Mr. Hugh Brooks has been appointed in charge of all horses and wagons, with the title of superintendent of trucking of the North Jersey Street Railway Co., the Jersey City, Hoboken & Paterson Street Railway Co., the Elizabeth, Plainfield & Central Jersey Railway Co., the Orange & Passaic Valley Railway Co., and the Port Richmond & Bergen Point Ferry Co.

Obituary.

MR. MICHAEL OHMER, father of Mr. John F. Ohmer, of the Ohmer Fare Register Co., died November 11th, at his home in Dayton, O. He was born in Bispang, Lorraine, France, Dec. 25, 1826. He removed to Dayton in 1837, afterward going to Buffalo, New Orleans and other cities, returning to Dayton in 1848, where he established a furniture manufactory which grew to large proportions.

MR. JOHN GRAHAM MILLAR, manager of the roofing department of the H. W. Johns-Manville Co., of New York City, died October 15th at St. Luke's Hospital, New York, of typhoid fever. He was 42 years old and was born in Birmingham, Eng. He came to this country in 1885, and, after a short period in the employ of the United States Leather Co., he entered the service of the Johns-Manville Co. 15 years ago.

MR. JOHN C. DANIELS, president of the Garton-Daniels Co., died October 25th at his former home at Eau Claire, Wis., where he had gone in the hope of securing relief from his sickness. He was born in New York state in 1840, and was, therefore, 63 years of age. Mr. Daniels was formerly the owner of a fleet of raft boats operating on the Mississippi River, and in 1892 engaged in the business of the Garton-Daniels Co., with headquarters at Keokuk, Ia.

MR. WILLIAM L. ELKINS died November 7th at his summer home, Ashbourne, near Philadelphia. He was 71 years old, having been born near Wheeling, W. Va., May 2, 1832. He was educated in the Philadelphia public schools. In 1881 he took up street railroading, and his first success was in organizing the Philadelphia Traction Co., which resulted in the consolidation of all the lines of the city under the name of the Union Traction Co. Mr. Elkins was a stockholder in street railway lines in New York, Chicago, Baltimore and other large centers. He was a director of the Pennsylvania R. R. for 21 years, and was interested in gas and electric light companies. He also organized the United Gas & Improvement Co., and had many other interests of a quasi-public nature.

Preparations are under way for the building of two competing electric lines between Kalamazoo and Lake Michigan points. These lines are projected by the Kalamazoo & Lake Michigan Traction Co., which will operate between Kalamazoo and South Haven, and the Kalamazoo & Lake Michigan Electric Co., which will build from Kalamazoo to Benton Harbor with a branch line to South Haven and Saugatuck.

New Publications.

SMITHSONIAN INSTITUTION, ANNUAL REPORT of the Board of Regents, showing the operations, expenditures and condition of the institution for the year ending June 30, 1902. 687 pages. Illustrated.

THE ALTERNATING CURRENT TRANSFORMER. By F. C. Ramm. Published by the McGraw Publishing Co., New York. Price \$1.50. This book contains 188 pages, including an appendix. It is illustrated and is bound in cloth boards. The work originated from a course of Stanford University lectures, and it is intended to be of use to the engineer and general reader who may have some knowledge of elementary alternating currents.

THE LAW OF STREET SURFACE RAILROADS, as compiled from statutes and decisions in the various states and territories. By Andrew J. Nellis. 682 pages. Published by Matthew Bender, Albany, N. Y. The writer's aim, as stated, has been to put together in convenient form and under a logical arrangement an epitome of the judicial decisions relating to street railways, the idea being to make the book a time and labor saver and a work of ready reference. It is claimed for it that it contains a survey of the entire field of the law. The author is a member of the New York bar.

ENGINEERING PRELIMINARIES FOR AN INTERURBAN ELECTRIC RAILWAY. By Ernest Gonzenbach. Published by the McGraw Publishing Co., New York. 70 pages, cloth board covers. In the introduction the author states that "in view of the present interest in interurban railway development and engineering, the writer submits, as a result of an invitation from the Street Railway Journal, the plans and recommendations embodied in a report on a proposed railway in the Middle West, which serves as a good example of many roads now on paper, and which may soon assume tangible form." Price \$1.

FRICITION AND LUBRICATION, a Handbook for Engineers, Mechanics, Superintendents and Managers. By William M. Davis, Mem. N. A. S. E., E. S. of Western Pennsylvania and Ohio Society of M., E. and S. E. 216 pages, cloth bound, illustrated. This work presents the subject of lubrication and lubricants in a plain, concise way that will be of practical value to the engineers, managers and mechanics who read it, it being the author's plan to get away from the old-style treatment of the subject and treat it from a practical, or, rather, a mechanical point of view. It is published by the Lubrication Publishing Co., of Pittsburg, Pa.

THE "ENGINEERING" AND ELECTRIC TRACTION POCKET BOOK. By Philip Dawson, author of "Electric Railways and Tramways." Third edition, 1903, revised and rewritten. 1,412 pages, flexible covers, gilt edges, illustrated. In the second edition two new sections were added, one on gas engines and gas producers, and one on the use of electrical energy in factories and workshops. Conversion tables of English and foreign measurements were inserted, also. In this third edition a large number of sections have been entirely rewritten and brought up to date. Heavy electric traction has grown so rapidly since the last edition that a very large amount of new matter has had to be added. Published by "Engineering," London, Eng.; New York, John Wiley & Sons.

NOTES ON ELECTRIC RAILWAY ECONOMICS AND PRELIMINARY ENGINEERING. By W. C. Gotshall, Mem. A. S. C. E., Mem. A. I. of E. E., and president of New York & Port Chester Railway Co. This book is based upon a series of lectures which the author delivered at Lehigh University, the subject of which dealt with the economics of the preliminary determinations and of the construction and operation of high-speed interurban electric roads. The work treats exclusively of high-speed roads, taking up the project from the preliminary office investigation of the probable earnings and expenses. Original drawings and diagrams, which were used in the lectures, have been reproduced. VI. + 252 pages, cloth boards. Published by the McGraw Publishing Co., New York. Price \$2.

INTRODUCTION TO POOR'S MANUAL FOR 1904 Pamphlet, 16 pages, containing statistics of the railroad of the United States in 1902. This is a compilation showing the financial condition, statistics of operation, mileage, classification, equipment, earnings, construction, stock and bond capitalization, passenger traffic for 13 years, freight traffic, etc. Published by H. W. and H. W. Poor, New York. The publisher of Poor's

Manual for 1903 recently announced that its issuance had been delayed, chiefly because it was entirely set by linotype and Lanston machines, this being an innovation, and also because it contains 180 more pages of text than last year. It was expected that the edition would be ready for delivery by November 16th. The Manual contains the latest railroad information published prior to November 1st.

COMPOUND CORLISS ENGINES. By James Tribe, Mem. A. S. M. E., author of "Compound Engines." 177 pages, leather covers, gilt edges. First edition, 1903, illustrated by cuts and diagrams. Published by the author at Milwaukee, Wis. The author states that this volume was intended as the second edition of "Compound Engines," but so much new material has been added and so many changes made as to make it virtually a new book. It is essentially an elementary text book on the generation and utilization of heat and the transformation of heat energy into mechanical energy by means of the multi-cylinder Corliss steam engine. Although theoretical in treatment, it aims to be practical in purpose, all of the examples being based on actual up-to-date practice. It was expressly written to meet the needs of the steam engine designer whose knowledge of higher mathematics may be limited and who finds himself handicapped by the complex formulæ usually found in works on this subject. Price \$2.50.

Strikes of the Month.

So far as the company is concerned the strike of the conductors and motormen of the Citizens Railway Co., of Waco, Tex., has been over since the first cars were run on October 12th, as stated in the "Review" for October. On October 19th a temporary injunction was ordered by the district court restraining the city from attempting to enforce the ordinance requiring persons seeking employment as motormen to show that they had had 30 days' experience before they filed their applications. After the injunction was issued the company had no difficulty in manning their cars. November 6th the city council repealed the ordinance referred to. October 20th, in a battle between union and nonunion men, one of the nonunion motormen was fatally shot. The strike began September 26th and was declared off November 11th.

As mentioned in the "Review" for October, the strike on the San Antonio (Tex.) Traction Co.'s lines was practically concluded October 12th, when full schedules were run with nonunion men. There was a revival of rioting November 2d, when a Laurel Heights car was ambushed and stoned and the motorman severely hurt. November 8th a number of strikers made application for reinstatement, and six were taken back upon their promising to forsake the union. Others followed suit and will be given work as vacancies occur. The strike began October 7th.

The strike of the employes of the People's Traction Co., of Galesburg, Ill., which was mentioned in the "Review" for October, was called off October 26th, the company agreeing not to discriminate against union men, but insisting upon hiring nonunion men, too, if it sees fit. The strikers conceded everything else.

The motormen and conductors of the Murphysboro (Ill.) & Carbondale Electric Railway Co., which connects the mines and mining towns of Williams County, went out on strike October 30th, tying up the road. They were receiving 15 cents an hour and asked for 20 cents. The company is surveying for a 26-mile extension to Harrisburg.

The decision of the commission which was appointed several months ago in the San Francisco street railway wage arbitration was handed down November 4th. It awards an increase of 10 per cent in wages to men employed for two years prior to April 1, 1903, and 5 per cent to those of shorter service. Hours were left unchanged and the wage rate was declared effective from May 1, 1903, to May 1, 1904. The award was written by Mr. Oscar Strauss and was assented to by Mr. W. D. Mahon.

The Mansfield (O.) Railway, Light & Power Co. recently ordered 10 closed cars of the J. G. Brill Co., to be shipped on December 1st. They are to be 35 ft. over all, mounted on Brill 27 G double trucks and will be equipped with "American" upholstered spring seats, Hunter signs, safety car steps and K-12 controllers. The company's old cars are to be used as stations along the line of the Mansfield & Shelby branch.

Chicago Union Traction Co.

Matters are practically at a standstill between the Chicago Union Traction Co. and the city of Chicago, owing to the city insisting upon the waiver of the 99-year franchise act, which the company states it cannot assent to. A new element entered into the situation October 29th, when the Chicago Railways Co. was incorporated with the ostensible purpose of taking over the Union Traction and underlying companies, if it can be arranged. The new company has a nominal capitalization of \$10,000, but it is stated that the capital is to be increased to \$5,000,000. Mr. Alfred L. Skitt, of New York, will be president, and Messrs. R. R. Govin, Joseph Auerbach and H. B. Hollins will be directors. The incorporators of the new company are Nathan C. Johnston, William E. Cooper and Archibald G. Thiselton. It is stated that H. B. Hollins & Co. are ready to finance the company. This matter is in abeyance.

October 31st two bills were filed in the Cook County circuit court by Jacob Miller, a resident of Germany and a stockholder in the North and West Chicago Street Railroad Companies, seeking to have adjudicated the legality of the amendatory leases and the tripartite agreement entered into by the three companies, and asking that the officers and directors of the North and West companies be enjoined from acting as such or transacting any business on behalf of the companies, and that a new election of officers and directors be held. He also asked that the new leases and tripartite agreement be declared void and beyond the power of the North and West companies to execute. November 1st Judge Grosscup, of the federal court, caused warrants to be issued summoning Mr. Miller's attorneys before him on a charge of contempt in attempting to secure an injunction against the officers of the North and West Chicago companies. A restraining order was also issued. November 12th this preliminary injunction was made permanent and Judge Grosscup intimated that in future all parties who attempt to delay matters by bringing suits in the state courts will be harshly dealt with. He also said that he would act in this case as in the Townsend suit and would not order the dismissal of the state court suits until the Court of Appeals had passed on his right to enjoin the prosecution of those bills.

November 4th the announcement was made to stockholders of the three companies, whose stock interests have been in the hands of a protective committee for reorganization purposes, that certificates of deposit may now be exchanged again for the original stock certificates through the Guarantee Trust Co. The committee took this stand upon the ground that its work had been completed, a new company having been incorporated and substantial progress having been made in safeguarding the interests of stockholders. Stockholders of the North Chicago and West Chicago companies have held meetings at which the advisability of forming a voting trust to represent their interests in the negotiations with the new company have been considered.

November 12th Judge Grosscup directed the receivers to pay \$74,917.50 to the stockholders of the West Chicago Street Railroad Co. November 15th, as provided by the amended lease.

Reorganization of the Lake Street Elevated.

October 26th the Equitable Trust Co., of Chicago, was appointed receiver for the Lake Street Elevated Railroad Co., of the same city, upon application of James Bolton and Daniel F. Crilly, the former a director and stockholder and the latter a stockholder. Mr. Bolton owns 3,500 shares of stock and Mr. Crilly owns 700 shares. Mismanagement was alleged in strong terms in the bill, and the president, Mr. Clarence A. Knight, and Mr. Charles T. Yerkes were directly accused of trying to ruin the company, which was claimed to be insolvent. October 28th Lester E. Frankenthal, Samuel J. Kline, Leo Grossman and Eli B. Rosenthal were allowed by order of court to become co-complainants with Messrs. Bolton and Crilly.

October 28th, also, Mr. Alfred Kohn, one of the defendants, filed an answer and cross-bill, denying that he was guilty of any wrong-doing and praying that the injunction and receivership already obtained be continued. October 31st President Knight filed his answer to the petition for receiver, in which he stated that everything charged against him was untrue. He also stated that Mr. Yerkes had sold all his stock in the road in February, 1901,

and since that time had had nothing whatever to do with the company. He asked the court to dismiss the bill as regards himself.

Four committees had been at work for some time in an effort to harmonize the conflicting interests of the company and effect an equitable reorganization, and it is announced that the receivership came upon the eve of the submission of a plan by the reorganization committee that would very likely have been acceptable, especially in view of the belief that there was no necessity for the appointment of a receiver at this time. The reorganization committee comprises H. N. Higinbotham (chairman), David R. Forgan, Helge A. Haugan, Cory E. Robinson and Thomas Templeton. This committee was appointed January 29th last.

November 5th it was announced that the reorganization of the company had been virtually accomplished, and November 6th formal approval was given by the security holders' committee to a plan of reorganization which had been approved by the stockholders' protective committee and the income bondholders' committee. All that remained, it was announced, was the submission of the plan to the security holders, and it was stated that this would be done at once, and that the approval of 90 per cent had already been obtained.

Under the proposed reorganization plan the company will continue under a new name, and it is stated that there will be a new set of officers. The new company will be capitalized as follows: First mortgage 5 per cent bonds, \$5,000,000; preferred stock, \$3,200,000; common stock, \$6,000,000. The capital stock of the old company was \$10,000,000, all common. It is not thought that it will be necessary to disturb the present first mortgage bonds other than to reduce the amount of the issue, which is now \$5,860,000. The reduction of the bond issue brings the fixed charges of the company within its net earning capacity. The \$3,200,000 preferred stock will be 5 per cent non-cumulative, and the income bondholders are to receive this stock to the amount of 80 per cent of the face or par value of their income bonds. The stockholders are to pay an assessment of \$2 per share in exchange for each share of their present stock, and for the said assessment they will receive \$40 in new common stock and \$4 in new preferred stock.

The plan of reorganization sets aside \$2,000,000 of preferred stock, \$2,000,000 of common stock and \$500,000 of bonds, the proceeds of which, together with the \$200,000 assessment paid by the stockholders, will be used for paying the notes and floating indebtedness of the old company. The Northwestern Elevated Railroad Co. agreed, in settlement of its claim of approximately \$770,000, to accept the debenture note of the company for \$350,000, payable in five years.

November 11th the receiver was discharged and the bill dismissed upon the application of the attorneys for both sides, Messrs. Bolton and Crilly having testified that the reorganization plan is a fair settlement in which no preferment is shown.

The Michigan & Indiana Traction Co.

The Michigan & Indiana Traction Co., which was recently incorporated, and which has its headquarters at Battle Creek, Mich., has arranged with the Peninsula Construction Co., which was organized for the purpose, to construct its third-rail system from Battle Creek to Grand Ledge, Mich., by way of Bellevue, Olivet, Charlotte, Pottsville, Millets, Ledey's Park and Lansing. It is the intention to secure right of way four rods wide, and to build all bridges for future double track. In entering Battle Creek, Charlotte and Lansing the company will procure mostly private right of way, with the object of running through cars with as little delay as possible in entering these cities.

At Battle Creek there will be facilities for transferring passengers to Gull Lake, an ideal summer resort. Lake Goguac, about 1½ miles from Battle Creek, will also be on the line. Olivet is a college village; Ledey's Park is about three miles from Lansing and is a popular resort for Lansing people; Grand Ledge, situated on the Grand River, is another attractive resort, where the Spiritualist association holds a 60-day camp meeting each year. The road will be equipped in an up-to-date manner and cars will be run with an idea of combining speed and comfort.

The officers of the Michigan & Indiana Traction Co. are: President, Edward F. Pangburn; secretary, William M. Dibble; treasurer, Charles J. Austin; chief engineer, John M. Comstock; assistant

engineer, Frederick G. Higby. The company has no connection with the Michigan Central Traction Co. which was incorporated some time ago to build a trolley system between the same points.

Los Angeles Notes.

In addition to building new car houses, the Los Angeles Railway Co. is about to erect car shops. The company formerly had its own shops, but these are now used mostly as car houses and most of the car building and repairing is being done in the shops of the Pacific Electric Railway Co. The amount of work is becoming so great, however, that these shops are unable to handle it all and the new shops have been decided upon. They will be located at the southern end of the city adjoining the new car houses and will be similar to the shops of the Pacific Electric Railway Co. They will be arranged in two rows with a transfer table between. The estimated cost is \$300,000, and the enterprise will give employment to about 300 men.

The roadbed of the Los Angeles Traction Co., recently purchased by the Hellman-Huntington syndicate, is being put in first class condition. Many of the Traction company's cars are also in the shops of the Pacific Electric Railway Co., being overhauled and repaired. Instead of having a distinctive color for each of its three lines (red, white and green), the cars are all to be green. A number of changes will be made in the design of the cars as they are rebuilt.

The Los Angeles Railway Co. recently received another shipment of cars from the St. Louis Car Co. These are being put through the shops as rapidly as possible, being fitted with Westinghouse air brakes and a number of new features. As fast as these cars are put in service the old-style cars are brought in and rebuilt. About 20 new cars are standing in the yards at the shops receiving their equipments.

Many of the old cable cars, which have been stored in the cable power houses, are being brought in and are either scraped or worked over. The grip cars are being used for waiting stations along interurban lines.

The Pacific Electric Railway Co., it is reported, has taken formal action to increase its capital stock from \$10,000,000 to \$20,000,000, the funds thus derived to be used in making extensions to the road, some of which are already under way.

The company recently adopted the use of mileage books, issued in books of 500 miles each and sold for \$6.25, or at the rate of 1¼ cents per mile. The tickets are good over all divisions of the road excepting on the Mt. Lowe division north of Altadena. The rate is of great benefit to persons living along the line between the important points, but is no cheaper for through rides. A minimum fare of five cents is collected.

The city council has just passed an ordinance compelling the street railway companies to sprinkle their tracks and the street for two feet on either side of the outer rails. The saving to the city is estimated to be about \$50,000 annually. It is expected that the mayor will sign the ordinance in a few days. The street railway companies, it is understood, will vigorously contest it.

The Griffith Ave. line of the Los Angeles Railway Co.'s system was recently opened and franchises for two new lines are soon to be offered for sale. The new lines will be several miles in extent.

The first installment of machinery in the new power house of the Los Angeles Pacific Ry. has just been started. Two sub-stations fed from this station, one at Playa del Rey on the coast and one in Los Angeles, are also in operation.

The Whittier branch of the Pacific Electric Ry. was opened November 7th. The road follows the Long Beach line to the southern end of the city and then turns east. The new line is about 13 miles long, or 17 miles from Los Angeles. A new sub-station has been erected at Laguna and the first of three machines, a 400-kw. Stanley motor generator set, is in operation.

Contracts for the brick work on the new interurban depot of the Pacific Electric Railway Co. have been awarded to C. Leonardt. Four million common brick and 600,000 pressed brick will be required. The contract for fireproofing the building was awarded to the same contractor. This is the largest brick-work contract in the history of southern California.

New Orleans Notes.

During the past season the New Orleans Railways Co. renewed its rolling stock by the purchase of larger and better cars from the St. Louis Car Co. At first the new cars were unpopular, patrons averring that they did not make as good time and could not be stopped as promptly as the old cars; also that the schedules were not maintained. As the motormen became more accustomed to the air brake and other improved appliances, however, complaint ceased, and the big cars are running satisfactorily upon all the important routes.

This fall the company is improving its tracks in the Canal St. district. Among others, one-half mile of double track each in St. Charles, Bourbon and Baronne Sts. is being constructed with 10-in. groove rails, to replace 9-in. girder rails. The city is paving these streets, which are narrow and are used almost exclusively for theater traffic, with asphalt, instead of the old cobble-stone pavement. The new rails are being furnished by the Lorain Steel Co. and the Pennsylvania Steel Co.

After the first of the year several contemplated extensions will be completed, among them the Napoleon Ave. line, which will be extended one mile toward the river, thus completing one side of the V-shaped cross-town line, which was built last year and which intersects the principal up-town routes. The company is also building a new power house, to be equipped with up-to-date generating and transmitting apparatus.

Recently the New Orleans Railways Co. agreed to repair all the city bridges which are used by its cars. Consequently the company will purchase a considerable quantity of supplies this winter for use early in 1904.

Receiver for Springfield & Xenia Traction Co.

October 29th the Springfield & Xenia (O.) Traction Co. was placed in the hands of a receiver, Mr. F. J. Green, at the instance of William L. Snyder, a creditor.

April 15, 1903, when the present management took possession of this property, the company had issued \$421,000 of bonds; its floating indebtedness amounted to about \$60,000; it had \$438 in the treasury, and no provision had been made to meet the \$10,525 of interest due May 1, 1903. Seventy nine of the bonds, for \$1,000 each, had not been sold, but the same had been pledged as collateral security to a portion of the floating debt, and the present management was in hopes that they could make such a showing in the way of earnings for the property that these 79 bonds might be sold for a price sufficient to pay the floating debt and leave a small margin for much-needed repairs upon the property; but purchasers for these bonds could not be found. The property was also in very bad physical condition and there were expensive repairs needed.

The road has been carefully and economically managed during the past season, but notwithstanding the large increased earnings it was unable to accumulate sufficient money to pay the interest on its bonds due November 1st, or even to pay back the money borrowed for paying the interest due May 1, 1903; and justice to its creditors and stockholders seemed to require that it be placed in the hands of a receiver until such time as a plan can be matured for the reorganization of the company on a firm financial basis.

The Columbus Railway & Lighting Co. on November 4th distributed checks to its employes amounting to about \$5,000, it being a 5 per cent dividend on the men's wages for the quarter just passed.

During a severe electrical storm November 11th lightning struck the wires at the power house of the Rapid Transit Co. of Chattanooga, Tenn., causing a loss of about \$20,000 and fatally injuring the engineer. The 50-ft. fly wheel burst.

Work has begun on the construction of a power house, 150 x 125 ft., for the Kokomo, Marion & Western Traction Co., at Kokomo, Ind. The plant will be equipped with four 300-h.p. boilers, two 600-h.p. engines, directly connected with two 350-kw. dynamos; two 150-kw. rotaries and one 75-kw. 2,200-volt a. c. generator. The old power house will be converted into a car barn and general repair and machine shop.

First Convention of Southwestern Electrical Association.

The first convention of the Southwestern Electrical Association was held October 9th and 10th, at Delmar Garden, Oklahoma City. The first session was called to order at 9:30 a. m. by the president, C. W. Ford, and the members were welcomed to the city by Hon. C. Porter Johnson. The address of welcome was responded to by M. W. Hanks, representing the Nernst Lamp Co. President Ford outlined the history and objects of the Association, and was followed by reports of the secretary, G. W. Cooper, and the treasurer, M. G. Fristoe. Upon motion of T. K. Jackson, of Enid, Okla., the Association was made a permanent organization; the acts of the executive committee were ratified, and several applications for membership were accepted.

Friday afternoon session was called to order by the vice-president, J. W. Wilson, of Oklahoma City. The constitution of the Ohio Electric Light Association was adopted by the Association, with minor changes, upon the recommendation of the executive committee. It was voted that the officers and committees chosen at this meeting serve only until the next annual meeting. John W. Shartel, secretary of the Metropolitan Railway Co. and president of the Oklahoma Traction Co., read a paper on "The Possibilities of the Electric Railway in Oklahoma and Indian Territories." Following is an abstract of Mr. Shartel's paper:

The subject may be rudely divided into three branches, namely: First, the possibilities of street railways standing alone; second, the street railway as a part of an interurban system, and third, affinity between street railways and lighting plants. The street railway by itself presents the most difficult and doubtful problem with respect to a small-sized city, as the maintenance of a power house and paying salaries for a small system becomes a destructive factor in the expense account, and greater care and caution must be exercised in looking a situation in the face under these circumstances than any other. The difference in the cost of maintenance of a power house for 15 miles of railway and for 4 miles is measured chiefly by the fuel bill. The difference between the cost of power house maintenance for a small system of electric railway by itself and such a system in combination with an electric lighting plant is measured in the cost of installation of separate units for generating power and the additional fuel consumed, yet, notwithstanding these factors, the successful operation of an electric street railway system in cities of from six to twelve thousand people is by no means an impossibility. There are more than 150 such street railway plants in the United States and their success is by no means measured by the size of the town, and their vicissitudes under recent developments of modern methods are in the main not below the average maintained in cities of from twenty-five to fifty thousand people, which has clearly demonstrated in practice that while the size of the city or town is a factor greatly in favor of a proposition it is by no means controlling.

Electric railway enterprise in the small cities was largely discouraged by the unfortunate experience of 15 years ago, at a time when electric railway construction was a fury almost amounting to insanity under crude methods of construction and insane routings of lines. Horse-car tracks were thought to be good enough for electric railways and imaginary populations were converted into actual patrons in the mind of the promoter, and, if in spite of all these conditions the gross earnings were sufficient to have reasonably supported a line they were completely exhausted and deficits created by the necessity of keeping very poor roadway and equipment in repair; scarcely without exception in the smaller cities and very few exceptions in the medium size cities bankruptcy, foreclosure and reorganization or complete abandonment was the price paid "the fiddler," out of which resulted the philosophy that it requires an urban population away up in the tens of thousands to furnish an adequate patronage for any kind of a street railway system. Of course, no one will question the fact that it takes a fixed amount of population to contribute the necessary nickels to keep up a line of street railway, but a few people who will pay their nickels often are just as good as more people who do not pay so often, and the question resolves itself finally to a careful study of traffic conditions in each locality, and no infallible rule can be laid down to govern every case. As a general proposition, if from ten to fifteen hundred people can be located in a bunch, so

to speak, a mile beyond the business center of the city or town the routing of a line to that portion of the community can be made with safety, and for the location of lines with respect to every day traffic some such rule as this may be regarded. Very often in rapidly growing towns one or two street car lines may be made a very safe factor in anticipation of controlling the future settlement of the inhabitants and the street railway thus creates its own patronage. This is, of course, to be pursued to a very limited extent and with extreme caution, and regard must always be had whether the proposed extension of the community is one which might be abandoned if the growth of the town should be checked or reversed.

There are many towns in Oklahoma and Indian Territories that will meet these conditions and they present an inviting field for the construction of small systems of street railways. There is very little opportunity to secure the enlistment of outside capital for these smaller enterprises, even if their success is fully demonstrated, because the eastern investor is impregnated with the prejudices outlined, and because there is little economy in the ownership and operation of a small plant at so great a distance. The initial development of all these enterprises, both large and small, will depend largely, if not wholly, upon local capital.

There are now but two systems in the two territories, one in each. The results obtained in these cases are calculated to inspire confidence in development in other communities, although it must be admitted that the two most inviting opportunities have been taken advantage of in these instances; but it is a fact that careful, conservative judgment based upon the experience of other communities, and the experience of the country generally, would seem to point to many more equally inviting on a smaller or a greater scale. The past experience, however, has a retarding effect upon the local investor, and even though the opportunity could be demonstrated to be a better one than the best paying institution in the town it is not generally regarded as such and the difficulty of securing capital either locally or from abroad is almost insurmountable. Notwithstanding these obstacles, however, the day is approaching, and more rapidly than we think, when a well-planned and well-executed electric railway enterprise in Oklahoma will be regarded as better than almost any other form of investment.

The combination of street railway and electric lighting interests in the same town multiply the chances of success of both enterprises. It divides the power house expense in two, it affords an opportunity which could not otherwise be sustained by selling commercial electricity 24 hours in the day, while now the lighting plant "wakes up and goes to bed with the owl"; and the operating results of lighting plants and street railways in combination in the smaller cities of the country show in the great majority of cases that the larger portion of the revenue and clean profit results from the operation of the electric railway. Given a town two miles in its longest dimension, with a park or pleasure resort at a sufficient distance to compel the use of street cars in going to and from the park, and you have an assured success for a railway and lighting plant, and the street railway will be the better of the two.

There is no economy in any plant that is worth installing until it is installed properly. The success of the enterprise depends on not what it costs, but on what it costs to operate. One mile of track constructed of 40 or 50-lb. rails will require more care and attention than five miles constructed of 65-lb. rails, and this is given merely as an illustration of the burden of maintenance between a poor and good construction. The rule holds good throughout.

The interurban railway in connection with the street railway forms mutual support for both. Many a street railway system in the country dragging a miserable existence has been saved by interurban connections and many a town or village which would be wholly inadequate to support a street railway system has enjoyed the benefit of these facilities by means of interurban railways passing through them, with branch lines leading to the most populated parts of such towns, which performs the functions of both street and interurban railways. Many such a combination will in the future be effected in these territories. Town development is just now in process and the time is surely coming when eastern and central Oklahoma and the Indian Territory will be served with adequate electric railway facilities so common in older communi-

ties, and which add more to the enjoyment and comfort of the community than any other industrial factor known in modern life.

The convention was called to order Saturday morning by Chairman Wilson.

T. K. Jackson presented a paper on "Benefits Derived from Heating from the Central Station Electric Lighting Plant." Mr. Jackson is manager of the Enid Electric & Gas Co., and his paper was substantially a discussion of certain methods of central station heating and their pitfalls.

T. E. Bissell, of the Wagoner Electric Co., read a paper on "Single Phase a. c. Motors as a Means of Increasing Central Station Earnings," after which adjournment was taken until 2:30 p. m.

Saturday afternoon session was opened by a paper on "Central Station Accounting," by U. S. Hart, secretary and treasurer of the Shawnee Light & Power Co., of Shawnee, Okla. This paper was read by J. L. Sale, Mr. Hart being absent. Following are excerpts from Mr. Hart's paper:

Accounting, with the central station man, begins with the fuel pile, and, I might say, never ends, for there are many little details about a plant that we do not keep, which we often afterwards wish we had kept. We will begin with the source of power—the boiler room. In order to keep the proper check on the expense of operating, it is necessary to weigh every pound of fuel that goes into the furnaces. By doing this, an exact check can be had as to what it costs per kilowatt hour for fuel, and also how many pounds of fuel it requires to generate a kilowatt of current per hour. The fireman is furnished with a daily report sheet, and this report is filled in by him and turned in to the office, which gives the number of pounds of fuel consumed during his shift, and also the minimum and maximum pressure carried on the boilers. By this report, firemen soon learn who is doing the load with the most economy and each tries to keep the coal consumption per kilowatt output lower than the other, and by this means you get the most economical firing possible. They fire to make steam and not to burn coal. The engineer keeps a record of the voltage and amperes, noting it on his report sheet every 15 minutes during the day. This proves a very interesting and valuable card. It gives you a comparison of the day's load with the previous day, with the same day last week, last month and last year. He also gives the reading of the panel meters, showing the kilowatt output for the day. This, with the fireman's report, will give you the data to figure the cost per kilowatt for generation. This report also covers the amount of oils and waste used, repairs, etc.

For keeping up with the line, poles and transformers, I keep a map, and in addition to this what I term "pole cards." Beginning with the first pole out of the power house, a card is issued with a pole and the number of cross arms drawn on it. This pole is numbered and the number of the pole is on the card, also the street, and the number of the street. The arms are lettered and the pins are numbered. This is the first card in my file, and covers the line with full data until it makes a change. When a change is made, a new card is issued covering the change from that point to the next change in the line. A card is issued for each junction pole and each transformer pole, in a similar manner.

Transformers, when purchased, have cards issued for them, with full data, giving the make, number, size, voltage, when bought, when installed, voltage connected for, location, etc.

A vote of thanks was tendered the authors of the papers read at the convention, after which officers were elected as follows:

President, J. W. Shartel, Oklahoma City.
First Vice-President, J. W. McLendon, Fayetteville, Ark.
Second Vice-President, L. F. Duggan, Wichita, Kans.
Third Vice-President, Samuel A. Hobson, Dallas, Texas.
Secretary-Treasurer, J. L. Ellis, Oklahoma City.
Executive Committee: T. K. Jackson, Enid, Okla.; W. K. Berry, Ardmore, I. T.; S. P. Render, Oklahoma City; W. E. Robertson, Oklahoma City.

A motion to incorporate the Southwestern Electrical Association was tabled indefinitely.

An invitation was received and accepted to meet in Dallas, Tex., next spring, either in April or May.

After meeting of officers the convention adjourned.
The Association has 46 active members.

Electric Railways and Electrical Congress at World's Fair.

Plans are being made which contemplate a very prominent recognition of the electric railway and electric railway problems at the St. Louis Exposition. The appointment of an advisory commission on electric railway tests of the Louisiana Purchase Exposition has just been announced. The commission is thoroughly representative of each branch of electric railway activity and its personnel is as follows:

Mr. J. G. White, president J. C. White & Co., New York City, chairman; Mr. H. H. Vreeland, president New York City Street Ry., New York City; Mr. W. J. Wilgus, vice-president New York Central & Hudson River R. R., New York City; Mr. George McCulloch, president Union Traction Company of Indiana, Indianapolis, Ind.; Mr. J. G. McGraw, president McGraw Publishing Co., New York City.

The commission will act in an advisory capacity in connection with a series of tests on electric railway apparatus to be conducted at the Exposition under the auspices of the Department of Electricity.

From Mr. W. E. Goldsborough, chief of the Department of Electricity, we learn that the electric railway test tracks have been laid north of the Transportation Building on the Exposition grounds, and represent a practically level, clear double track, 1,400 ft. in length. These tracks will connect with the Intramural Ry. and also the steam railway system serving the grounds. It is said that several important manufacturers have already promised complete equipments for exhibition and test, and the present outlook indicates that all of the new systems of alternating current propulsion, as well as the old direct current system, will be offered for inspection and operation.

It is not so much the intention to conduct these tests in a competitive sense as it is to arrange for the accumulation of data which will be valuable in promoting further electric railway undertakings from an engineering standpoint. A very complete equipment of testing apparatus will be provided, and all of the work will be done in a thoroughly scientific manner.

The program of the International Electrical Congress, which was outlined in the "Review" for August, has been further worked out and the following appointments have been made by Prof. Elihu Thomson, president of the organization committee, for the officers of the various sections: General Theory—Section A, Mathematical and Experimental, Prof. E. L. Nichols, Cornell University, chairman; Prof. H. T. Barnes, McGill University, secretary. Applications—Section B, General Applications, Dr. C. B. Steinmetz, Schenectady, N. Y., chairman; Prof. Samuel Sheldon, Polytechnic Institute, Brooklyn, secretary. Section C, Electro-Chemistry, Prof. H. S. Carhart, University of Michigan, chairman; Mr. Carl Hering, Philadelphia, secretary. Section D, Electric Power Transmission, Mr. Charles F. Scott, Pittsburgh, chairman; Dr. Louis Bell, Boston, secretary. Section E, Electric Light and Distribution, Mr. J. W. Lieb, jr., New York, chairman; Mr. Gano S. Dunn, Ampere, N. J., secretary. Section F, Electric Transportation, Dr. Louis Duncan, Massachusetts Institute of Technology, chairman; Mr. A. H. Armstrong, Schenectady, secretary. Section G, Electric Communication, Mr. F. W. Jones, New York, chairman; Mr. B. Gherardi, jr., New York, secretary. Section H, Electro-Therapeutics, Dr. J. W. Morton, New York, chairman; Mr. W. J. Jenks, New York, secretary. With one exception these gentlemen, who are well-known specialists, have accepted these appointments. The gentleman who has not accepted has been in Europe, but it is thought that he will accept upon his return home.

The papers that are to be read at the congress will be contributed upon invitation by well-known authors; afterward they will be published in book form. Over 6,000 circular letters of invitation to join this congress will be sent out. Members will be entitled to participate in the various functions at St. Louis and will receive also a copy of the Transactions. It is expected that many will join who cannot attend the sessions merely to make sure of receiving the Transactions. Already about 350 American electricians have joined in response to circulars, and but a small part of the circular catalog has been covered. Communications concerning the congress should be addressed to Dr. A. F. Kennelly, Cambridge, Mass.

A New Block Signal System.

The Eureka Automatic Electric Signal Co., of Lansford, Pa., has developed a new block signal system for single track electric roads, which we illustrate herewith, and the principal claims for which are the following: Any number of cars can follow each other into a block; the first car in sets the signals to danger; the last car out sets the signals to safety; cars in a block can leave it at either end without deranging the signals; cars trying to take a block at

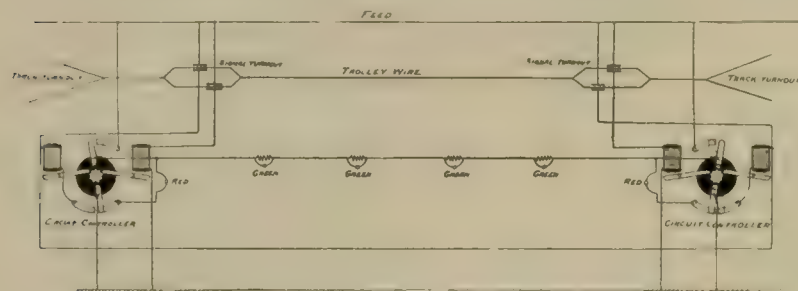
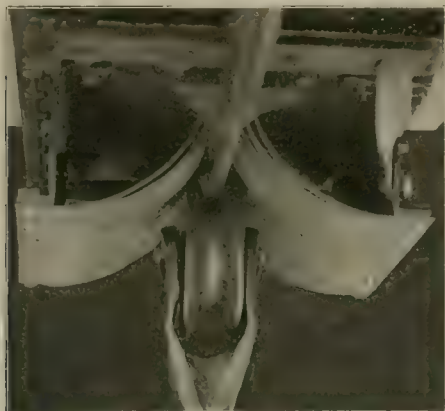


DIAGRAM OF CIRCUITS—EUREKA BLOCK SIGNAL.

opposite ends cannot set the signals; signals are so placed that the motorman always has one ahead of him when setting the system to danger or safety; the conductor is relieved from giving attention to signals, thereby allowing him to attend to his other duties; signals show the direction a car is moving in a block and can be read by day as well as by night; burnt-out lamps do not make the system inoperative; there are no operating magnets in series; there are no operating magnets or mechanism in circuit with the overhead wiring, hence freedom from the effects of lightning; the magnets are wound for certain operation even with 65 per cent drop in voltage; the contact makers are certain of action with the least sparking, avoid generation of electro-motive forces in the magnet coils, and although but 12 in. long will operate at a speed of 60 miles per hour.

The signals consist of incandescent lamps contained in improved lanterns, and instead of thick lenses a deflecting screen and thin plate glass, colored green or red, are used. To prevent burnt-out lamps from throwing the system out of service, a resistance is shunted around each lamp, except one in each red lantern; that lamp should be replaced when it has been in service about half of its life. The life of lamps with resistance in shunt is greatly lengthened, owing to the slight reductions in voltage, which does not appreciably affect the incandescence of the lamps. The system is automatic in that the signals are actuated by means of a contact



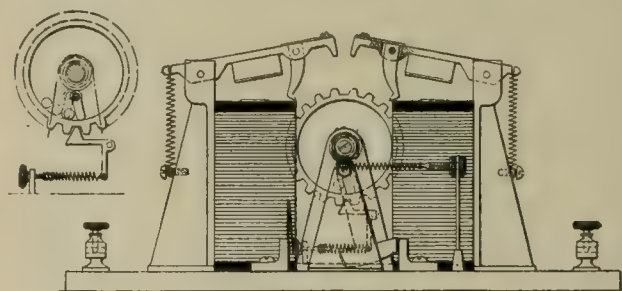
OVERHEAD CONTACT MAKER.

maker overhead. This contact device consists of a double row of steel fingers somewhat in the form of a comb, mounted on a wooden insulator against which the trolley wheel presses as it passes underneath. One side of the device is connected with the feed wire and the other with the signal wire. When the trolley wheel engages the contact maker it energizes a controller.

Normally the signal circuit of an empty block is grounded at both

ends. It includes a series of green lamps distributed along the block and red lamps at the extreme ends of the block. A feed wire comes into the circuit at each end between the red lamp and the first green lamp, and these feed wire connections are normally open. The signal circuit being normally dead, no accidental grounding through bad insulation, falling wires, etc., can cause false signals. In case of any such accidental grounding the system will still work on the entrance of a car into the block affected, but the dulling of the lamps will show the existence of trouble and enable the repair gang to locate it. If a red lamp that has no resistance in shunt burns out it disables the system for cars entering at the other end of the block. If both red lamps burn out it disables the system until they are replaced.

Upon entering a block a frog of special construction causes the trolley wheel to take the right hand branch of the trolley wire and engage the contact device thereon. This operates the circuit controller at that end of the block, cutting out the ground and cutting in the feed connection. This causes all the green lamps to glow and also the red light at the far end of the block. The green lights indicate that the block ahead is clear and the far red light indicates to the motorman of a car approaching the other end of the block that the block is occupied by a car coming toward him. If another car follow the first the glowing green light and the absence of any red light at his end shows the motorman that a car is ahead of him going in the same direction, and if his instructions are to follow that car he enters the block under control.



CONTROLLER.

This does not change the signals, but moves the circuit controller a notch further. When the first car goes out of the block it sets back the controller at the other end one notch, provided there are one or more cars following in the same block; if that is the only car in the block, it cuts out all the lamps.

If a motorman overruns a danger signal and enters a block while a car in it is running in the opposite direction, it cuts out both grounds and extinguishes all the lamps. This notifies the motorman in the block that a car has entered from the other end, or that the system is out of order and he must stop or feel his way out. If a car enters a block wrongly for any reason, backing out will reset the system. When traffic is heavy any number of cars going in the same direction may occupy the block at the same time. If any part of the system is thrown out of service every motorman within the district affected is notified by the lamps going out.

Where the cost of extra wiring is not prohibitive, the green lamps may be connected in multiple, and when the number of green lamps in any one block exceeds the voltage capacity of the signal current the multiple system must be used. Semaphores may be used in addition to the lamps; the current, not being dependent upon lamps for continuity, first sets the far signal before it can operate the near signal, thus securing the certainty that both ends of the block are guarded before a car enters it and eliminating all possibility of accident through failure of the far signal to work. The controller is retained in the system employing semaphores.

The Eureka system has been in use for more than a year on the Tamaqua & Lansford Street Railway Co.'s system at Lansford, Pa., with such satisfactory results that all the blocks of the road, about 20 in number, have been protected with it.

One man was killed in a collision on the Cincinnati, Dayton & Toledo Traction Co.'s line November 15th.

New Open Cars for Rutland Street Railway Co.

The accompanying illustration shows one of eight new open cars built by the Laconia Car Co. and recently delivered to the Rutland Street Railway Co., of Rutland, Vt. The car bodies are 44 ft. long over all, 9 ft. 3½ in. wide over the lower running boards and 12 ft., 8½ in. high when mounted on trucks. The roofs are of steam-car type, with full-length monitors extending over the dashers.

Each car is equipped with double steps running the full length



FIFTEEN BENCH CAR. LACONIA CAR CO.

of the car, the lower step being arranged to fold, and each has drop life guards and safety chains. The grab handles are of ash fitted to bronze sockets and extending from the eaves to the ends of the seats, all trimmings being of solid bronze, highly polished. The general finish of the cars is of white ash, the ceilings being of white birch and the seats of paneled white maple. There are 15 seats in each car, 11 being reversible and 4 having stationary backs. The curtains of waterproof duck extend to the floor.

These cars are also equipped with Providence fenders, Sterling registers operated by rods, De Witt sand boxes, Wheeler headlights placed on the ends of the roof, Christensen air brakes and Westinghouse motors. The trucks are the Laconia high-speed trucks, with 5-ft. wheel base, and with patented swing bolsters and Laconia 33-in. double-plate wheels.

Tunnel System in Chicago.

The Illinois Tunnel Co. was incorporated last month with a capital of \$30,000,000 to take over all the property, franchises, etc., of the Illinois Telephone & Telegraph Co., of Chicago, and in addition to expend about \$10,000,000 more in perfecting the system for underground transportation of merchandise in Chicago, as outlined in the "Review" for September, 1903. The incorporators of the new company are Charles C. Wheeler, Henry A. Wilkening and Thomas A. Moran, Jr. The incorporation fee amounted to \$30,045. The same interests are behind the new company as the old and the officials will remain the same.

McGuire Sweepers and Sprinklers.

That the McGuire Manufacturing Co., of Chicago, is experiencing a busy season is evidenced by the accompanying view of a portion of its North Sangamon St. yard. There, it will be noted, are several of the snow sweepers for which the company is so favorably known in process of manufacture and equipment, and these are but a small part of the sum total either recently finished and shipped, or waiting to be built. On October 20th last the company shipped 12 completed sweepers in one train, the sweepers being loaded on flat freight cars, making an interesting spectacle. The destinations of the sweepers shipped on that date were as follows: Three to

the Union Railway Co., of New York City; two to the Cleveland Electric Railway Co.; one each to Albany, N. Y., Camden, N. J., Girardville, Pa., and Youngstown, O.; two to the Levis County Railway Co., Levis, Can., and one to the Ottawa Electric Railway Co. Among other recent orders for sweepers received by the McGuire company are the following: Montreal Street Railway Co., three; Public Service Corporation of New Jersey, six; Lake Shore Electric Railway Co., of Cleveland, two. The company has also received many orders for its well-known trucks, including recent shipments of 100 trucks to the Pittsburg Railways Co., 15 trucks to the Metropolitan Railway Co., of Oklahoma City, and two carloads to the Madison (Wis.) Traction Co.

In addition to the demands for its regular product the McGuire Co. is frequently in receipt of orders for special apparatus. Among the most recent of this character is an order for a combined sweeper and sprinkler car for service in Wellington, New Zealand, the order coming through Macartney, McElroy & Co. Outwardly the combined sweeper and sprinkler resembles the regular vestibuled snow sweeper built by the company. The sides of the car are formed by two steel tanks, 28 in. wide, 10 2-3 ft. long, and 6 2-3 ft. high, the tanks extending from the floor to the roof. These tanks will contain the water and both will hold approximately 2,500 gallons, or more than 10 tons. The sprinkling will be done by gravity and will be regulated, of course, by the amount of water in the tanks. Special sprinkler heads of the McGuire patent will be employed, there being a sprinkler at each end of the car, under the center of the platform. The sprinklers may be used separately or together, and as it is desired to sprinkle only in the region of the track they will be placed so that only about half the street will be covered, including the car tracks.

The sweeper brooms will be similar to the regular McGuire brooms, only smaller, and they will be controlled by the same general arrangement as those on a regular sweeper. Good stiff brooms set at an angle of 45° will be used and each broom may be operated independently, or both together. There will be a steel roof with ventilators, and a framework on the outside of the tanks will contain windows, so that the car will have the appearance of an ordinary



YARD OF THE MCGUIRE MANUFACTURING CO.

street car. Inside there will be a passageway between the water tanks. The car will be mounted on the McGuire four-wheel locomotive type truck. It is anticipated that not only will the car be used to clean the tracks of sand, which abounds in New Zealand, and to sprinkle them, but because of its weight it can be used as an electric locomotive.

Another piece of special work which the McGuire company has in hand is an electric locomotive for the Chicago, Harvard & Geneva Lake Railway Co., of Walworth, Wis. This is to be 36 ft. x 8 ft. 6 in., all steel, of a special design. It will be mounted on McGuire No. 35 steel trucks and will be equipped with four electric motors and with steam-road couplers and fittings. The trucks weigh over 11,000 lb. each. The locomotive building for the Geneva Lake road is to be used in transferring freight cars between the Chicago & Northwestern and the Chicago, Milwaukee & St. Paul roads.

The Fort Wayne & Southwestern Traction Co. carried 55,300 passengers in October, an increase of 10,526 over October, 1902.

Suspension Bridge Built in Five Days.

Herewith is illustrated a suspension foot bridge built by the John A. Roebling's Sons Co. at Paterson, N. J., the entire work on which, from design to finish, required but five days. It was built for the New Jersey & Hudson River Railway & Ferry Co., to



TEMPORARY FOOT BRIDGE AT PATTERSON, N. J.

temporarily replace a bridge which was carried away by recent floods. To prevent interruption to travel as much as possible it was necessary to act quickly.

The work of designing the bridge, constructing the cables, suspenders and fittings, together with the time consumed in shipping the materials from Trenton, took three days; in another 48 hours the bridge had been completed and thrown open to the public.

The bridge is 150 ft. long and 4 ft. wide. The cables are steel wire ropes, $1\frac{1}{2}$ in. in diameter, and they will safely carry the entire span fully loaded. It was designed by Mr. S. A. Cooney, engineer for the John A. Roebling's Sons Co., who also superintended its erection.

The Arthur Rail Block in Service.

In the "Review" for July, 1903, an improved rail paving block was described and illustrated, it being the invention of Mr. William H. Arthur, superintendent of public works at Stamford, Conn. These blocks are designed to be used with T-rail for city pavements. During the past summer the Arthur block was laid on West Main St., Stamford, where it has been in use a sufficient length of time to have its merits fully tested, and according to the Stamford Advocate it has been found to come fully up to the claims that were made for it. Speaking of the difficulty of keeping carriage wheels in the tracks where these blocks are used, the newspaper states that carriage wheels will become caught in the rail groove for only a few seconds, when they work out themselves, owing to the arrangement of the patented rail block. Recently a driver who was skeptical regarding the merits of the Arthur block deliberately tried to keep the carriage wheels in the rail groove and utterly failed to do so for more than a distance of 10 ft. or so. The wheels would mount out of the groove and cross the rail without any strain to the carriage, and it was quite impossible to drive between the rails for any distance.

The Positive Railway Sander.

The "Positive" railway sander, which is made by the Positive Railway Sander Co., of Lancaster, Pa., and which was illustrated in the "Review" for October, is the result of years of careful study on the part of the inventor, who is convinced that it will appeal to traction companies as a sander that can be relied upon. It comprises a sand box, which is placed under the car seat, and a flexible tube or pipe, which is attached to the car truck. The object in attaching the pipe to the truck is to keep it central with the wheel at all times, thereby making it possible to sand a curve at any radius as well as a straight track. Furthermore, it is claimed that

the pipe being connected with the truck the constant jarring which it receives will not permit the sand to collect in the pipe during damp or freezing weather.

The sand box is made of good galvanized iron and is strong and durable. Being placed under the seat it cannot freeze. Under the box is a mechanism which is worked by the action of the pedal and lever. This mechanism has a corrugated upper surface over which a lip projecting from the bottom of the forward end of the box runs backward and forward as the lever is worked. This action agitates the box and contents, throwing the sand against a check piece in the front of the box, and the sand being divided by striking against this check, it either flows under or over it out onto an inclined spring lip at the front end, through which it passes into the spout, or pipe. The pipe is not connected to the sand box, but has a funnel shaped orifice into which the sand is thrown.

The company guarantees that this sander will throw sand wet or dry, and that at no time will it lose the sand or allow it to escape during the travel of the car. A hand lever may be used, if desired, it only being necessary to work the lever backward and forward; if a pedal is used, it is pressed up and down the same as a gong pedal. The company also has a fender that may be fastened to the under part of the car floor, for the purpose of keeping any slop from entering the upper end of the pipe. The fender consists of a piece of sheet iron, 12 x 14 in.; it is not furnished with the sander unless requested, but its use is recommended.

The Car Heating Problem.

In view of the approach of the time of the year when car heating becomes necessary, attention is called by the firm of William C. Baker, of 143 Liberty street, New York City, to the Baker system of hot water heating, which is claimed to be cheaper and more agreeable than any other system of heating for electric railway service. Since the death of Mr. Baker, the former head of this company, the business has been carried on as usual, with constantly increasing success. Baker heaters are used on the interurban cars of the Twin City Rapid Transit Co., the Milwaukee Electric Railway & Light Co., the Waterloo & Cedar Falls Rapid Transit Co., and on other large systems.

As an indication of the success of this method of heating, the following letter from A. B. Newell, vice president and general manager of the White Pass & Yukon route, is quoted: "Last year you furnished us with one 'mighty midget' heater No. 4, which was installed in our private car No. 200. The car has been in commission all winter, and I am glad to say that the heater has given excellent satisfaction. In one instance it was out for 24 hours with the thermometer averaging 50° below zero, but no difficulty was experienced in keeping the car warm with Comox, B. C. soft coal (which is similar to Pennsylvania soft coal); in fact, we have burnt soft coal in the heater almost entirely."

The firm of William C. Baker emphasizes the fact that inasmuch as various imitations and infringements of various parts of the Baker system have appeared, it is best to order direct from the company and thus avoid the use of infringing apparatus.

Electric Towing on Erie Canal.

October 28th a public demonstration of electric towing was made in the Erie Canal at Schenectady, N. Y., under the auspices of the International Towing & Power Co., of New York City, which has acquired the system invented by Mr. Stephen W. Wood. The governor of New York and many other prominent officials were present at the test. The towing device, or "mule," is a motor car about 10 ft. long, 2 ft. wide and 3 ft. high. It is equipped with two 40-h. p. motors. The track over which the test was made is 2,700 ft. long. It was built by the Jones & Laughlins Co. The power and electric equipment were furnished by the General Electric Co., the designing engineer being Mr. C. W. Larson and the electrical engineer Mr. F. O. Blackwell. The test was considered successful in every respect.

Fort Wayne-Southwestern Time-Table.

The Fort Wayne & Southwestern Traction Co. has issued an exceptionally attractive time-table folder, comprising 8 pages printed in red and green, the covers being adorned with designs in which the company's trade-marks are emphasized. Folded, it is about $3\frac{1}{2} \times 8\frac{1}{2}$ in. in size; opened, the pages are 7 in. wide. Leading merchants in the cities through which the line passes advertise in the time-table, and space is also devoted to showing serviceable time-tables of the roads with which the Fort Wayne & Southwestern connects. On one page is a map of the company's lines and connections, and in the November issue the many merits of the Fort Wayne-Southwestern line are set forth in catchy rhyme. Mr. S. L. Nelson is general manager of the company.

Mile Posts on Electric Railways.

Mr. Charles H. Cox, resident manager of the Middleboro (Mass.), Wareham & Buzzard's Bay Street Railway, who believe in encouraging the employes of the company to take an interest in ways and means for bettering the service, has recently tried the experiment of placing mile posts marking each mile along the road as an assistance to the men in keeping on schedule time. This idea has been adopted so commonly in steam railroad operation it is surprising that electric railway companies have not given more attention to it. By marking off the line into mile lengths and designating posts by consecutive numbers, not only are the car crews able to keep better check on their running time, but the track department also is able to locate work, and, in fact, to use the scheme in various ways. The posts stand as permanent and visible records of the official survey and can be used as reference marks for all sorts of measurements and for designating locations. Although perhaps of secondary importance, the idea is of appreciable interest to the public, as passengers frequently like to know just how far they are from other points.

As arranged on the Middleboro road, the mile signs are made of pine board 8×24 in. and 1 in. thick, and the signs are attached to the line poles about 12 ft. from the ground. The signs have beveled edges, the beveled portion being painted black, with the body of the sign in white. On each side of the board are 6-in. black block letters, indicating the number of miles from the pole to the terminus at Middleboro.

The Bear and the Fender.

A car equipped with the Providence fender was bowling along at a good rate over a thinly populated section of the Tyrone line on the Altoona (Pa.) & Logan Valley Electric Ry., on the evening of October 20th, when Motorman Cox suddenly straightened up and rubbed his eyes. Down the track a short distance ahead was a genuine black bear, ambling along with his nose to the ground in the shiftless way that bears have. Motorman Cox became very much excited, but the bear didn't in the least. Motorman Cox yelled with all his might, wildly clanged the bell and tugged frantically at the brake. The bear took one glance at the fender, grunted and switched what should have been his tail contemptuously and continued on toward the rapidly approaching car. The bear had never seen a car fender before, but by all the laws of bear logic such an insignificant-looking thing as that should fold up and pass into oblivion before any respectable sized bear. Where the bear made his mistake was in not knowing the fender was a "Providence."

In spite of the motorman's efforts to stop, the car continued on at good speed and the fender struck Mr. Bruin fair and square head on. When the bear had completed two somersaults in the air and had landed 20 ft. away, a sadder, and, it is to be inferred, a wiser, bear, his idea concerning fenders had evidently undergone a radical change. He did not wait for any further acquaintance, but turned tail and shot off into the underbrush at his best speed. The fender was not damaged in any way. Motorman Cox made out a report of the incident and at the end of the report added the remark: "That fender seems to have been built to bear anything."

A New Power Brake.

The McCollum momentum brake, which has been in use in Toronto and other Canadian cities about two years, is to be manufactured and sold in this country, exclusive rights for the United States having been secured by the Sterling-Meaker Co., of Newark, N. J. This company is the owner of the Sterling safety brake, the sale of which is steadily increasing, but the company also recognizes that there is a growing demand for power brakes and has put itself in position to meet this demand. The momentum brake is applied by means of a lever, utilizing the power developed by the car. It not only stops the car as quickly as may be desired, but, it is stated, it is so constructed that the stops are graduated and the comfort of passengers thereby conserved, and flat wheels avoided. The device is strong, moderate in price, and is said to be very moderate in point of maintenance. Mr. T. E. McCollum, the inventor, has associated himself with the Sterling-Meaker Co., still retaining the oversight of his interests in Canada.

More Brill Cars for Tamaqua and Lansford Railway.

The Tamaqua & Lansford Street Railway Co. has received another handsome car from the J. G. Brill Co., similar to the four cars built by the same company for it last year. The lines of this railway have been extended to Mauch Chunk and the road now operates about thirty miles of track. The cities of Tamaqua and Lansford are situated in the heart of the anthracite coal region—a region which



INTERURBAN CAR J. G. BRILL CO.

is thickly populated and affords an excellent field for interurban railroading. As an illustration shows, the cars make a handsome appearance with their twin windows, straight sides, steam car roofs and enclosed vestibules. The smoking compartment seats 16 and the larger compartment seats 32 passengers. These cars are not intended for high speed, as the stops are frequent and the grades heavy. Brill 27-G trucks are used which are capable of thirty miles an hour. The Brill link-suspended semi-elliptic equalizers of this truck, it is claimed, give an extremely easy motion and carry the cars smoothly around curves even with these large and heavy car bodies. The interior is finished in mahogany with birch ceilings. Folding gates are provided at the platform entrance in addition to the folding vestibule doors. Upper and lower truss rods strengthen the sides. The side sills are $4\frac{1}{2} \times 8$ in. and the center crossings $4\frac{1}{2} \times 5\frac{1}{2}$ in. The corner posts are $3\frac{3}{4}$ in. thick and the side posts 3 in. Each alternate post is thicker than usual to make up for the lighter posts which go back of the glass of the upper sashes. The lower sashes drop into wall pockets and when down the opening is closed by a hinged cover.

The general dimensions of the car are as follows: Length over end panels 34 ft. 5 in.; over crown pieces and vestibules 43 ft. 10 in.; width over sills and sheathing 8 ft. 4 in.; from bottom of sill over top of deck 9 ft. $4\frac{1}{4}$ in. and over trolley-board 9 ft. $7\frac{1}{2}$ in. All the carlines, with the exception of those next the end, have steel sandwiched between the wood. Between the compartments there is a partition of hardwood, with glass in the upper part, and single sliding door. The smoking compartment is 11 ft. 10 in. in length.

The Northern Ohio Traction & Light Co. has ordered a steam turbine generator for its Beech St. power house at Akron, O.

Perry Roller Side Bearings.

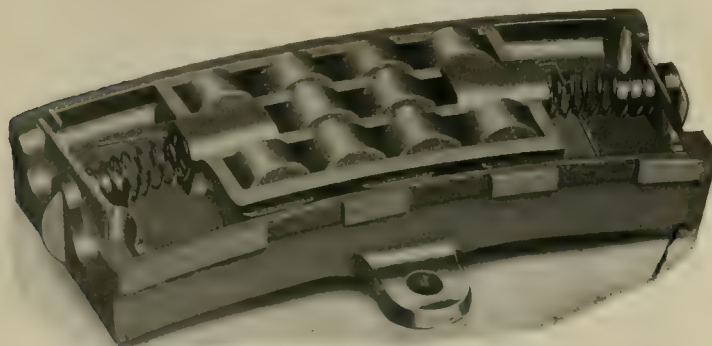
The Perry roller side bearing, two views of which are shown herewith, is made by the Midland Railway Supply Co., of Chicago, for all classes of railway equipment, and especially for street railway, elevated and interurban cars. This bearing has been in successful operation for 3½ years under the heaviest kind of freight and locomotive tank equipment. The bearing is designed to be applied to any kind of truck by simply arranging the lugs to fit and increasing the height if necessary. The working parts are protected so that it is not necessary to have the upper bearing come into direct contact with the rollers. This is accomplished by a movable cover, in which a 50-point carbon steel plate is inserted for the top of the rollers to operate on, a similar plate being inserted in the bottom, so that the carriage of rollers operates between these carbon steel plates and gives a very large bearing surface to carry the load. The cover distributes the load evenly on the rollers, of which there



PERRY ROLLER SIDE BEARING.

are 10, and, being turtle-back in shape, the entire load is carried on the center of the cover; in whatever position it moves it is always inside of the two outside sets of rollers. This prevents all possibility of part of the rollers having to carry the entire load, owing to the upper bearing not being level, as is sometimes the case. In case of accident this bearing is interchangeable, so that separate parts can be easily supplied, thus reducing the expense of operation to a minimum.

With a roller side bearing, instead of carrying the weight of the car on the center plates, as with the old rigid type, the load is carried on the two side bearings and center plate, and this makes the car ride more evenly and avoids a rocking motion. With the old style bearing, it is stated, trucks cannot adjust themselves going around curves on account of the heavy weight thrown on the bearings at that point, and this causes the greatest amount of flange and rail wear. In the Perry bearing the extent of travel is provided for so that the bearing can take all curves. On a recent test by



BEARING WITH COVER REMOVED.

the Pullman Co., made under sleeping cars on the Pennsylvania R. R., the report showed that by using a roller side bearing instead of the rigid type there was a reduction in the amount of flange wear of 17½ per cent.

The Midland Railway Supply Co. has a well-equipped plant for turning out these bearings and supplying them to the trade, and has complete drawings and pamphlets which will be furnished on request.

Accidents.

A motorman fainted and fell off his car on the Chicago & Joliet Electric Railroad Co.'s line at Joliet, Ill., October 25th, and the car ran down a steep hill, caught up a boy on the fender and crashed into a house, killing the boy and unsettling the house.

October 26th a Euclid Ave. car of the Cleveland Electric Railway Co. was struck by a "wildcat" train at the Euclid Ave. crossing of the Pennsylvania R. R. About 29 persons were injured, two fatally, it was thought.

Six persons were injured, one of them fatally, in a street railway accident at Chicago, October 26th. It was stated that a gripman failed to drop his grip when passing a cable vault, and a North Clark St. grip car and a trailer car of the Union Traction Co. crashed into each other, practically telescoping the latter.

By the caving in of the roof of the Rapid Transit subway in New York at 195th St. and St. Nicholas Ave., October 24th, 17 workmen were buried under thousands of tons of rock and earth. The total number of killed was 10.

A workmen's train on the Philadelphia, Wilmington & Baltimore R. R. collided with a trolley car at 23d St. and Washington Ave., Philadelphia, October 28th. Six passengers of the trolley car were hurt and the car wrecked. The locomotive was derailed.

A motorman was fatally hurt and several other persons injured in a collision October 30th between two cars on the Miamisburg and Germantown branch of the Southern Ohio Traction Co. One was an express car.

A car of the Cincinnati, Dayton & Toledo Traction Co. left the track at a curve at Hamilton Ave. and the old College Hill railroad junction, November 2d, and struck an iron trolley pole. One man was killed and several were injured. The car was cut in two. Wet leaves on the rails caused the car to slide.

Two Fond du Lac Street Railway & Light Co. cars were in a head-on collision between Fond du Lac and North Fond du Lac November 2d. A motorman was seriously injured and five other persons slightly so. The cars were damaged considerably.

The conductor was killed and a dozen persons hurt in a wreck on the Danville, Urbana & Champaign Railway Co.'s line at Vermillion Heights November 3d. The car jumped the track while rounding a curve.

The breaking of a coupling pin between a work car and a heavy sweeper, together with slippery rails, caused an accident on the Versailles division of the Pittsburgh, McKeesport & Connellsville Railway Co.'s system, near McKeesport, November 3d, that resulted in the death of the motorman and injury to three passengers.

Two vestibuled cars of the Montgomery (Ala.) Street Railway Co. collided head-on November 5th on Hall St., and six persons, including the conductor and motorman, were injured. There was a dense fog.

One person was killed and about sixty injured in a collision of two cable cars in a dense fog, November 4th, on the steep 12th St. viaduct in Kansas City, Mo. The accident was due to slippery tracks.

Five persons were killed and one fatally injured November 11th at McKean, Pa., when a crowded trolley car of the Erie Traction Co. was struck by a gravel car on a down grade. The brakes of the latter broke.

November 10th an Indiana Union Traction Co. interurban car was derailed at a switch in Anderson, Ind., left the track and struck a telegraph pole, injuring 20 people, some seriously.

A Northampton Traction Co. car was wrecked by a Bangor & Portland Ry. freight train near Easton, Pa., November 10th, and two persons were killed.

November 2d the Louisville Railway Co. presented 154 winter uniforms and 20 new overcoats to employees, in accordance with its annual custom. Employees who are given uniforms one year receive overcoats the next.

The interurban companies in Indiana have been occasioned a great deal of annoyance by thieves, who steal grips and valises of passengers. The plan is to wait until the conductor goes inside the car to collect fares and then to throw off the grips which have been left on the rear platform, and jump off before the conductor returns.

Best Methods and Material for the Interior Finish of Modern Passenger Cars.*

BY D. L. PAULUS, BARNEY & SMITH CAR CO.

The first consideration of this subject is the design, style, architectural treatment, etc.; second, the color scheme, and last, but not least, the manner of filling, varnishing and polishing—all under the master hand, the object being to provide every comfort, convenience and decorative feature known to the car builders' art.

Note the improvements that have taken place in the last few years. There are today leaving Chicago and numerous other cities, over various railroads, trains palatial in all their appointments. These consist usually of buffet, library, smoking, parlor, dining and sleeping cars, also chair and day coaches, and, with but few exceptions, none under 72 ft. in length.

The structural design, decorations and furnishings of these trains are of the highest order, the most noticeable feature being the extreme simplicity and the fine quality and beautiful finish of the wood, mahogany predominating. The upper deck or headlining is of the new dome or the effective Empire design, mostly colored in soft blended greens and ornamented in a neat design in gold, the latter broken by art deck glass, and by handsome combination gas and electric fixtures, heavily carpeted, and the color scheme, including a specially designed upholstery, forming an harmonious effect. This interior finish has simple but beautiful lines, and ornaments of marquetry of plain and smooth architectural effect, none of the heavy carved and molded finish of the past, where the principal object seems to have been to catch and hold dirt, which has been one of the hardest and most trying features of terminal cleaning, particularly at the shopping—the experience of those of us who have a dark shop and are at the mercy of the interior car scrubbers being that after the car is tracked ready for service, we will discover the majority of the crevices and carvings well filled with dirt and sealed under varnish. This new feature of plain finish has also the advantage of being thoroughly sanitary, through being so easily kept clean at terminals.

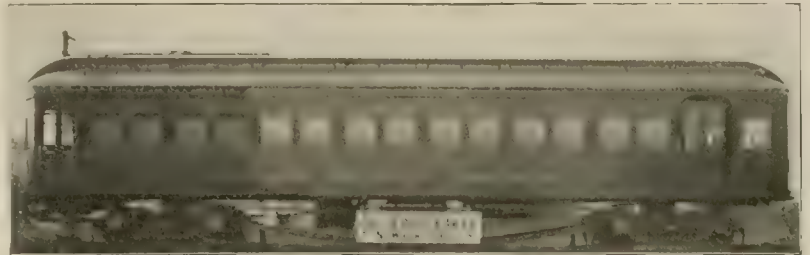
Regarding the hardwood acid and burning method and staining, these are all false methods, and have a tendency to destroy the beauty of the wood in that it places an opaque finish over the grain. I am of the opinion that this method is not used by any reputable car building establishment, as I know our company uses nothing of the kind, but select first-class lumber, matched as to color, discarding 10 to 20 per cent in order to get a uniform effect; but, however, you are compelled to stain your wood filler slightly with burnt sienna and Vandyke in order that the filler does not show white or milky. After the filler has been applied and dried over night, there should be two coats of inside car bur varnish, each coat allowed 48 hours to dry, and each coat well sanded. The third coat of varnish allowed 48 hours for drying, then rubbed with F. FF. pumice stone and water. The fourth coat varnish 48 hours for drying, then rubbed with F. FF. pumice stone and water, and allowed to stand 24 hours, rerubbed with rotten stone and polished. Age will give mahogany that rich effect of which no stain is capable.

New Cars for Cleveland, Painesville & Ashtabula Railway.

The Jewett Car Co. has just shipped several large, handsome cars to the Cleveland, Painesville & Ashtabula Railway Co. The accompanying illustrations show exterior and interior views and general plan of the new cars, the principal dimensions of which are as follows: Length over buffers, 53 ft. 1 1/4 in.; width over posts, 8 ft. 4 in.; width over all, 8 ft. 8 in.; height from rail to top of roof, 12 ft. 9 in.; distance between centers of trucks, 33 ft. There are six longitudinal yellow pine sills in the floor framing running the full length of the car. The side sills are additionally strengthened by cross members and plates. All cross timbers are of the best quality white oak. M. C. B. construction is used in the

bolster and truss-rod work. The body framing is of white ash, steam car construction. Each car is equipped with Jewett standard vestibules with double folding doors at each side and automatic trap door over steps.

Each car is divided into three compartments—passenger, smoking and baggage. The main and smoking compartments are finished in Honduras mahogany inlaid with marquetry, and the baggage com-



NEW CAR FOR CLEVELAND JEWETT CAR CO.

partment in white ash, natural finish. The ceiling is green with gold decorations. Hale & Kilburn "Walkover" seats are used being green plush in the main compartment and rattan in the smoker. The



PLAN OF JEWETT CAR.

windows are of polished plate glass, except the gothics, which are of green opalescent leaded glass, and the deck lights of white chipped glass. Trimmings are of solid bronze and the curtains of "Crown" goods, Forsyth type.

The cars are lighted by 35 single incandescent lights distributed



INTERIOR OF JEWETT CAR.

evenly. They are heated by the Peter Smith hot water system and are equipped with Christensen straight air brakes, hand brakes, water coolers, Van Dorn drawbars, locomotive type of pilots, arc headlights and the De France patent air-blast sanding device, made by the Newark Air Sand Box Co., of Newark, O. The cars are mounted on Peckham M. C. B. double trucks, equipped with four G. F. 77 motor.

It is expected that the Louisville Railway Co.'s new interurban line to Jefferson town will be opened to traffic January 1st.

*Contributed by the author to the 1903 Annual Convention of Master Car and Locomotive Builders Association, Chicago, Sept. 8-11, 1903.

A Handsome Private Electric Car.

The St. Louis Car Co., which has built a number of private trolley cars which have called for special notice, recently built a handsome private electric car, called the "Palatine", which it considers one of the best it has turned out. It was built for Mr. Charles H. Ledlie, of St. Louis, Mo. It is divided into two compartments, a parlor and a smoking room. The buffet is in the smoking compartment and its appointments are first class in every particular.

As will be seen by referring to the illustration showing the in-



PRIVATE CAR.—ST. LOUIS CAR CO.

terior of the car, its finish and furnishings are exceedingly attractive. A beautiful settee adorns the center of the parlor and is upholstered in the finest of fabrics. The interior finish is of African mahogany, with artistic designs of inlaid marquetry. The lower sash is of polished beveled edge plate glass, while the upper sash is



INTERIOR OF PRIVATE CAR.

of plate glass with designs of opalescent art glass in the center. The interior is lighted with St. Louis Car Co. arc lamps.

The car has a double observation room at each end, the entrance being at the center, and there is a motorman's cab at each end, also. The car is arranged to carry a large supply of water, which is stored in tanks underneath and is forced into the toilets by compressed air.

The "Palatine" is further equipped with the St. Louis Car Co. arc headlight, No. 23-A truck, and air brakes.

The Newark Air Sand Box.

We present herewith views of the "Newark" air sand box, which has been devised for use on all cars equipped with air brakes, and which has been adopted by several prominent electric interurban railways. It is made by the Newark Air Sand Box Co., of Newark, O. As will be seen by reference to Fig. 2, which shows a general outline of one equipment, the sand box proper has a basket or screen at the top to prevent stones and gravel from passing into the pipes and clogging them. This basket, which is made of 3-16-in. wire mesh, may be removed and emptied whenever necessary.

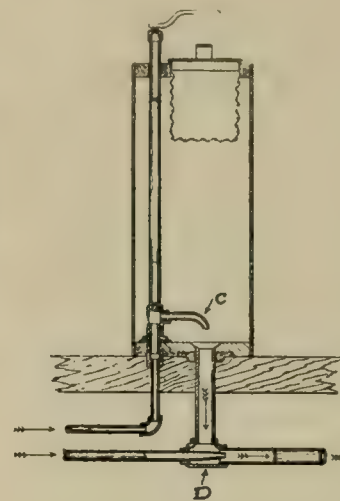


FIG. 1.

The box is provided with a mixer C, shown in Fig. 1. Compressed air applied at the valve B passes through this mixer and its force blasts loose any sand that may be clogged, the mixer being manipulated by turning the handle on the top of the box. An important advantage of the mixer, also, is that it will almost immediately dry damp sand, if any there be. Then, by applying the air at the valve A it passes through the T-joint D, which has a combining cone which forces the sand through the pipes, causing it to separate at E, and delivers the sand in front of both wheels at the same time.

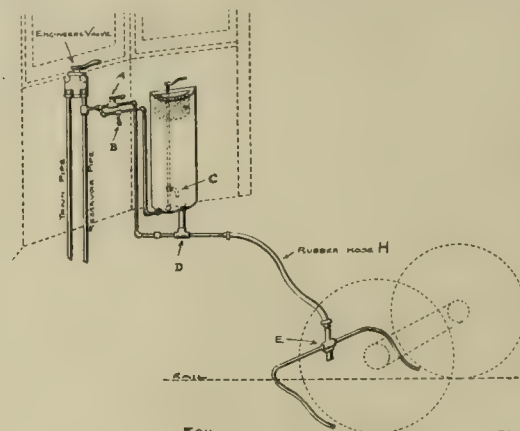


FIG. 2.

The pipe 11 shown in Fig. 2 is fastened to the truck and a rubber hose, H, permits it to swing freely, so as to always throw the sand directly in front of the wheels, even on the shortest curves. All the pipes are air-tight and, consequently, water-tight.

Among the roads on which this sanding device is in operation are the following: Indianapolis & Northwestern Traction Co.; Cleveland, Painesville & Ashtabula Railway Co.; Columbus, Buckeye Lake & Newark Traction Co.; Canton-Akron Railway Co.; Newark & Granville Street Railway Co.; Columbus, Delaware & Marion Electric Railroad Co., and the Indianapolis & Southern Traction Co.

Financial.

The gross earnings of the St. Louis Transit Co. for October were \$667,174, an increase of \$60,771 over October, 1902.

The gross earnings of the Detroit United Ry. systems for the nine months ended September 30th were \$3,304,050; net earnings, \$1,356,572, a gain of \$71,465; other income, \$29,572; total income, \$1,386,114; fixed charges, \$743,762; surplus, \$642,382, against \$614,883 for the corresponding period last year. The gain for all lines for the first three weeks in October was \$28,327.

The earnings of the Toronto Railway Co. for October show an increase of \$29,059 over October of last year.

The gross earnings of the Pueblo & Suburban Traction & Lighting Co. for August amounted to \$44,223; for September, \$47,191; for the nine months, \$368,707.

The earnings from operation of the Northern Texas Traction Co. for October were \$47,200, as compared with \$41,458 for September and \$43,389 for August. The increase was due to the state fair.

The annual report of the Hoosac Valley Street Railway Co. shows that during the year the company carried 2,874,287 passengers. The gross earnings were \$144,706; operating expenses, \$101,976; net divisible income, \$28,248.

The September earnings of the Eastern Ohio Traction Co. amounted to \$21,676; operating expenses, \$12,899; net earnings, \$8,777. For the nine months ending September 30th the earnings were \$153,214; operating expenses, \$97,130; net earnings, \$56,084.

The Savannah Electric Co.'s net earnings for September amounted to \$19,100, against \$20,080 for the same month last year. The operating expenses increased 16.2 per cent.

The Seattle Electric Co. reported net earnings for September of \$53,478, against \$55,796 in September, 1902. The operating expenses increased 13.2 per cent.

The report of the Northampton & Amherst Street Railway Co. for the year ended September 30, 1903, shows gross earnings of \$56,746; operating expenses, \$44,042; net earnings, \$12,704; fixed charges, \$12,561; surplus, \$143. During the year 1,162,025 passengers were carried. The company operates over 14 miles of track.

The Boston & Worcester Street Railway Co. reported as follows for September: Gross earnings, \$30,449; operating expenses, \$12,299; net earnings, \$18,150. For July, August and September the gross earnings amounted to \$91,808; operating expenses, \$36,023; net earnings, \$55,785. The interest on the company's bonds amounts to \$56,250 per annum.

The Chicago & Milwaukee Electric Railway Co. reported \$32,561 net earnings for October, and for the 10 months, \$160,261, as compared with \$110,746 for the entire year 1902. The gross earnings for 1902 were \$190,110; operating expenses, \$79,364; gross for the first 10 months of 1903, \$237,943; operating expenses, \$77,682.

October 26th a mortgage for \$600,000 was filed by the Chicago Midland Transit Co. with the Wisconsin Trust & Security Co. of Milwaukee, on the assets of the Chicago General Railway Co. The Midland Transit Co. will issue \$600,000 in new bonds for the purpose of acquiring the \$400,000 of the West & South Towns Street Railway Co.'s bonded indebtedness, and also paying off the judgments and other floating indebtedness.

A meeting of the bondholders of the Mauch Chunk, Lehigh & Slatington Street Railway Co. was held November 6th to devise means for either settling up the affairs of the company or to place it on a sound financial footing, the company having been in the hands of a receiver for the past eight months. Resolutions were adopted appointing a committee to consider the advisability of seeking a foreclosure of the mortgage, the auditing of the accounts of the

receiver, and to formulate plans for the future operations of the road. The last two payments of bond interest were defaulted.

MUNCIE, HARTFORD & FT. WAYNE.

Following is the statement of the Muncie, Hartford & Fort Wayne Railway Co. for September:

| | |
|-------------------------------|----------|
| Earnings from operation | \$12,444 |
| Operating expenses | 6,105 |
| Net earnings | 6,339 |
| Operating ratio | .49 |

SYRACUSE RAPID TRANSIT CO.

The Syracuse Rapid Transit Co. reported for the quarter ended September 30th as follows:

| | 1902. | 1903. | Increase. |
|------------------------------|-----------|-----------|-----------|
| Earnings from operation..... | \$182,741 | \$211,510 | \$28,778 |
| Operating expenses | 101,223 | 117,459 | 16,236 |
| Net earnings | 81,518 | 94,060 | 12,542 |
| Total income | 83,090 | 95,133 | 12,043 |
| Fixed charges | 57,075 | 60,882 | 3,807 |
| Net income | 26,015 | 34,251 | 8,236 |

OSWEGO TRACTION CO.

The report of the Oswego (N. Y.) Traction Co. for the quarter ended September 30th is as follows:

| | 1902. | 1903. | Increase. |
|------------------------------|----------|----------|-----------|
| Earnings from operation..... | \$13,990 | \$17,315 | \$3,325 |
| Operating expenses | 8,820 | 9,191 | 371 |
| Net earnings | 5,170 | 8,124 | 2,954 |
| Other income ..... | ..... | 25 | 25 |
| Gross income | 5,170 | 8,149 | 2,979 |
| Fixed charges | 3,540 | 3,498 | *42 |
| Net income | 1,630 | 4,651 | 3,021 |

*Decrease.

The assets of the Oswego Traction Co. amount to \$654,984, including \$622,196 cost of road and equipment. The capital stock is \$300,000; funded debt, \$288,000.

LAKE SHORE ELECTRIC RY.

Following are the earnings of the Lake Shore Electric Railway Co. for September:

| | 1902. | 1903. | Increase. |
|------------------------------|----------|----------|-----------|
| Earnings from operation..... | \$40,051 | \$63,198 | \$17,447 |
| Operating expenses | 29,795 | 36,639 | 6,844 |
| Net earnings | 16,256 | 26,859 | 10,603 |
| Operating ratio | .6470 | .5770 | *.07 |

For the nine months:

| | | | |
|------------------------------|-----------|-----------|-----------|
| Earnings from operation..... | \$342,574 | \$407,913 | \$125,339 |
| Operating expenses | 215,027 | 291,130 | 76,109 |
| Net earnings | 127,546 | 176,777 | 49,230 |
| Operating ratio | .6277 | .6222 | *.0055 |

*Decrease.

ELGIN, AURORA & SOUTHERN.

The Elgin, Aurora & Southern Traction Co., reported for September as follows:

| | 1903. | Increase. |
|-------------------------------|----------|-----------|
| Earnings from operation | \$40,446 | \$2,640 |
| Operating expenses | 22,056 | 1,243 |
| Net earnings | 18,390 | 1,397 |
| Fixed charges | 9,172 | 122 |
| Net income | 9,218 | 1,275 |

From July 1:

| | | |
|------------------------------|-----------|----------|
| Earnings from operation..... | \$135,051 | \$13,267 |
| Operating expenses | 71,581 | 8,658 |
| Net earnings | 63,470 | 4,609 |
| Fixed charges | 27,517 | 368 |
| Net income | 35,953 | 4,241 |

LONDON (ONT.) STREET RAILWAY CO.

The comparative statement of the London (Ont.) Street Railway Co. for September follows:

| | 1902. | 1903. | Increase. |
|-------------------------|-----------|-----------|-----------|
| Earnings from operation | \$ 18,157 | \$ 19,530 | \$ 1,370 |
| Operating expenses | 8,048 | 10,308 | 1,660 |
| Net earnings | 9,509 | 9,277 | 282 |
| Fixed charges | 2,100 | 2,431 | 322 |
| Net income | 7,399 | 6,795 | 604 |
| For the nine months: | | | |
| Earnings from operation | \$115,011 | \$132,510 | \$16,855 |
| Operating expenses | 70,811 | 83,755 | 12,944 |
| Net earnings | 44,849 | 48,761 | 3,912 |
| Fixed charges | 20,284 | 19,872 | *412 |
| Net income | 24,565 | 28,889 | 4,324 |

*Decrease.

INTERNATIONAL TRACTION CO.

Following is the comparative statement for September of the International Traction Co. system, Buffalo:

| | 1902. | 1903. | Increase. |
|-------------------------|------------|------------|-----------|
| Earnings from operation | \$ 321,355 | \$ 377,921 | \$ 56,566 |
| Operating expenses | 161,524 | 201,040 | 39,515 |
| Net earnings | 159,830 | 176,880 | 17,050 |
| Fixed charges | 125,887 | 127,445 | 1,558 |
| Net income | 33,943 | 49,435 | 15,491 |
| Operating ratio | .512 | .539 | .027 |

For quarter ended Sept. 30:

| | 1902. | 1903. | Increase. |
|-------------------------|-------------|-------------|------------|
| Earnings from operation | \$1,019,518 | \$1,198,315 | \$ 178,797 |
| Operating expenses | 506,664 | 592,925 | 86,261 |
| Net earnings | 512,854 | 605,390 | 92,535 |
| Fixed charges | 381,198 | 398,970 | 17,772 |
| Net income | 131,656 | 206,419 | 74,762 |
| Operating ratio | .507 | .503 | *.004 |

*Decrease.

PHILADELPHIA CO.

Comparative statement for September of Philadelphia Co., Equitable Gas Co., Consolidated Gas Co. of the City of Pittsburgh, the Allegheny Light Co. and Pittsburgh Railways Co.:

| | 1902. | 1903. | Increase. |
|------------------------------|-------------|-------------|------------|
| Earnings from operation | \$1,085,702 | \$1,199,070 | \$ 113,284 |
| Miscellaneous earnings | 15,622 | 21,070 | 5,448 |
| Operating expenses and taxes | 664,360 | 720,221 | 55,861 |
| Net earnings | 437,054 | 499,925 | 62,871 |
| Fixed charges | 308,045 | 318,419 | 10,374 |
| Accrued div. on Phila. pref. | 23,036 | 23,036 | ..... |
| Net income | 105,072 | 157,560 | 52,497 |
| Available for Phila. Co. | 104,037 | 157,425 | 52,488 |

For nine months of calendar year:

| | 1902. | 1903. | Increase. |
|------------------------------|--------------|--------------|-------------|
| Earnings from operation | \$10,108,975 | \$11,327,983 | \$1,219,008 |
| Miscellaneous earnings | 404,186 | 337,090 | *67,096 |
| Operating expenses and taxes | 5,765,852 | 6,540,366 | 774,514 |
| Net earnings | 4,747,309 | 5,124,707 | 377,398 |
| Fixed charges | 2,760,826 | 2,872,234 | 111,408 |
| Accrued div. on Phila. pref. | 216,295 | 215,410 | *876 |
| Net income | 1,770,187 | 2,037,053 | 266,866 |
| Available for Phila. Co. | 1,767,830 | 2,034,720 | 266,893 |

*Decrease.

ONEIDA RAILWAY CO.

The annual report of the Oneida (N. Y.) Railway Co. for the year ended June 30, 1903, shows the gross earnings to have been \$6,240; operating expenses, \$7,108; net loss, \$869; other income, \$4; gross loss, \$865; fixed charges, \$749; year's loss, \$1,614; total deficit, \$1,460. The assets amount to \$27,743, including \$24,765 cost of road and equipment. The capital stock is \$15,000; funded debt, \$10,000. The number of passengers carried was 143,423. The length of the road is $4\frac{1}{2}$ miles (single track).

PORTLAND & BRUNSWICK STREET RY.

The annual report of the Portland & Brunswick Street Ry., of Portland, Me., for the year ended June 30, 1903, shows the earnings from operation to have been \$28,854; miscellaneous earnings, \$100; total earnings, \$28,954; operating expenses, \$17,552; net earnings, \$11,401; interest on funded debt, \$9,625; net divisible income, \$1,776. The number of passengers carried was 523,880; number of persons

employed, 42; miles of road in operation, 15.41. There were no accidents during the year. The total assets amount to \$535,901; total cost of road, \$524,300; capital, \$300,000; funded debt, \$205,000.

ROME CITY STREET RAILWAY CO.

The annual report of the Rome City Street Railway Co., of Rome, N. Y., for the year ended June 30, shows the gross earnings as \$2,102; operating expenses, \$2,636; net loss, \$1,534; fixed charges, \$6,781; year's loss, \$8,315; total deficit, \$10,284. The assets amount to \$291,488, including \$280,440 cost of road and equipment. The capital stock is \$150,000 and the funded debt is \$123,500. The number of passengers carried during the year was 43,482. The five employees received \$1,160 in wages. The length of the road (single track) is $5\frac{1}{2}$ miles, and the rolling stock comprises 10 cars.

INTERBOROUGH RAPID TRANSIT CO.

The Interborough Rapid Transit Co., of New York, which has operated the Manhattan Railway Co.'s elevated lines since April 1st, issued a report of the earnings of those lines for the six months ended September 30th. Gross earnings amounted to \$6,210,540, an increase of \$858,178 over the same period last year; operating expenses were \$2,609,710, a decrease of \$130,336; net earnings, \$3,600,830, an increase of \$988,514. Deducting dividends and fixed charges there was a surplus of \$762,267.

For the year ended September 30th gross earnings were \$12,651,977; operating expenses, \$5,429,473; net earnings, \$7,222,504. The surplus balance to the credit of profit and loss account Sept. 30, 1903, was \$7,102,772, an increase of \$739,354.

UTICA & MOHAWK VALLEY RAILWAY CO.

The annual report of the Utica & Mohawk Valley Railway Co. for the year ended June 30, 1903, shows the gross earnings to have been \$619,065; operating expenses, \$368,382; net earnings, \$250,683; other income, \$2,911; gross income, \$253,594; fixed charges, \$147,680; year's surplus, \$105,904; total surplus, \$292,946. The assets amount to \$7,889,901, including \$5,404,381 cost of road and equipment. The capital stock is \$2,500,000 and the funded debt is \$2,700,000.

The number of passengers carried during the year was 13,335,409. Salaries and wages paid the 350 employees amounted to \$216,009. The year's accident record shows 10 persons killed and 12 injured. Accident damage claims paid amounted to \$18,571.

MONTREAL STREET RAILWAY CO.

The annual report of the Montreal Street Railway Co., for the year ended Sept. 30, 1903, shows the number of passengers carried to have been 54,592,014, or an increase of 4,644,547 over 1902; number of transfers, 16,774,595. Other statistics follow:

| | 1902. | 1903. | Increase. |
|-------------------------|-------------|-------------|-----------|
| Earnings from operation | \$2,046,208 | \$2,222,787 | \$176,579 |
| Operating expenses | 1,135,176 | 1,316,848 | 181,672 |
| Net earnings | 911,032 | 905,939 | *5,093 |

*Decrease.

The assets amount to \$10,405,721, including \$9,724,497 cost of road and equipment. The capital stock is \$6,000,000.

Accompanying the annual report is the report of the president, Mr. L. J. Forget, in which he states that during the year the directors declared four quarterly dividends, amounting to \$600,000, and in view of the company having assumed its own fire insurance risk, placed an additional sum of \$25,000 to the credit of the fire insurance fund, which now amounts to \$239,377, and \$50,000 to the credit of the contingent account, leaving a surplus of \$9,907. The company's earnings increased in a satisfactory ratio (8.63 per cent); the operating ratio shows an increase of .0381, due to the heavy increased rate of wages paid in all departments, the increased amount for maintenance and the increase paid to the city per cent on gross earnings.

During the year \$1,000,000 of new stock was issued to provide for extensions and additions to rolling stock and equipment. During 1903 the company paid the city the following amounts: Tax on earnings and other taxes, \$121,298; on account of snow clearing, \$47,168, making a total of \$168,466. The directors during the year have assisted in the establishment of a mutual benefit association, to provide life insurance, relief in cases of sickness and accident, and pension for long and faithful service, to the funds of which the company will contribute liberally.

New Lines and Extensions Opened.

The Erie (E. R.) Electric Motor Co. opened its east side extension October 26th. The line is six miles long, is double tracked for 1.2 mi. part of the distance, and cost \$100,000.

The first trip over the Cleveland, Painesville & Ashtabula Railway Co.'s line from Painesville to Ashtabula, O., was made October 24th.

The Richmond Street & Interurban Railway Co., of Richmond, Ind., has completed its branch to Easthaven and cars now run on schedule.

The Blue Grass Traction Co.'s line between Lexington and Paris, Ky., was formally opened November 7th and invitations were issued by the McAfee Co. to prominent persons, who rode over the line on special cars, leaving Lexington at 11 a. m.

The Conneaut & Erie Traction Co.'s system was opened to traffic October 29th. The opening of this road is said to complete the longest length of electric railway line in America, making it possible to travel uninterruptedly by trolley from Westfield, N. Y., to Port Huron, Mich., with opportunities to continue further south and west by connecting lines.

The Indianapolis Northern Traction Co., which is building a line to Peru, Ind., has established regular service between Indianapolis and Tipton. The fare is half that charged by the Lake Erie & Western R. R.

The Winnipeg (Manitoba) Electric Street Railway Co. opened its St. Boniface line to traffic November 4th.

November 7th cars were run over the Joliet, Plainfield & Aurora Ry's. line from Joliet to Plainfield, and there was celebration in which the leading officials of the two cities participated.

The first car from Canandaigua to Rochester, N. Y., over the Rochester & Eastern Rapid Railway Co.'s line was run November 5th at midnight. Regular traffic was not begun until recently, however.

C. O. Oberg & Co. in New Factory.

The "Never-Slip" register rod handles made by C. O. Oberg & Co., of Boston, have sprung into almost instant favor, and the demand for these handles has increased to such an extent during the past two months that the company found its old factory at 100 Purchase St., Boston, altogether inadequate to care for the rapidly increasing business. In consequence, more commodious quarters have been leased at 102 Pearl St., Boston, where the company's office and factory are now located. The new factory has been equipped with the most modern machinery and the company has every facility to enable it to fill orders very promptly.

Large Orders for Consolidated Heaters.

The Consolidated Car Heating Co., of Albany, N. Y., is rushed with orders this season, which it reports as one of the most prosperous seasons it has known. Among recent large orders which the company has received is one from the Boston (Mass.) Elevated Railway Co., for 60 heating equipments for surface cars. Another large order was received from the Brooklyn Heights Railroad Co., which has purchased 171 equipments for the elevated cars. This order was in addition to the contract which the company had already awarded the Consolidated company for 100 cars which are now being built.

The tracks of the three-cent fare railroad on Denison Ave., Cleveland, O., from Denison Ave. to Ridge Ave. are now being laid. This is about half way to Lorain St., the proposed terminus of the road.

The Evansville & Chicago Traction Co. has purchased a site, 67½ x 150 ft., in Evansville, Ind., for headquarters, freight and passenger cars, and a building now on the land will be used for the storage of the company's equipment.

Electric Locomotive for the Las Vegas & Hot Springs Railway.

The American Car Co., of St. Louis, recently sent to the Las Vegas & Hot Springs Electric Railway Light and Power Co. a heavy electric locomotive, as shown in the accompanying illustration. An interesting fact connected with the delivery of this locomotive was that although the body was finished (having been built for



LOCOMOTIVE-AMERICAN CAR CO.

another party), the motors were brought from Pittsburg, the car was mounted on its trucks, the equipment installed and the car received by the company in ten days. A short time after, the Galesburg & Kewanee Electric Co. asked to have this feat of rapid delivery duplicated in regard to a large car. The motors were obtained, the car mounted on trucks and the equipment installed, and ten days after the contract was given the car was at Galesburg.

The Las Vegas locomotive measures 30 ft. over crown pieces, and 8 ft. 2 in. over sills and sheathing. It is equipped at either end with steam road pilots and standard M. C. B. couplers. The ends are octagonal in form, and the doors situated at diagonally opposite corners, with a view to loading to its greatest length. The sliding doors are placed in the center at either side and have forty-inch openings. The four windows in each side are protected with iron bars; as it is intended for carrying freight and baggage. The windows in the ends are arranged to drop into pockets; those at the sides have stationary upper sashes which may be raised. The locomotive is mounted on Brill 27 G trucks and equipped with four 50-h. p. motors. Automatic air-brakes are used as well as hand-brakes.

Scaife Company in Mexico.

The William B. Scaife & Sons Co., of Pittsburg, manufacturer of the "Scaife" and "We-Fu-Go" systems for softening and purifying water, has appointed Mr. C. A. Malau, of the City of Mexico, its sole representative in Mexico. Mr. Malau is especially well fitted to look after his client's interests in that republic, as he is thoroughly acquainted with the engineering and industrial wants of the country, and has devoted considerable attention to the subject of water purification.

The Scaife company is now manufacturing every type of water purifying systems, intermittent or continuous, treating the water either hot or cold. It is softening and purifying 350,000,000 gallons of water daily for steam boilers and other purposes where pure, soft water is desired.

The question of whether the so-called Mueller law, applying to public ownership of street railways, shall be put into effect in Chicago will be submitted to a vote of the people at the next aldermanic election. April 5th the city council having passed an ordinance to that effect.

An Indiana Union Traction Co. car on November 15th ran 10½ miles in 22 minutes, and a mile in 46 seconds.

Car Barns at Cleveland Burned.

A dispatch states that three members of the Cleveland fire department were killed and three injured during a fire in the car barns of the Cleveland Electric Railway Co., November 16th, the barns being located on Holmden Ave. and Pearl St. There were 100 motors stored in the building, which covered four acres. The total loss is placed at more than \$200,000.

New Fenders for Brooklyn Rapid Transit.

The Brooklyn Rapid Transit Co. has just ordered from the Eclipse Car Fender Co., of Cleveland, O., complete outfits of Eclipse life guards to be placed upon the new cars being built for the rapid transit company at the Kuhlman car works at Cleveland. This order was given after the company gave the fenders an exhaustive test at Brooklyn, which convinced the company officials that the Eclipse fenders were all that is claimed for them.

Infringement Suit Appealed.

The infringement suit brought some three years ago by John A. Brill vs. the North Jersey Street Railway Co. and defended by the Peckham Motor Truck and Wheel Co., and which was recently decided by District Judge Bradford of Delaware in favor of Mr. Brill, has been appealed. Pending the appeal Judge Bradford has suspended the injunction granted against the railway company and the appeal will be heard at the March term of the circuit court of appeals.

Advertising Literature.

THE CROCKER-WHEELER CO., Ampere, N. J., has issued Bulletin No. 38, October, 1903, on "Small Motors, Form L."

THE LUNKENHEIMER CO., of Cincinnati, issues an attractive circular, 3½x6 in., illustrating the Lunkenheimer regrinding valves, which are made of gun metal and are especially adapted to high pressure power plants.

THE JOSEPH DIXON CRUCIBLE CO., of Jersey City, has issued a 24-page pamphlet, 4x8½ in., entitled "Graphite Suggestions," and treating of the more important uses of Dixon's graphite. It is illustrated and has an illuminated cover.

THE ALLIS-CHALMERS CO. has issued Catalog No. 62, 78 pages, 4¼x6 in., containing a partial list of foreign users of Corliss engines, pumping engines, hoisting engines, compressors and blowing engines built by the Allis-Chalmers Co.

H. B. COHO & CO., INCORPORATED, contracting engineers, 114 Liberty St., N. Y., has issued a 12-page pamphlet, attractively got up, showing some of the work the firm has been engaged upon during the past 10 years, including some notable installations of steam and electrical machinery.

THE JOSEPH DIXON CRUCIBLE CO., Jersey City, has issued a 20-page description and price list of Dixon's graphite lubricants as prepared by the company. The pamphlet is 6x7½ in. in size, nicely printed and illustrated, and the subject is treated in the readable style which marks all of the Dixon productions of this character.

THE CENTRAL ELECTRIC CO., of Chicago, has just issued its November price list and discount sheet. It is an exceedingly attractive little book, designed to supplement the company's 1903 general catalog. It has been revised to date and contains the very latest prices in force, and consequently will be of help to all in the electrical field.

THE AMERICAN BLOWER CO., Detroit, Mich., has issued the following catalogs: No. 118, "Mechanical Draught"; No. 145, "The Heating and Ventilation of Manufacturing Establishments"; No. 155, "Steel Plate Fans." Also pamphlets treating of the "A. B. C." moist air dry kiln, and of heating, ventilating, drying and mechanical draft apparatus generally.

THE BRUSH ELECTRICAL ENGINEERING CO., LIMITED, of London, Eng., has issued Bulletin No. 4, for August, 1903, on "Incandescent Lamps and Fittings." It is 8½x10½ in. in size, contains 30 pages and is handsomely illustrated with half and full-page views of interiors of churches, theaters, residences, public buildings, steamers, electric cars, etc.

THE ELECTRIC SMELTING & ALUMINUM CO., of Cleveland, has caused to be published in pamphlet form a decision of the United States Circuit Court of Appeals for the Second District, sustaining the "pioneer Bradley patent No. 168,148," for electric smelting, and instructing that a decree be entered in favor of the company for an injunction against the Pittsburg Reduction Co.

THE LUMEN BEARING CO., of Buffalo, N. Y., chose an exceptionally pretty subject for illustrating its November desk calendar, which it sends to customers and friends. The view is a country wayside, beautifully colored, entitled "Autumn in Virginia," it being a copy of the well-known painting by E. Lamasure. These calendars are costly to make and are in great demand each month, as has been stated in the "Review" heretofore.

THE CHASE-SHAWMUT CO., of Newburyport, Mass., has just issued its 1904 edition of "Electrical Data." This is a 36-page illustrated catalog, 4x7 in., treating of switchboards, wiring, fuses, conduit boxes and rail bonds. It contains also general data and definitions which serve to make the little book valuable in more ways than one. It will be mailed upon request. As will be noted, the address of the Chase-Shawmut Co. is now Newburyport, Mass., instead of Boston, as formerly.

THE ABENDROTH & ROOT MANUFACTURING CO., of Newburgh, N. Y., is sending out a return post card setting forth its products and requesting those interested to fill out and return the card and mail it to the company, whether in the market for boilers, pipe or other lines of the Abendroth & Root manufacture, or if it is desired that a representative of the company should call, or if any of the company's literature is desired.

THE UNDER-FEED STOKER CO. OF AMERICA, in its Publicity Magazine for November, illustrates the Commerce St. plant of the Milwaukee Electric Railway & Light Co., in the boiler room of which 32 Jones stokers are in operation beneath 6,400 h. p. of Edge Moor water tube boilers, the stokers being automatically equipped. A view is also shown of the installation of coal-conveying and ash-handling machinery in the same plant, which are used in connection with the Jones stokers.

THE STEWART HARTSHORN CO., E. Newark, N. J., in Hartshorn's Roller for October, announces that it has been compelled to increase its factory space at Muskegon, Mich., to keep pace with its increased business, and the result is a building, nearly completed, 342 ft. long and 150 ft. wide. It has also enlarged its factories in E. Newark and in Toronto, Can. The illustrations and the reading matter in the Roller sustain the high standard which makes it a much-sought paper every month.

THE EDGE MOOR IRON CO. has published a catalog, 120 pages, 6x9 in., cloth board covers, treating of the three different types of boilers which it makes—Edge Moor improved Galloway, Edge Moor internally fired return tubular, and Edge Moor water tube boilers. The catalog is nicely got up and well illustrated with views of the Edge Moor plant, and of plants equipped with the Edge Moor boilers. A partial list of users, which is appended, shows that the Edge Moor boilers are widely known.

THE B. F. STURTEVANT CO., Jamaica Plain, Mass., announces that the second edition of Catalog No. 115, the company's condensed general catalog, has gone to press and will soon be ready for distribution. A few pages in this revised edition have been devoted to factory and industrial railway equipments, a new departure of this enterprising company. The manufacture of this new line of products is the outgrowth of the success attained by the company in equipping its new plant at Hyde Park, Mass.

THE GENERAL ELECTRIC CO. has issued the following publications: Bulletin No. 4339 (supersedes No. 4285), "Automatic Circuit Breakers, Type M, for 600 Volt Direct Current"; Bulletin No. 4340, "Meridian Lamps"; Bulletin No. 4341, "Standard Photometer Lamps"; Bulletin No. 4342 (supersedes No. 4230), "List of Polyphase Power Plants"; Bulletin No. 4343 (supersedes No. 4174), "Slow and Moderate Speed Motors, Type MP, Form H"; Bulletin No. 4344, "The Synchronism Indicator"; Flyer No. 2115, "Meridian Lamps."

THE FRANKLIN PORTABLE CRANE AND HOIST CO., of Franklin, Pa., has issued a 24-page catalog, 4x7 in., treating of the Franklin portable crane and hoist, which has been designed for use in shops, factories and all places where it is necessary to lift heavy bodies, or to transfer them from place to place with safety and with the least expenditure of time and labor. One man can easily lift with this device a large casting or any piece weighing

up to three tons and convey and place it where required. It is recommended for street railway shops, where it would simplify the handling of motors, armatures and truck parts.

THE MAYER & ENGLUND CO., of Philadelphia, in the Keystone Traveller for October, makes the following interesting announcement: "Outside of a check book, a pocket book and Webster's dictionary, we don't know any book which has been so helpful to successful street railway men as our cloth-bound, 550-page catalog. It has been styled the Street Railway Encyclopedia." The October Traveller is replete with bright sayings calculated to advertise the Mayer & Englund specialties in attractive fashion, among the best being a series of illustrated "Rail Bond Proverbs."

THE AMERICAN STEAM SUPERHEATER CO., 176 Federal St., Boston, has issued a new catalog with the object, as stated, to describe the American superheater, and to point out the features of its construction which make it a practical and valuable appliance to users of steam. The new catalog contains 46 pages, 6x9 in., one-half of them being blank. The pages are not bound together, but are tied by a string. The descriptions are short and to the point, and the illustrations are unusually clear. There have been incorporated into the catalog two interesting items, one a letter from the Merrimack Manufacturing Co., of Lowell, Mass., attesting the virtue of the American superheater, and the other a paper on "The Practical Economy of Using Superheated Steam," by P. Nolet; translated by George L. Fowler.

THE GREEN ENGINEERING CO., of Chicago, has issued a 20-page pamphlet, 3½x6 in., containing testimonial letters from a number of its many customers, including the Chicago Electric Traction Co., the Chicago Union Traction Co., the Evanston Traction Co., the Anglo-American Provision Co., E. A. Cummings & Co., C. H. Wilmerding, Cook County Hospital, the Evanston Heating Co., the Toledo Heating & Lighting Co., the Waukesha Sheet Steel Co., the Atchison, Topeka & Santa Fe Railway System, Armour Packing Co., Charles G. Armstrong & Co., Danville (Ill.) Street Railway & Power Co., and Michigan Central Rail-

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road Co. In every case the writer states that the Green traveling link grates give perfect satisfaction. The pamphlet also contains a few views of prominent installations of Green stokers.

Trade Notes.

THE JOHN STEPHENSON CO. advises us that Mr. John G. Root, who has been associated with the company for some time, has been appointed its secretary.

THE LUKENHEIMER CO., of Cincinnati, has opened a branch office in Paris, France, at No. 24 Boulevard Voltaire, where will be carried a complete stock of the Lukenheimer products.

THE CROCKER-WHEELER CO., of Ampere, N. J., has established headquarters for the southern representative of its Washington office, Mr. S. M. Conant, at 425 Empire Building, Atlanta, Ga.

THE CHICAGO INSULATED WIRE CO., of Chicago, has just installed in its plant at Sycamore, Ill., several large stranding tools, which will enable it to build rope-laid cables up to 2,000,000 c. m. capacity.

THE STYLE OF CHAS. G. ARMSTRONG & CO., consulting engineers, of Chicago, has been changed to Armstrong & Fergus, consulting electrical and mechanical engineers, and the office address is now 1509 Fisher Building, instead of 1510.

THE NATIONAL STEEL FOUNDRY CO., New Haven, Conn., announces the establishment of an open-hearth steel casting plant, with all the conditions right for the production and delivery of good work promptly. The first pouring is to take place about Dec. 1, 1903.

THE BALL & WOOD CO., of New York City, builder of large, high-class engines, recently opened an office in Chicago at Room 1547 Marquette Building. J. H. Parshall, who has been associated with the company several years, has charge of this office and the surrounding territory.

THE W. T. VAN DORN CO., Chicago, has been awarded the contract to equip 100 elevated railroad cars recently ordered by the Brooklyn Rapid Transit Co., with the well-known Van Dorn couplers and draw bars. The Van Dorn coupler has also been placed upon the cars of the Danville, Urbana & Champaign Railway Co.

THE ST. LOUIS CAR CO. advises us that it has received another contract from the Oakland Transit Co. for 10 more handsome suburban cars, similar to the 16 which were furnished for the San Francisco, Oakland & San Jose Ry. system of the transit company, and which were described and illustrated in the "Review" for September, 1903.

THE LACONIA CAR COMPANY WORKS, of Boston, recently built for Stone & Webster seven 25-ft. closed, vestibule cars for the new Blue Hill (Mass.) Street Railway Co.'s system. The new cars are very handsome, being painted a rich olive on the outside. They have cross seats, seating 36 persons. They are double-truck cars, with four-motor equipment, and are provided with air brakes.

THE UNDER-FEED STOKER CO. OF AMERICA advises us that it recently received a second order for Jones stokers to be installed in the power house of the John Plankinton estate, the prop-

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erties of which include the well-known Plankinton House, in Milwaukee. A short time ago the chief engineer for the Plankinton estate, Mr. A. W. Grabe, made an exhaustive test of Jones stokers, with the result that he obtained a boiler efficiency of 82.82 per cent.

THE HEIL RAIL JOINT WELDING CO., of Milwaukee, Wis., has closed a contract with the South Covington & Cincinnati Street Railway Co., for welding a considerable portion of its line, and work commenced November 16th. The rails on this line are six and seven-inch girder. The above company has just finished its season's work at Pittsburg, and the machinery used in the work will be stored in that city during the winter and work will be resumed there in the spring.

THE LUDLOW SUPPLY CO. has appointed Watts & Uthoff, of St. Louis, southwestern agents for the Cleveland track-drilling machine, their territory including Missouri, Arkansas, Louisiana, Mississippi, Texas, Kansas, Colorado, Nebraska, Utah, Oklahoma, Indian Territory, southern Illinois and Memphis, Tenn. Porter & Berg, Incorporated, of Chicago, has the northwestern agency, covering northern Illinois, Wisconsin, Iowa, Minnesota, North Dakota, South Dakota and the northern peninsula of Michigan.

THE DORNER TRUCK & FOUNDRY CO., of Logansport, Ind., in order to better care for its increasing business in the street railway field, has opened a general sales office at 1062 Monadnock Block, Chicago, Ill. The new office will be directly in charge of Mr. H. A. Dörner, general sales agent, who has a wide acquaintance among street railway officials throughout the country. The Dorner Truck & Foundry Co. not only makes trucks, track cleaners and brake shoes, but it also deals in axles, fenders, pit-jacks, car wheels and other street railway supplies of that nature.

THE MALTBY LUMBER CO., of Bay City, Mich., advises us that the Kansas City & Olathe Electric Ry., now under construction, is using a special cedar tie that is proving very satisfactory as regards price and wearing qualities. The grade is the same as that used by steam roads, the only difference being that this tie is slightly smaller. The much lower price, however, enables the road to space the ties closely and still have a cheaper but no less durable



Special Conductors' Safes FOR STREET RAILWAYS.

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Thousands of people use the Lake Shore & Michigan Southern Railway because of its great record in the mail service—and it's a good reason.

Uncle Sam stipulates for the best service. Excuses for tardiness and poor service otherwise are not accepted.

Careful work in the operation of the greatest fast mail service in the world, for more than thirty years has established a world-wide record for safe, prompt service over the Lake Shore.

Nineteen daily passenger trains between the great commercial centers—Chicago, Cleveland, Buffalo, St. Louis, Pittsburg, New York, Boston, etc., have the same careful attention as the government trains.

Address undersigned for desired information about travel over the

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C. F. DALY, A. J. SMITH,
Chief A. G. P. A., Chicago, Ill. G. P. & T. A., Cleveland, O.

roadbed than if the larger tie were used. The Maltby company has delivered 50 carloads of these ties during the past three weeks.

THE B. F. STURTEVANT CO. is building a new power plant at Hyde Park, Mass., work upon which is rapidly nearing completion. It promises to be one of the most complete plants of its kind in the country. It will comprise four water-tube boilers, with stokers supplied by Sturtevant forced draft, an economizer with Sturtevant induced draft, and a complete outfit of Sturtevant generating sets, together with condenser, air compressor, etc. The Sturtevant exhaust head is used for separating water and oil from the exhaust steam.

THE NATIONAL TROLLEY MANUFACTURING CO. OF LOCKPORT, N. J., has purchased all rights, title and interest of the National Trolley Manufacturing Co. of Rochester, N. Y., in and to the Moon's patent trolley wheel, the invention of Mr. F. D. Moon, a member of the company. The company also announces that it is introducing a new trolley base, also invented by Mr. Moon, which, used in connection with the Moon patent roller-bearing trolley wheel, is thought to make an unusually efficient combination. It is claimed that nothing but an obstruction will cause the wheel to jump the wire, even at the greatest speed, and in that event the pole immediately throws off the tension and drops "lifeless" near the top of the car. A simple pull on the rope again locks it under the tension, which drives it back to its place on the wire with little or no loss of time and giving no embarrassment.

THE CANADIAN WESTINGHOUSE CO., LIMITED, which was organized at Hamilton, Ont., last month, with a capital of \$2,500,000, is a consolidation of all the Westinghouse interests in Canada, which have heretofore been conducted individually. It will take over all the property, patents and other interests of the succeeded companies, including the sales organization and business of Ahearn & Soper, of Ottawa. The new company will build a new plant, for which ground has been broken, at Hamilton, which will give work to at least 1,000 employees. The output of the aggregated manufactories of the Westinghouse companies in the United States is over \$50,000,000 per year in actual shipments, and it is expected that the establishment of this Canadian company will

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SECURE A HOME IN THE GREAT SOUTHWEST!

The rapid increase in population and the phenomenal crops of 1903 are pushing land prices upward. The Southwest was never as prosperous as now, and never before has there been such a demand for good farm lands. Through the M. K. & T. Land Bureau thousands of acres of rich farm lands (improved and unimproved), located along the line of the M. K. & T. Railway, are now offered for sale. The lands are especially adapted to the growth of corn, wheat, oats, fruits and vegetables, rice, cotton, sugar-cane, and for stock farming. The lands are well located as to markets, schools, etc.

If you are interested in this new and prosperous country, offering so many opportunities, and rich farming lands, which can be secured at low prices, we will gladly furnish you information about lands, business chances, etc. Advise exactly what you want, what state or territory you prefer, and the amount you have to invest.

The Homeseekers' Excursions on the first and third Tuesdays of each month afford an opportunity to visit the great Southwest at a small cost. If you are interested, write to-day for full information.

Address GEORGE MORTON, Gen'l Pass. Agt., M. K. & T. Ry.
Box 911 . St. Louis, Mo.

increase this amount considerably. The Westinghouse Manufacturing Co. alone has had sales in the Dominion amounting to about \$2,000,000 annually.

THE ELECTRIC STORAGE BATTERY CO., of Philadelphia, manufacturer of the "Chloride Accumulator," recently closed a contract through its Canadian representative, the Canadian General Electric Co., Ltd., for an installation in the power house of the Toronto Railway Co. of a regulating battery, consisting of 276 cells, capable of discharging 3,000 amperes. Other recent contracts are the following: Bangor (Me.) Public Works, a railway regulating battery of 264 cells, capable of discharging 160 amperes; Carnegie Steel Co., a regulating battery at its Youngstown works, capable of discharging 1,600 amperes at 260 volts; Chicago Edison Co., a battery for the Haddock Place station, having a capacity of 100,000 ampere-hours at 128 volts; United States government, for a battery at Fort Totten, consisting of 62-640 ampere-hour cells; the Stevens Building, Detroit, 146-160 ampere-hour cells; House of the Good Shepherd, Roxbury, Mass., 62-160 ampere-hour cells, and the Johnson-Kahn Co., 68-560 ampere-hour cells.

ADAM COOK'S SONS, 313 West St., New York, sole makers of Albany grease, have long claimed that the use of Albany grease for lubricating machinery of all kinds will cut the oil bills in half. As conclusive evidence that it will do better than that, even, they submit the following letter, dated Oct. 10, 1903, from L. G. Mills, chief engineer of the Knoxville (Tenn.) Ice Co.: "In answer to yours of recent date, will say that the Albany grease cups you sent me I put on some of our different machines, and I have had very good results from them. Our machines have run harder and longer this season than ever before, and with 80 lbs. of grease and your cups I cut the oil from 12 bbls. last season to 4 bbls. this season. For instance, our electric light engine, running at 320 r. p. m., always took a gallon of oil a night, and it was hard to keep cool bearings with that amount. I put your cups on this engine in June, and have only filled them once since then, and at no time have the bearings shown any signs of heating. It is the same on our large

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
HARRISON BUILDING, PHILADELPHIA.

machines, and I will say that your grease has done the work on whatever bearing I have used it."

THE CROCKER-WHEELER CO., of Amper, N. J., advises us that during the past fortnight a number of notable orders have been received, and, being pretty evenly distributed between its larger branch offices, this is taken to indicate that the improving condition of business is not confined to any one section. Among the orders referred to are the following: Lorain Steel Co., 41 motors, ranging from 2½ to 360 h. p., and representing a total of 1,423 h. p.; New Jersey Zinc Co., Hazard, Pa., one 125-kw. and two 600-kw. generators, and 37 motors aggregating 401 h. p.; Warren Foundry & Machine Co., Phillipsburg, N. J., one 200-kw. generator, four 35-h. p. motors and two 60-h. p. motors; G. H. Hammond Co., for its plant at the Stock Yards, Chicago, one 50-h. p., one 25-h. p., and two 20-h. p. motors, and an 800-kw., 550-volt, engine-type generator. This last is a duplicate of one now being built for the St. Louis Exposition, the Crocker-Wheeler Co. having the contract to provide the generators for the entire intramural system at the World's Fair.

THE VILTER MANUFACTURING CO., of Milwaukee, maker of refrigerating and ice-making machinery, corliss engines, brewers' and bottlers' machinery, recently closed large contracts with the following: Mesa Dairy & Ice Co., Mesa, Ariz.; Adam Scheidt Brewing Co., Norristown, Pa.; Brownsville Brewing Co., Brownsville, Pa.; Shreveport Brewery, Shreveport, La.; Cornell Bros., Huntley, Ill.; Bay City Ice, Light & Power Co., Bay City, Tex.; Dalhart Ice & Electric Co., Dalhart, Tex.; Leetsdale Ice Co., Leetsdale, Pa.; Spangler Brewing Co., Spangler, Pa.; Idaho Brewing

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Notice to the Trade

WE desire to notify our customers and the trade that no suit has ever been brought against us for infringement of any patent arising out of the manufacture by us of any of our well known types of trucks.

In the suit brought by John A. Brill vs. The North Jersey Street Railway Company and defended by the Peckham Motor Truck & Wheel Company, in which our 14-B-3 truck was involved, we would say that an appeal has been taken from the decision of District Judge Bradford of Delaware against that Company, and we believe that the appeal will lead to a reversal of the decision of the lower court, as we are advised by our attorneys. We have evidence, which the defendant in the North Jersey suit was not permitted to offer in evidence, which of itself is a complete defense to any claim of infringement.

No customer of the Peckham Motor Truck & Wheel Company or The Peckham Manufacturing Company has ever been obliged to pay one dollar to settle any claim for alleged infringement claimed to have arisen by the use of any truck manufactured at any time by either of these companies. We will protect our customers in the future as we have in the past.

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The Blue Hill Street Railway Co., of Boston, one of the Stone & Webster traction interests, has placed another order for closed cars with the Laconia Car Co. The new cars will be vestibuled and have cross seats, and are to be equipped with air brakes and specially heavy motors.

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STREET RAILWAY REVIEW

Vol. XIII

DECEMBER 20, 1903

No. 12

The Muncie, Hartford & Ft. Wayne Ry.

General Description of Route Track Construction—Safety Devices Bridges Overhead Construction—Power Station—Sub.Stations—Car House and Shops—Rolling Stock—Dispatching—Freight and Express—Traffic Statistics—Personnel.

The Muncie, Hartford & Ft. Wayne Railway Co., which, like some of the steam railway corporations, finds its name too long for convenience and prefers to have its line locally known as the "Hartford Route," was organized in July, 1901, by Cleveland capitalists. The first idea was to build from Muncie to Montpelier, a distance of 27.8 miles, and the portion between Muncie and Hartford, 18.5 miles, was opened Feb. 11, 1903, and from Hartford to Montpelier, 9.3 miles, was opened May 7th. This

considerable travel for pleasure purposes throughout the year.

All of the road in the country, and small portions in the towns, is on private right-of-way, the balance being on the streets in the several towns. The cities, towns, and villages through which the road passes, starting from the south end, are as follows: Muncie, Royerton, Shideler, Eaton, Hartford City, Montpelier, Keystone, Poneto, and Bluffton.

The road is practically parallel to the Lake Erie & Western R. R.



PARK ON MISSISSINEWA RIVER—MUNCIE, HARTFORD & FT. WAYNE RY

season the company has been building from Montpelier to Bluffton, 14 miles, and eventually it will extend from Bluffton to Fort Wayne, a further distance of 25 miles. This will give the company a line of 67 miles in practically a straight line from Muncie north to Ft. Wayne, and in connection with the Indiana Union Traction Co.'s line furnishing an electric route from Indianapolis to Ft. Wayne. There is also a spur, two miles long, from Shideler directly east to a large gravel pit, from which all of the ballast for the road has been obtained. At Eaton there is a spur, approximately three-fourths of a mile long, from the main line to a park situated on the north side of the Mississinewa River, which park is owned by the railway company, and the main buildings are equipped for use as a house as well as a summer, thus insuring

and lies in what is known as the gas and oil region of Indiana. Muncie and Hartford City are the county seats of Delaware and Blackford Counties, respectively, and Montpelier, in the northern part of Blackford County, is the operating headquarters of the Standard Oil Co. in this part of the state. Bluffton is the county seat of Wells County. There is a great deal of passenger traffic between Montpelier and the other towns on the line due to the gas and oil well operations, and the legal business relative to real estate transfers calls for transportation facilities to and from the county seats. The road is practically level; the steepest grade outside of the towns is 2 per cent, and there is but little of that, and in Hartford City 2 per cent for a short distance. The sharpest curve on the line between the terminal V's is 23 degrees

Track Construction.

The road is single track with turnouts spaced for a half-hourly service, and some additional ones in and near towns. The rail is 60-ft.



THROUGH TRUSS BRIDGE, HARTFORD, MUNCIE & FT. WAYNE RY.

70-lb. A. S. C. E. section laid on 6 x 8 in. x 8 ft. ties spaced 2 ft. c. to c. Cedar ties are used on tangents and oak ties on curves and in streets. In Muncie 7-in. 98-lb. full-grooved, girder rail is used in order to conform to the regulations of the Muncie city council, while



POWER HOUSE, MUNCIE, HARTFORD & FT. WAYNE RY.

in Bluffton 8¾-in. 95-lb. ¾-grooved, girder rail is used in order to make a neat and durable track in the asphalt streets.

In Muncie a portion of the track is laid in an asphalt paved street; the asphalt was cut under the location for the rail, and



VIEW IN POWER HOUSE, MUNCIE, HARTFORD & FT. WAYNE RY.

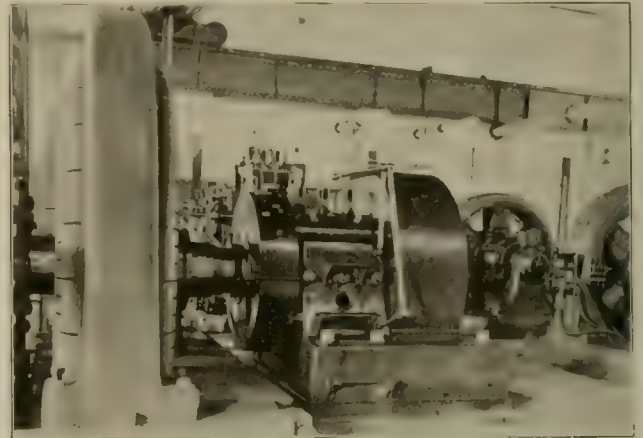
a concrete base was constructed, the rail placed on the same, concreted up to the lower level of the asphalt, and a top coat of asphalt

placed up to top of rail, this being the same construction as that of the Union Traction Co. in Muncie, and as desired by the city engineer. Similar construction is used in Bluffton.

The rail bonds on the line between Bluffton and Montpelier were furnished by the Ohio Brass Co.; between Montpelier and Muncie "Protected" bonds are installed.

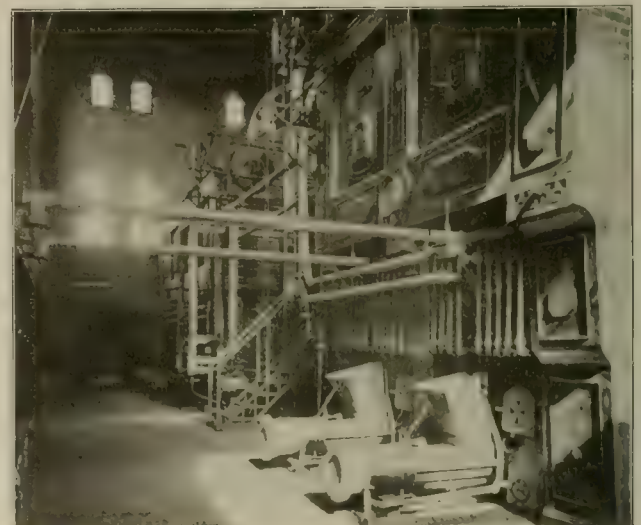
All track is fully ballasted with not less than 6 in. of good gravel ballast under the ties, and filled flush with the top of the tie, and neatly dressed off on the slopes.

The grades and alignments outside of the cities and towns are excellent, and in the towns the grade is necessarily controlled by



ENGINE ROOM, MUNCIE, HARTFORD & FT. WAYNE RY.

the grade of the streets and the curves necessary in order to turn such corners as required. Such curves, however, are few in number, there being two in Eaton, which are approximately 250-ft. and 325-ft. radius; these were secured by obtaining private right of way across corner lots. The sharpest curve outside of towns is six degrees. There are many tangents over five miles in length. The effect of these very favorable conditions as to grades and alignment



BOILER ROOM, MUNCIE, HARTFORD & FT. WAYNE RY.

will undoubtedly be apparent in low operating and maintenance expenses.

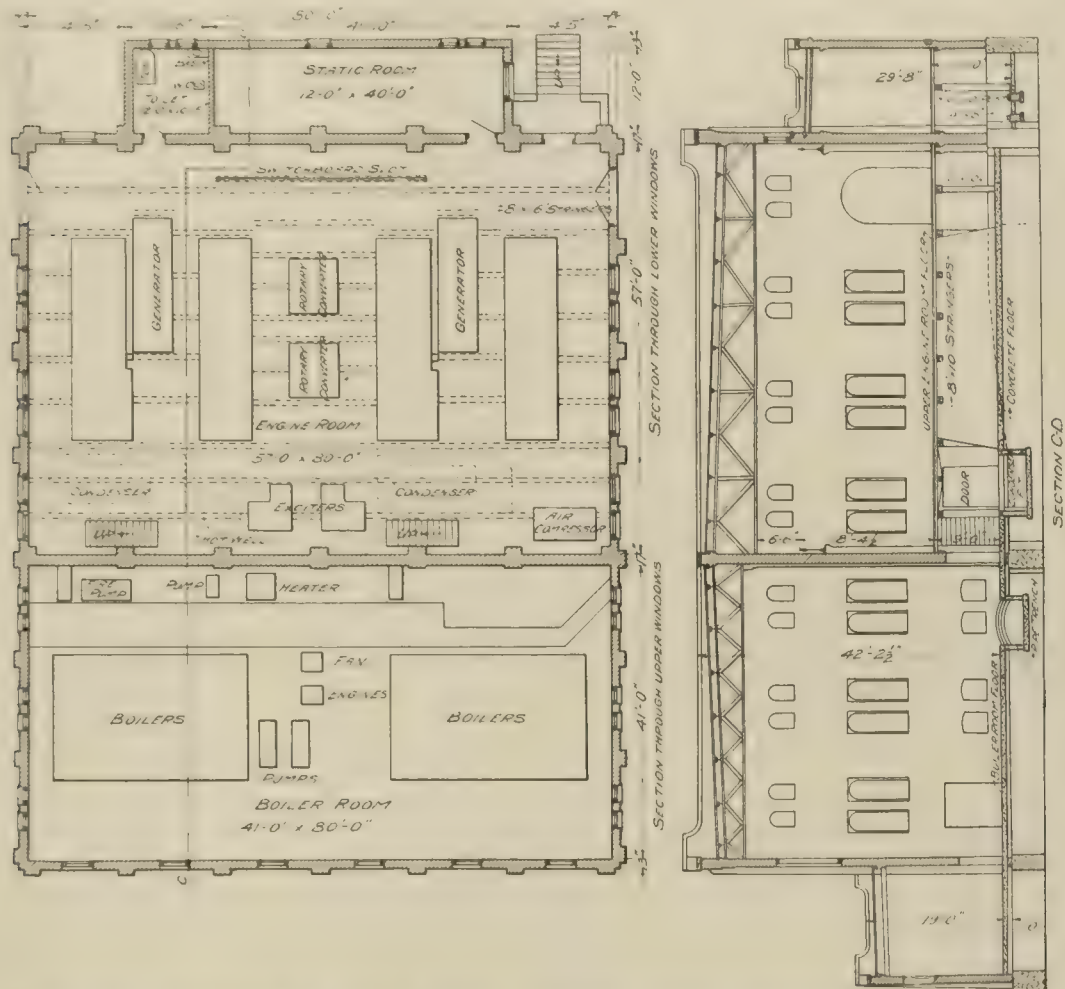
Safety Devices.

All but two of the grade crossings with steam railroads are protected by hand-operated derail switches. At these two, Granville crossing near Muncie, and a crossing at the Montpelier sub-station, "half-interlocking" systems are installed. These were put in by the Pneumatic Signal Co., of Chicago, and are as follows: Derailing switches are placed in the electric railway tracks and semaphore signals on the steam railroad 500 ft. from the crossing, both derails and semaphores being actuated by levers in a tower so located as to give a clear view of the tracks. Track circuits on the steam

road extend for 2,000 ft. in each direction with connections at the tower so that a train within the track circuit sections locks the operating levers. When an electric car reaches the crossing the de-

Bridges.

There are several bridges on the line, the principal ones being a through truss bridge with spans of 128 ft. and 104 ft. over the Mis-



PLAN AND ELEVATION OF POWER HOUSE MACHINERY, MUNCIE, HARTFORD & FT. WAYNE RY.

rail is open; the conductor goes to the signal tower and (the steam road being clear) throws the lever setting semaphore signals against steam trains, and then the lever closing the derails in the



SWITCHBOARD, MUNCIE, HARTFORD & FT. WAYNE RY.

central track. The movement of these levers locks the door of the tower so that the conductor cannot enter until the levers have been restored to their normal position.

sissinewa at Eaton; through truss with two 104-ft. spans over the White River near Muncie; two 80-ft. deck girder spans near Montpelier; a 75-ft. through girder near Hartford; and an overhead crossing with the L. E. & W. at Eaton, this last having two 40-ft. deck and one 50-ft. through girder spans.

The bridges along the line are designed for a loading of 3,000 lb. per lineal foot, and also for the concentrated loads of 40-ton cars. The piers and abutments for these bridges are concrete. In addition there are a few short timber spans, and a number of concrete culverts, one near Eaton being 4 ft. wide by 6 ft. high, in a 20-ft. fill.

Overhead Construction.

The overhead work is bracket construction, except in cities. Two trolley wires, No. 00 figure 8, are used to avoid overhead switches. Direct current feeders are of aluminum, 477,000 c. m. in cross section, equal to 300,000 c. m. of copper, except an auxiliary feeder of No. 0 bare copper which is carried for about two miles south of the power station. On the Bluffton extension No. 0000 copper feeder is used. Garton lightning arresters are placed every quarter-mile for the protection of the lines. The overhead material is of Ohio Brass Co. make.

A telephone system is provided with telephones on each car and in the dispatcher's office, the sub-stations and the principal waiting rooms along the road, with "plug-in" boxes at all switches and other convenient points.

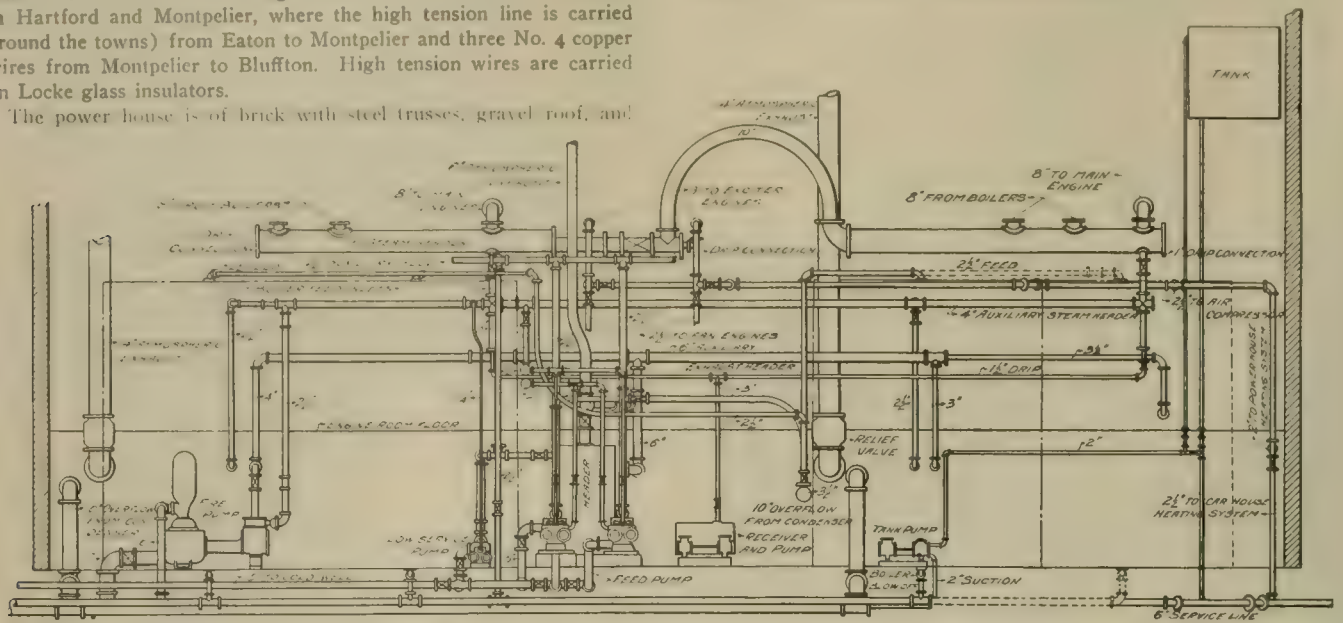
Power Station.

The main power station is at Eaton, and the sub-station (there being only one now in operation) is near Montpelier, 16½ mile-

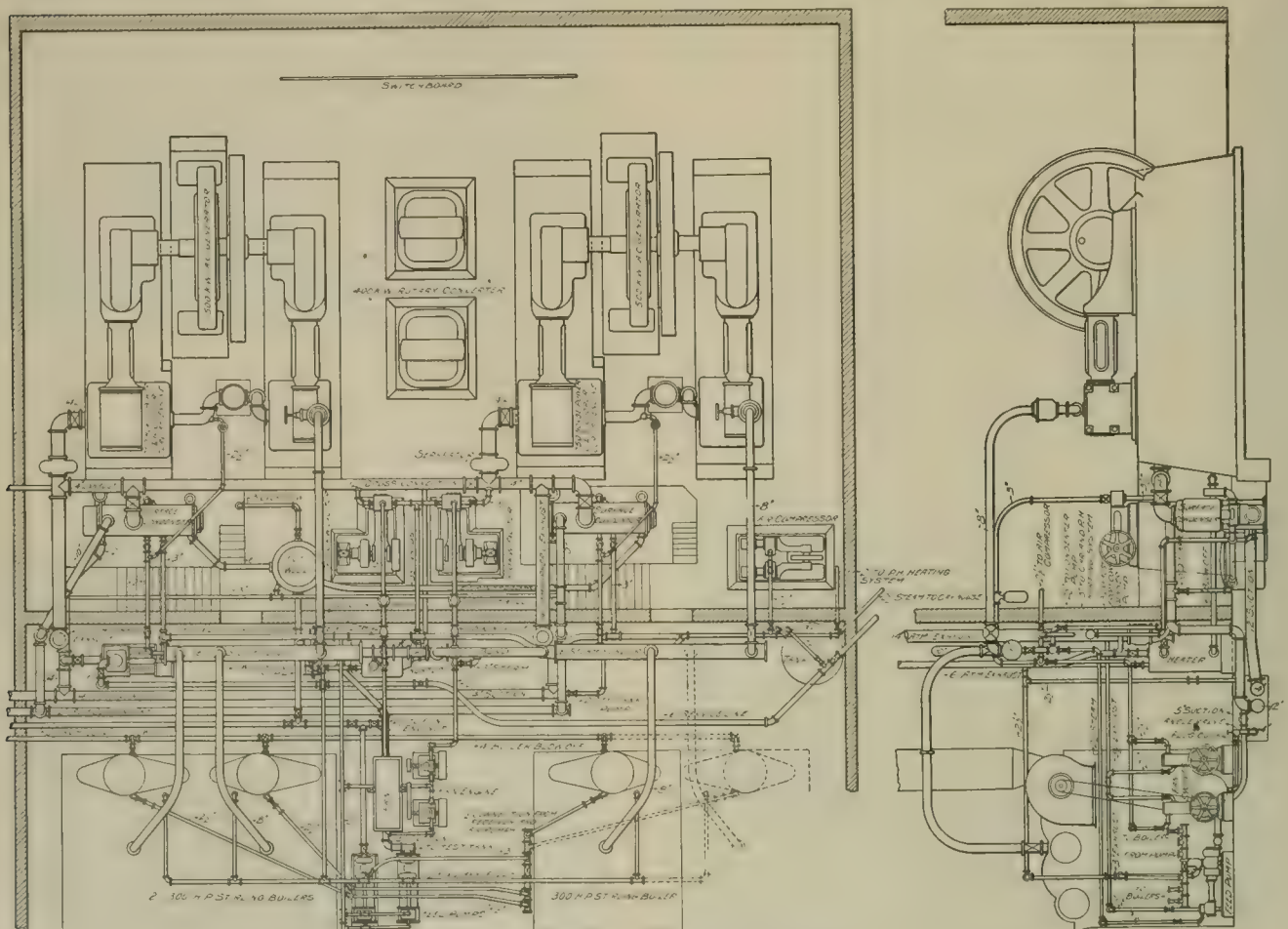
from the power house. Another sub-station and small car barn are located at Bluffton. The transmission voltage is 15,000, three aluminum No. 8 B. & S. wires being carried on the line poles (excepting in Hartford and Montpelier, where the high tension line is carried around the towns) from Eaton to Montpelier and three No. 4 copper wires from Montpelier to Bluffton. High tension wires are carried on Locke glass insulators.

The power house is of brick with steel trusses, gravel roof, and

gine room is 57 ft. x 80 ft., with average height of 30 ft. The room in which the static transformers and high tension switches are placed is an addition to the building proper, and is of brick with



ELEVATION OF BOILER ROOM PIPING, MUNCIE, HARTFORD & FT. WAYNE RY.



PLAN AND ELEVATION OF POWER HOUSE, MUNCIE, HARTFORD & FT. WAYNE RY.

concrete floor in the boiler room and the basement below the engines; the floor at the engine level is of slow burning construction. The boiler room is 41 ft. x 80 ft., and the height from the floor to top of truss in center of room is 40 ft. The coal storage room is 15 ft. x 77 ft. 4 in., with average height of 19 ft. The en-

gine room is 57 ft. x 80 ft., with average height of 30 ft. The room in which the static transformers and high tension switches are placed is an addition to the building proper, and is of brick with

The principal machinery in the power house is as follows: Two

540-kw. three phase revolving field, 25 cycle, 400-volt General Electric generators, directly connected to two Cooper cross-compound condensing engines, having a speed of 94 r. p. m.; two 400-kw. rotary converters, G. E. make; six 75-kw. static transformers, G. E. make; complete switchboard, having all the necessary switches and indicating apparatus, and also recording wattmeters, and a Lincoln synchronizer. Three 300-h. p. Stirling water-tube boilers are installed with room provided for a fourth boiler. The boilers are arranged for burning either coal or natural gas, the gas being used during the summer and coal during the winter, the gas not being obtainable at this season. For burning coal each furnace has an equipment of two Jones under-feed stokers, and for burning natural gas each boiler has 20 gas burners.

Each boiler has a stack 48 in. in diameter and 76 ft. high above the grates, and also for use in connection with the stokers there is provided one American Blower



SUB-STATION AND INTERLOCKING CABIN, NEAR MONTEPIELIER

adjacent to the boiler house, and the water flows by gravity into this well from the Mississinewa River through an intake pipe 20 in. in diameter. A spur from the L. E. & W. is provided for obtaining coal.

Sub-Stations.

At sub-station No. 1, south of Montpelier, there are two 200-kw. rotary converters, six 75-kw. static transformers with the necessary switchboard instruments and controlling apparatus.

In sub-station No. 2, south of Bluffton, there are about to be placed one 200-kw. rotary converter, three 75-kw. static transformers and the necessary switchboard instruments, and controlling apparatus.

The sub-station buildings are each 33 ft. x 37 ft. x 10 ft. with brick walls and gravel roofs.

All of the electrical apparatus is of General Electric Co.'s manufacture.

Car House and Shop

The car house, shop and operating office are at Eaton. At Muncie, where the company has its independent track direct to the court house, at Eaton, at Hartford and at Montpelier waiting rooms are provided, the plan being to place the room in charge of a man who serves as agent and care taker without compensation other than the privilege of conducting a confectionery store and news and cigar stand, rent free.

The car house and shop are under one roof, but separated by a brick wall; four tracks are in the car house and one in the shop. The shop equipment includes a wheel press, a 20-in. shaper, radial drill, sensitive drill, 14-in. lathe, and 42-in. lathe. In the rear portion of the shop are the armature repair room and the store room.

All the car house tracks have pits extending about two fifths of



POWER HOUSE ELEVATIONS, MUNCIE, HARTFORD & FT. WAYNE RY

Co.'s blower, having a 54-in. wheel and 30-in. outlet, and for driving same there are provided two 9 in. x 7 in. American Blower Co.'s. automatic engines, one of which is belted to the fan and the other kept for reserve.

The auxiliary steam apparatus consists of the following: Two Wheeler Admiralty type surface condensers, having 1,800 sq. ft. condensing surface each; two 14-in. Bundy vacuum separators with special individual vacuum pumps; one 1,200-h. p. Cochrane feed water heater; two 10 x 6 x 10-in. outside center packed boiler feed pumps; one 6 x 7 x 6-in. piston pattern boiler pump; one 10 x 9 x 12 in. standard Underwriter's fire pump; one 4 1/2 x 3 3/4 x 4-in. drinking water pump connected to a deep well. All of these pumps are of the standard Worthington duplex type, the boiler feed pumps being fitted with bronze piston rods, plungers and valves for handling hot water. The pumps are so cross connected that the failure of any pump will not injure the operation of the system.

The steam and water piping is of the most complete character for convenience and reliability of operation. The Holly system is provided for returning the live steam drips to the boilers. Water is pumped from a cold well 10 ft. in diameter, 22 ft. deep, located



SUB-STATION INTERIOR, MUNCIE, HARTFORD & FT. WAYNE RY

building; the pit floors are concrete, and elsewhere in the house the floor is gravel

Rolling Stock.

The passenger car equipment comprises 12 cars, eight built by the John Stephenson Co. and four by the Niles Car Co. These are all



CAR BARN, MUNCIE, HARTFORD & FT. WAYNE RY.

similar in design, excepting that the later cars received are plainer in finish, and have the following principal dimensions: Length of body, 34 ft. 4 in.; length over vestibules, 43 ft. 6 in.; length over bumpers, 44 ft. 5 in.; width, 8 ft. 4 in.; height from bottom of sill

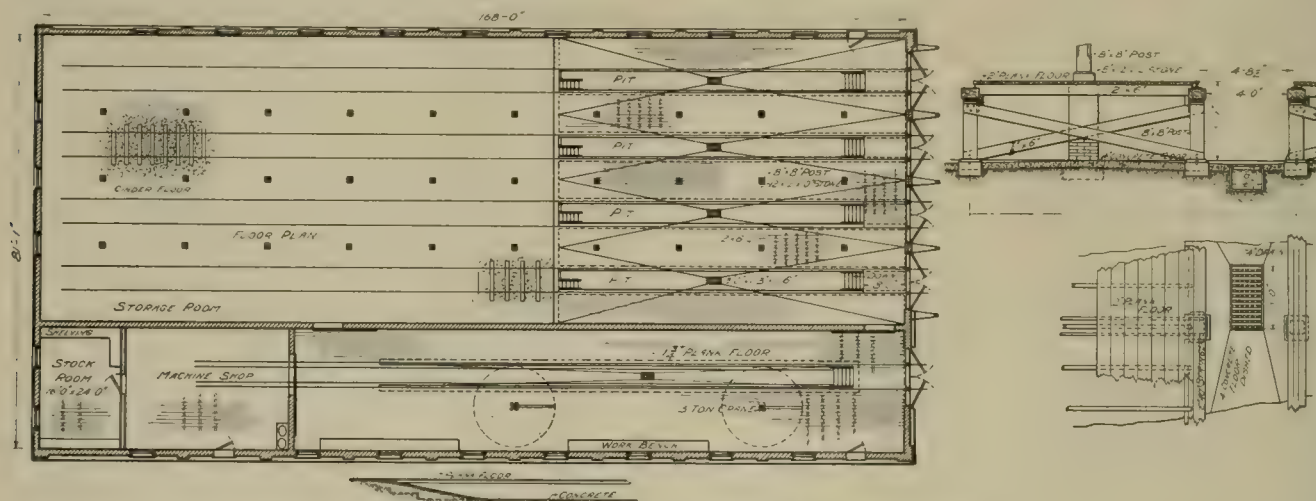
with 6-ft. wheel base. The wheels are 33 in. in diameter, with 3-in. tread and 1 in. flange; axles are 4½ in. in diameter with four



INTERIOR OF CAR BARN, MUNCIE, HARTFORD & FT. WAYNE RY.

nals 3¾ x 7½ in. Two G. E.-57 motors are mounted on each truck, with a K 14 controller on the front platform only.

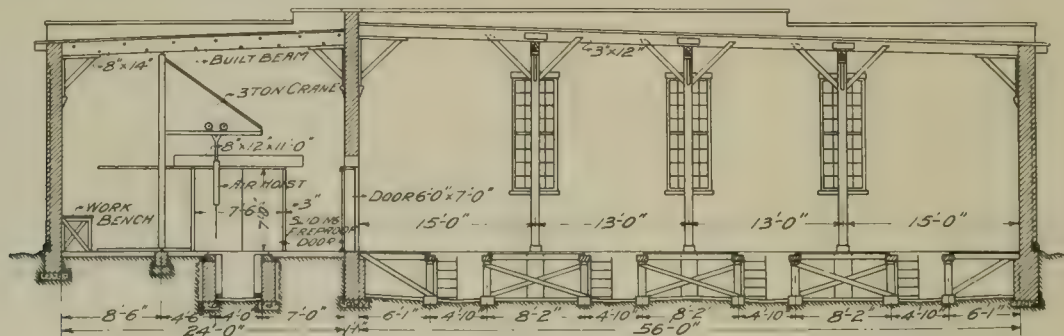
The equipment includes Baker hot water heaters, Ohmer fare registers, Wagenhals electric headlights, Wilson trolley catchers,



PLAN OF CAR BARN, MUNCIE, HARTFORD & FT. WAYNE RY.

to roof, 9 ft. 4 in.; height inside, 8 ft. 5¾ in.; weight 24,000 lb. All cars have vertical siding below the window rests, and round fronts. In eight cars there are baggage compartments, also used

Kalamazoo trolley wheels, Hale & Kilburn "walkover" seats, and Christensen air brakes, with AA-1 motor compressors and 8-in. brake cylinders. The equipped car weighs about 26 tons.



SECTION THROUGH CAR BARN, MUNCIE, HARTFORD & FT. WAYNE RY.

for smokers; four cars have the smoking compartment only. All cars have toilet rooms.

The cars are mounted on Peckham No. 26 swing bolster trucks

For its passenger cars the company has chosen a very handsome green as the standard color. Those who followed the proceedings of the American Railway Mechanical and Electrical Association

will doubtless recall the remarks of Mr. H. J. Lake regarding the care required to keep clean cars that are operated in the oil and gas regions. A greasy and gritty coating forms on the cars and would gather dust and destroy the varnish were it allowed to accumulate. Accordingly, the cars are thoroughly cleaned after a day's run before they are again put in service. One man can clean only two cars per day, going over the whole of them carefully. For car cleaning "Knoxall" soap, made by the Hoosier Manufacturing Co., is used. A solution of this soap is kept in the car house and diluted for use as needed, the proportion in the wash water as used being a tablespoonful of soap to two gallons of water. This amount of soap softens the water and cleans the woodwork. For cleaning trucks gasoline is used to cut the grease.

Three cars at present give hourly service between Muncie and Montpelier, making mileage as follows: A, 389 miles; B, 333 miles; C, 372 miles. On Dec. 1st regular two-hourly service was



STANDARD CAR, MUNCIE, HARTFORD & FT. WAYNE RY.

this division, hourly service will be inaugurated and all cars run through. During the very hot weather last summer cars would be



PAVILION, MUNCIE, HARTFORD & FT. WAYNE RY.

begun between Montpelier and Bluffton, one car giving this service and making 252 miles per day. After the installation of the Bluffton sub-station machinery and the completion of the track ballasting on

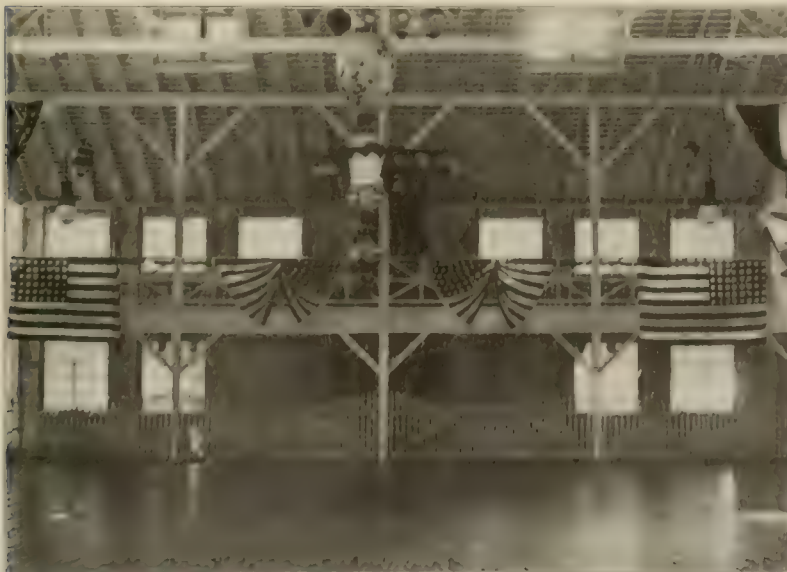
taken out of service after half a day's run in order to avoid danger of over-heating the motors.

Besides the passenger cars the company has 16 construction flat cars, a motor box car, and a general utility work car. The work car is 35 ft. long over the bumpers, with a controller house $2\frac{1}{2} \times 6$ ft. in the center. This car is equipped with four G. E.-57 motors and has enough ballast added to bring the weight up to 60,000 lb. The box car has the same equipment. For ballasting gravel was taken from a 30-acre tract near Shideler that was bought by the company, the gravel being hauled by steam engines for ballasting from Muncie to Hartford, and by electric power the balance of the distance to Bluffton.

Dispatching.

The operation of cars is governed by telephone orders from the car dispatcher in Eaton. The office, power stations, and waiting rooms are, of course, in telephone connection, and all cars are provided with portable telephones with flexible cord and plugs for plugging into the line at turnouts, where taps are brought down from the telephone wires carried on the line poles.

Habitually cars are run on the time-table which shows the time each train should arrive at every turnout. For the hourly schedule figures on the time-table are written horizontally, and for the extra cars needed to provide a half-hourly schedule the



INTERIOR OF PAVILION, MUNCIE, HARTFORD & FT. WAYNE RY.

figures are written on an angle of 45 degrees. Passing points are indicated by a semi-circle drawn about the time, and placing above the time the number of the train to be passed at that point. Each car runs on a train number indicated by the time-table.

MUNCIE-HARTFORD & FORT WAYNE RAILWAY CO. DISPATCHER'S TRAIN SHEET.

| DISTANCE FROM MUNCIE. | | MOTORMAN. | | CONDUCTOR. | | DISTANCE FROM MONTPELIER. | |
|-----------------------|-----------------------|-----------|----|----------------|--|---------------------------|--|
| TRAIN NO. | | CAR NO. | | A. M. OR P. M. | | | |
| 6 | Muncie Court House | 27 | 80 | | | | |
| 11 | Muncie Y | 27 | 69 | | | | |
| 92 | Highland Ave Siding | 26 | 44 | | | | |
| 222 | Urgentia Grove Siding | 25 | 58 | | | | |
| 524 | Reveries Siding | 22 | 54 | | | | |
| 805 | Soldier | 19 | 75 | | | | |
| 884 | Leard's Siding | 18 | 96 | | | | |
| 1002 | Power House | 17 | 78 | | | | |
| 1042 | Park Junction Y | 17 | 38 | | | | |
| 1062 | Eaton | 17 | 17 | | | | |
| 1232 | Campbell's Siding | 16 | 28 | | | | |
| 1288 | Enclave | 12 | 92 | | | | |
| 1634 | Waterbury Siding | 11 | 44 | | | | |
| 1682 | Hartford Siding | 9 | 28 | | | | |
| 1945 | North Hartford Y | 8 | 25 | | | | |
| 2914 | Carroll's Siding | 7 | 64 | | | | |
| 3145 | Dowdport | 6 | 25 | | | | |
| 3275 | Hattie | 6 | 55 | | | | |
| 2452 | McGee's Siding | 3 | 67 | | | | |
| 2504 | Bryantwood | 2 | 14 | | | | |
| 2604 | Sub-Station | 1 | 12 | | | | |
| 2643 | Race Track Siding | 97 | | | | | |
| 2700 | Montpelier Y | 0 | | | | | |
| A. M. OR P. M. | | | | | | | |

REMARKS—Delays, Etc.

So long as cars are on schedule time the duties of the dispatcher are simply to record the reports made to him from the various reporting points. When a change from the schedule is necessary an order is written by the dispatcher, who fills out form T O 2 (shown herewith), a form $6\frac{1}{4} \times 3\frac{1}{2}$ in., above the upper double rule. He then telephones the order to Conductor Brown, who writes out the order on a similar form carried by him on the car; Motorman Smith then reads the order to the dispatcher, who underscores each word and enters the names, train number, station, and time, and signs with his initials, as shown on the first line below the order proper. The dispatcher keeps this order before him until he can get the other train, when the order is given to Conductor Doe, repeated by Motorman Roe, the dispatcher again underscoring each word, and when the record from Doe and Roe is made the order is completed.

The middle portion of the train sheet is shown herewith. So long as trains are on time, this when filled out is simply an abbreviated copy of the time-table, since train crews ordinarily report only at regular reporting stations.

Freight and Express

The tables showing the receipts by months give an idea of the

package and express business done by the company. A freight department has not yet been organized, but all sorts of packages not too bulky for the baggage compartment are handled by the car crews on demand; a piano is not an unusual shipment. During a

Muncie, Hartford & Ft. Wayne Ry. Co. COAL RECORD.

Order No. Cars
From whom ordered.....
Date of Shipment.....
Date Received.....
Car No.
Car Initial.....
Billed Weight
Correct Weight
Date Freight Paid.....
Amount Freight Paid.....
Date of Invoice.....
Amount of Invoice.....
Amount Paid.....
Date Paid.....
Remarks.....

fair held at Montpelier recently 25 race horses were shipped from Indianapolis over the lines of the Indiana Union Traction Co. and the Muncie, Hartford & Ft. Wayne Ry.

Park.

The company's pleasure resort is known as Riverside Park and is a tract of 35 acres located on the Mississinewa River about $\frac{3}{4}$ mile from the main line in Eaton. The principal improvements at this park comprise a pavilion and an eight-room cottage for use as a residence by the park manager. The pavilion, of which exterior and interior views are

FORM T O 2 MUNCIE, HARTFORD & FT. WAYNE RY. CO.

Train Order No. Date 1903. Time 3:42 AM
Train No. 46 } Meet { Train No. 49 }
Car No. 43 } } Car No. 48 } At Cleveland Siding.

| Received by Conductor | Repeated by Motorman | Train No. | At | O.K'd by Dispatcher | Time |
|-----------------------|----------------------|-----------|-----------------|---------------------|-------------|
| <u>Brown</u> | <u>Smith</u> | <u>46</u> | <u>Leards</u> | <u>BWA</u> | <u>3:46</u> |
| <u>Doe</u> | <u>Roe</u> | <u>49</u> | <u>Hartford</u> | <u>BWA</u> | <u>4:05</u> |

Remarks.....
..... Dispatcher.

shown in the engravings, is surrounded on all sides by a 10-ft. veranda. Inside is a hard-wood floor, 50 x 70 ft., for dancing, around which is a promenade 10 ft. wide. Only dancers are allowed

upon the floor, the charges being 5 cents per dance, or 50 cents for the entire evening. Above the promenade is a gallery, as shown in the interior view

Muncie, Hartford & Ft. Wayne Ry. Co.

Disturbance Report No.

Date Car No. Train No.

Time Place

Name and address of passengers causing disturbance.

Cause of disturbance (state fully what occurred)

Was it necessary to eject passenger?

If so, was it done without injury?

(NOTE—If any injury was sustained, fill out regular accident report.)

Was car standing, starting, stopping or running?

Speed of car?

Where did passenger board car?

Destination?

Amount of fare paid? Amount refunded?

We certify that the above is a true statement.

..... Conductor

..... Motorman

OVER

Band concerts are given every Sunday during the summer, and there is dancing every evening except Sunday. The only other attraction provided at the park is boating on the river, the company having a fleet of row boats. No gambling or liquor is permitted on the park grounds.

The park, with pavilion and manager's residence, is leased, the rental paying about 5 per cent on the park investment.

Accident Reports.

The form of accident report used is shown in one of the engravings; on the reverse side is a ruled blank for the names and

addresses of witnesses. The "disturbance report" is also an interesting form; on the reverse of this form are three vertical columns for the names, addresses, and occupations of witnesses. There are twelve horizontal lines on this side of the form.

Traffic Statistics.

The population of the principal towns along the line, based upon school census and other available data, is as follows:

| | |
|--------------|---------------|
| Muncie | 32,000 |
| Royerton | 300 |
| Shideler | 300 |
| Eaton | 2,000 |
| Hartford | 8,000 |
| Montpelier | 6,000 |
| Keystone | 300 |
| Poneto | 500 |
| Bluffton | 7,000 |
| Total | 56,400 |

FORM 40.

Muncie, Hartford and Ft. Wayne Railway Company.

ACCIDENT REPORT.

NOTICE TO EMPLOYEES

Employees are required to fill out accident reports and leave them at the office **IMMEDIATELY** after the accident occurs. Report every accident however slight the same may appear, even though no damage or injury exists, or is claimed.

EVERY EMPLOYEE who may **WITNESS** an accident in which this Company may be interested is required to fill out one of these blanks and transmit same to the office. All reports should be made as full and complete as possible and should include names and addresses of all witnesses.

Under particulars, on reverse side of sheet, state fully any detail not called for on this side.

NOTE: DO NOT TALK ABOUT THIS ACCIDENT, EXCEPT TO OFFICERS OF THIS COMPANY. KEEP AWAY FROM INJURED PARTIES AND HAVE NO COMMUNICATION WITH THEM AFTER THEY HAVE BEEN CARED FOR.

| | | |
|---|--------------------------------------|----------------|
| Date of accident | Time | Train No. |
| Exact place of accident | | |
| Name and residence of person injured or owner of property damaged | | |
| Name of Driver of Vehicle | Address | |
| Nature and extent of injuries | | |
| Motor No. | carrying passengers | Trailer No. |
| Motorman | Conductor | |
| Position of Conductor and Motorman at time of accident | | |
| Position of person or vehicle at time of accident | | |
| Was person under influence of liquor? | | |
| In what direction was car going? | | Other vehicle? |
| At what speed per hour? | | |
| Was motor reversed? | How far did car move after accident? | |
| Was car standing, starting, running or stopping? | | |
| Was warning bell or whistle sounded before accident? | | |
| What was state of weather? | Condition of street? | |
| Condition of Rails? | Condition of pavement? | |
| What was damage to car? | | |
| What was done for or with person or property injured? | | |

Name of doctor called

By whom was doctor called?

State remarks made by injured person, by party in charge of property damaged or by any witnesses of the accident

RECEIPTS OF MUNICIE, HARTFORD & FT. WAYNE RY.

| Month | Fares | Passenger Receipts from Conductors | Fares and Receipts | Local Ticket Sales | Chartered Cars | Other Receipts | Total Receipts | Car Miles | Passenger Receipts per passenger per cent | Passenger Receipts per car mile, cents | Total Passengers |
|-------|----------|------------------------------------|--------------------|--------------------|----------------|----------------|----------------|-----------|---|--|------------------|
| Feb. | 1,144.00 | 23.00 | 247.17 | 247.17 | | 2.80 | 1,408.97 | 9,747 | 15.7 | 14.8 | 21,649 |
| Mar. | 1,144.00 | 48.00 | 127.30 | 127.30 | | 40.00 | 6,539.35 | 17,376 | 15.9 | 14.1 | 40,425 |
| Apr. | 6,120.45 | 60.80 | 2,000.00 | 2,000.00 | 104.70 | 11.50 | 6,551.20 | 31,125 | 16.7 | 14.0 | 86,693 |
| May | 1,144.00 | 152.10 | 200.00 | 200.00 | | 78.40 | 10,915.60 | 33,519 | 17.4 | 12.6 | 61,114 |
| June | 1,144.00 | 172.15 | 462.80 | 462.80 | | 20.00 | 12,435.05 | 9,280 | 16.5 | 10.9 | 74,807 |
| July | 1,144.00 | 272.00 | 1,691.40 | 1,691.40 | | 16.00 | 14,346.42 | 36,500 | 14.9 | 16.0 | 96,039 |
| Aug. | 1,144.00 | 272.00 | 1,691.40 | 1,691.40 | | 140.22 | 14,018.97 | 36,500 | 16.2 | 14.1 | 81,908 |
| Sept. | 1,144.00 | 272.00 | 1,691.40 | 1,691.40 | | 16.00 | 12,435.05 | 36,500 | 16.2 | 14.1 | 74,911 |
| Oct. | 1,144.00 | 272.00 | 1,691.40 | 1,691.40 | | 108.10 | 11,050.67 | 34,197 | 16.7 | 12.3 | 66,102 |
| Nov. | 1,144.00 | 272.00 | 1,691.40 | 1,691.40 | | 88.00 | 10,920.68 | 36,150 | 17.1 | 30.2 | 62,218 |

The townships in which these towns are located have rural populations in addition as follows:

| | |
|----------------------------------|-------|
| Center (Muncie) | 8,000 |
| Hamilton (Royerton and Shideler) | 900 |
| Union (Eaton) | 1,300 |
| Lacking (Hartford) | 2,000 |
| Harrison (Montpelier) | 2,100 |
| Chester (Keystone) | 2,100 |
| Liberty (Poneto) | 1,700 |
| Harrison (Bluffton) | 2,200 |

20,300

| 12 | 10 | 8 | 6 | 4 | 2 | TRAIN NO. | 1 | 3 | 5 | 7 | 9 | 11 |
|-----|-----|-----|-----|-----|-----|-------------------------|-----|-----|-----|-----|-----|-----|
| A | B | C | A | B | C | RUN | A | C | B | A | C | B |
| 815 | 715 | 615 | 515 | | | 0 MUNCIE COURT HOUSE | 215 | 508 | 605 | 705 | 805 | 905 |
| 816 | 716 | 616 | 516 | | | 11 MUNCIE Y | 216 | 507 | 604 | 704 | 804 | 904 |
| 820 | 720 | 620 | 520 | | | 192 HIGHLAND ST. S.D. | 268 | 503 | 600 | 700 | 800 | 900 |
| 825 | 725 | 625 | 525 | | | 222 GRANVILLE S.D. | 258 | 509 | 555 | 655 | 747 | 855 |
| 832 | 731 | 632 | 532 | | | 524 ROYERTON S.D. | 254 | 505 | 548 | 648 | 741 | 848 |
| 838 | 738 | 638 | 538 | | | 815 SHIDELER SPUR | 265 | 501 | 641 | 738 | 841 | 941 |
| 840 | 740 | 640 | 540 | | | 834 LEARDS SIDING | 269 | 500 | 640 | 735 | 840 | 940 |
| 843 | 743 | 643 | 543 | | | 1002 POWERHOUSE | 278 | 537 | 637 | 733 | 837 | 937 |
| 845 | 745 | 645 | 545 | 445 | 440 | 1002 " " | 278 | 535 | 635 | 732 | 835 | 935 |
| 847 | 747 | 647 | 547 | 447 | 441 | 1002 PARK JUNCTION Y | 278 | 533 | 633 | 731 | 833 | 933 |
| 848 | 748 | 648 | 548 | 448 | 442 | 1063 EATON | 277 | 532 | 632 | 730 | 832 | 932 |
| 855 | 755 | 655 | 555 | 455 | 448 | 352 COUNTY LINE SIDING | 285 | 525 | 625 | 725 | 825 | 925 |
| 901 | 801 | 701 | 601 | 501 | 453 | 1639 WINTERHURST S.D. | 146 | 519 | 619 | 719 | 819 | 919 |
| 908 | 808 | 708 | 608 | 508 | 458 | 1052 HARTFORD S.D. | 928 | 512 | 612 | 712 | 812 | 912 |
| 910 | 810 | 710 | 610 | 510 | 458 | 1052 " " | 928 | 510 | 610 | 710 | 810 | 910 |
| 916 | 816 | 716 | 616 | 516 | 503 | 945 BLAKES Y | 835 | 504 | 604 | 704 | 804 | 904 |
| 917 | 817 | 717 | 617 | 517 | | 2044 CLEVELAND SIDING | 768 | 603 | 703 | 803 | 903 | |
| 925 | 825 | 725 | 625 | 525 | | 2413 PARK HARTFORD S.D. | 367 | 555 | 655 | 755 | 855 | |
| 930 | 830 | 730 | 630 | 530 | | 2668 SUB STATION | 112 | 550 | 650 | 750 | 850 | |
| 931 | 831 | 731 | 631 | 531 | | 2683 PACETRACK SIDING | 97 | 549 | 649 | 749 | 849 | |
| 938 | 838 | 738 | 638 | 538 | | 2780 MONTPELIER | 0 | 545 | 645 | 745 | 845 | |
| 94 | 84 | 74 | 64 | 54 | | | | AM | AM | AM | AM | AM |
| 12 | 10 | 8 | 6 | 4 | 2 | TRAIN NO. | 1 | 3 | 5 | 7 | 9 | 11 |

PORTION OF TIME TABLE, MUNCIE, HARTFORD & FT. WAYNE RY.

The rural population within one mile of the railway was estimated at 10,000.

These figures on population, from Muncie to Montpelier, together with the tables showing the number of passenger fares of each denomination collected per month, will be found extremely interesting and valuable to those charged with the responsibility of passing upon the merits of proposed electric railways in territory where conditions are at all similar. July 4, 1902, 15,466 passengers were carried on the main line and 9,551 on the park branch.

The regular operating schedule provides for an hourly service in each direction, excepting on Saturdays and Sundays during the summer, when cars are operated at half-hourly intervals from noon until 6 p. m. The running time between Muncie and Montpelier, 27.8 miles, is 80 minutes, which with a lay-over of 10 minutes at termini requires three cars to maintain the usual schedule. Four cars will give hourly service between Muncie and Bluffton, making the 41.8-mile run in 110 minutes, and lying over 10 minutes at termini.

The rate of fare is approximately 2 cents per mile. From Muncie to Hartford, 18.5 miles, is 35 cents; from Hartford to Montpelier,

| | | | | | | |
|-------------------|---|---|---|----|----|----|
| M. H. & F. W. Ry. | 1 | 2 | 3 | 4 | 5 | 6 |
| | 7 | 8 | 9 | 10 | 11 | 12 |
| No. 33998 | | | | | | |

HAT CHECK.

9.3 miles, is 15 cents; from Muncie to Montpelier is 50 cents; Montpelier to Bluffton, 25 cents; Muncie to Bluffton, 75 cents. The cars are all equipped with Ohmer fare registers, on which are separately recorded 5, 10, 15, and 20-cent fares and passes and tickets. For fares from 25 to 75 cents, varying by increments of 5 cents, duplex tickets are used.

For fare-fixing purposes the road between Muncie and Bluffton is divided into 16 sections, corresponding to 5-cent fares. Stops are made only at designated points, which are from a half-mile to a mile apart outside of towns; the stopping points and fare section limits were, of course, chosen with due regard to the tributary population, the greatest convenience for the greatest number being kept in mind.

Muncie, Hartford & Fort Wayne Railway Co.

RECORD FOR MONTH OF

190

| DATE | Passenger Receipts from Conductors | FREIGHT RECEIPTS Package Express Freight | CASH RECEIPTS | | | | | | Total Receipts | PASSENGERS CARRIED | | | | CAR MILEAGE | | | | | | | | Total Car Miles | WEATHER Special Event |
|------|------------------------------------|---|----------------|-------------|--------------------|---------------|---------|------|----------------|--------------------|---------|--------|-------|-------------|----|----|----|----|----|----|----|-----------------|--------------------------|
| | | | Chartered Cars | Advertising | Local Ticket Sales | Sale of Power | Rentals | Mail | | Cash Fares | Tickets | Passes | Total | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | | |
| 1 | | | | | | | | | | | | | | | | | | | | | | | |
| 2 | | | | | | | | | | | | | | | | | | | | | | | |

FORM 881

MUNCIE, HARTFORD AND FORT WAYNE RAILWAY CO.

DAILY RECORD OF RECEIPTS.

| SPECIAL EVENT | | | | | | | | | | WEATHER | | | | | | | | | | | | | | | | | | 190 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---------------|--|-------|--------|--|---------|--|---------|--|---------|---------|---------|--|---------|--|---------|--|---------|--|---------|--|---------|--|---------|--|---------|--|---------|-----|---------|--|---------|--|---------|--|---------|--|---------|--|---------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-------|--|-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| CONDUCTOR | | TRAIN | 5 Cts. | | 10 Cts. | | 15 Cts. | | 20 Cts. | | 25 Cts. | | 30 Cts. | | 35 Cts. | | 40 Cts. | | 45 Cts. | | 50 Cts. | | 55 Cts. | | 60 Cts. | | 65 Cts. | | 70 Cts. | | 75 Cts. | | 80 Cts. | | 85 Cts. | | 90 Cts. | | 95 Cts. | | 1.00 | | 1.05 | | 1.10 | | 1.15 | | 1.20 | | 1.25 | | 1.30 | | 1.35 | | 1.40 | | 1.45 | | 1.50 | | 1.55 | | 1.60 | | 1.65 | | 1.70 | | 1.75 | | 1.80 | | 1.85 | | 1.90 | | 1.95 | | 2.00 | | 2.05 | | 2.10 | | 2.15 | | 2.20 | | 2.25 | | 2.30 | | 2.35 | | 2.40 | | 2.45 | | 2.50 | | 2.55 | | 2.60 | | 2.65 | | 2.70 | | 2.75 | | 2.80 | | 2.85 | | 2.90 | | 2.95 | | 3.00 | | 3.05 | | 3.10 | | 3.15 | | 3.20 | | 3.25 | | 3.30 | | 3.35 | | 3.40 | | 3.45 | | 3.50 | | 3.55 | | 3.60 | | 3.65 | | 3.70 | | 3.75 | | 3.80 | | 3.85 | | 3.90 | | 3.95 | | 4.00 | | 4.05 | | 4.10 | | 4.15 | | 4.20 | | 4.25 | | 4.30 | | 4.35 | | 4.40 | | 4.45 | | 4.50 | | 4.55 | | 4.60 | | 4.65 | | 4.70 | | 4.75 | | 4.80 | | 4.85 | | 4.90 | | 4.95 | | 5.00 | | 5.05 | | 5.10 | | 5.15 | | 5.20 | | 5.25 | | 5.30 | | 5.35 | | 5.40 | | 5.45 | | 5.50 | | 5.55 | | 5.60 | | 5.65 | | 5.70 | | 5.75 | | 5.80 | | 5.85 | | 5.90 | | 5.95 | | 6.00 | | 6.05 | | 6.10 | | 6.15 | | 6.20 | | 6.25 | | 6.30 | | 6.35 | | 6.40 | | 6.45 | | 6.50 | | 6.55 | | 6.60 | | 6.65 | | 6.70 | | 6.75 | | 6.80 | | 6.85 | | 6.90 | | 6.95 | | 7.00 | | 7.05 | | 7.10 | | 7.15 | | 7.20 | | 7.25 | | 7.30 | | 7.35 | | 7.40 | | 7.45 | | 7.50 | | 7.55 | | 7.60 | | 7.65 | | 7.70 | | 7.75 | | 7.80 | | 7.85 | | 7.90 | | 7.95 | | 8.00 | | 8.05 | | 8.10 | | 8.15 | | 8.20 | | 8.25 | | 8.30 | | 8.35 | | 8.40 | | 8.45 | | 8.50 | | 8.55 | | 8.60 | | 8.65 | | 8.70 | | 8.75 | | 8.80 | | 8.85 | | 8.90 | | 8.95 | | 9.00 | | 9.05 | | 9.10 | | 9.15 | | 9.20 | | 9.25 | | 9.30 | | 9.35 | | 9.40 | | 9.45 | | 9.50 | | 9.55 | | 9.60 | | 9.65 | | 9.70 | | 9.75 | | 9.80 | | 9.85 | | 9.90 | | 9.95 | | 10.00 | | 10.05 | | 10.10 | | 10.15 | | 10.20 | | 10.25 | | 10.30 | | 10.35 | | 10.40 | | 10.45 | | 10.50 | | 10.55 | | 10.60 | | 10.65 | | 10.70 | | 10.75 | | 10.80 | | 10.85 | | 10.90 | | 10.95 | | 11.00 | | 11.05 | | 11.10 | | 11.15 | | 11.20 | | 11.25 | | 11.30 | | 11.35 | | 11.40 | | 11.45 | | 11.50 | | 11.55 | | 11.60 | | 11.65 | | 11.70 | | 11.75 | | 11.80 | | 11.85 | | 11.90 | | 11.95 | | 12.00 | | 12.05 | | 12.10 | | 12.15 | | 12.20 | | 12.25 | | 12.30 | | 12.35 | | 12.40 | | 12.45 | | 12.50 | | 12.55 | | 12.60 | | 12.65 | | 12.70 | | 12.75 | | 12.80 | | 12.85 | | 12.90 | | 12.95 | | 13.00 | | 13.05 | | 13.10 | | 13.15 | | 13.20 | | 13.25 | | 13.30 | | 13.35 | | 13.40 | | 13.45 | | 13.50 | | 13.55 | | 13.60 | | 13.65 | | 13.70 | | 13.75 | | 13.80 | | 13.85 | | 13.90 | | 13.95 | | 14.00 | | 14.05 | | 14.10 | | 14.15 | | 14.20 | | 14.25 | | 14.30 | | 14.35 | | 14.40 | | 14.45 | | 14.50 | | 14.55 | | 14.60 | | 14.65 | | 14.70 | | 14.75 | | 14.80 | | 14.85 | | 14.90 | | 14.95 | | 15.00 | | 15.05 | | 15.10 | | 15.15 | | 15.20 | | 15.25 | | 15.30 | | 15.35 | | 15.40 | | 15.45 | | 15.50 | | 15.55 | | 15.60 | | 15.65 | | 15.70 | | 15.75 | | 15.80 | | 15.85 | | 15.90 | | 15.95 | | 16.00 | | 16.05 | | 16.10 | | 16.15 | | 16.20 | | 16.25 | | 16.30 | | 16.35 | | 16.40 | | 16.45 | | 16.50 | | 16.55 | | 16.60 | | 16.65 | | 16.70 | | 16.75 | | 16.80 | | 16.85 | | 16.90 | | 16.95 | | 17.00 | | 17.05 | | 17.10 | | 17.15 | | 17.20 | | 17.25 | | 17.30 | | 17.35 | | 17.40 | | 17.45 | | 17.50 | | 17.55 | | 17.60 | | 17.65 | | 17.70 | | 17.75 | | 17.80 | | 17.85 | | 17.90 | | 17.95 | | 18.00 | | 18.05 | | 18.10 | | 18.15 | | 18.20 | | 18.25 | | 18.30 | | 18.35 | | 18.40 | | 18.45 | | 18.50 | | 18.55 | | 18.60 | | 18.65 | | 18.70 | | 18.75 | | 18.80 | | 18.85 | | 18.90 | | 18.95 | | 19.00 | | 19.05 | | 19.10 | | 19.15 | | 19.20 | | 19.25 | | 19.30 | | 19.35 | | 19.40 | | 19.45 | | 19.50 | | 19.55 | | 19.60 | | 19.65 | | 19.70 | | 19.75 | | 19.80 | | 19.85 | | 19.90 | | 19.95 | | 20.00 | | 20.05 | | 20.10 | | 20.15 | | 20.20 | | 20.25 | | 20.30 | | 20.35 | | 20.40 | | 20.45 | | 20.50 | | 20.55 | | 20.60 | | 20.65 | | 20.70 | | 20.75 | | 20.80 | | 20.85 | | 20.90 | | 20.95 | | 21.00 | | 21.05 | | 21.10 | | 21.15 | | 21.20 | | 21.25 | | 21.30 | | 21.35 | | 21.40 | | 21.45 | | 21.50 | | 21.55 | | 21.60 | | 21.65 | | 21.70 | | 21.75 | | 21.80 | | 21.85 | | 21.90 | | 21.95 | | 22.00 | | 22.05 | | 22.10 | | 22.15 | | 22.20 | | 22.25 | | 22.30 | | 22.35 | | 22.40 | | 22.45 | | 22.50 | | 22.55 | | 22.60 | | 22.65 | | 22.70 | | 22.75 | | 22.80 | | 22.85 | | 22.90 | | 22.95 | | 23.00 | | 23.05 | | 23.10 | | 23.15 | | 23.20 | | 23.25 | | 23.30 | | 23.35 | | 23.40 | | 23.45 | | 23.50 | | 23.55 | | 23.60 | | 23.65 | | 23.70 | | 23.75 | | 23.80 | | 23.85 | | 23.90 | | 23.95 | | 24.00 | | 24.05 | | 24.10 | | 24.15 | | 24.20 | | 24.25 | | 24.30 | | 24.35 | | 24.40 | | 24.45 | | 24.50 | | 24.55 | | 24.60 | | 24.65 | | 24.70 | | 24.75 | | 24.80 | | 24.85 | | 24.90 | | 24.95 | | 25.00 | | 25.05 | | 25.10 | | 25.15 | | 25.20 | | 25.25 | | 25.30 | | 25.35 | | 25.40 | | 25.45 | | 25.50 | | 25.55 | | 25.60 | | 25.65 | | 25.70 | | 25.75 | | 25.80 | | 25.85 | | 25.90 | | 25.95 | | 26.00 | | 26.05 | | 26.10 | | 26.15 | | 26.20 | | 26.25 | | 26.30 | | 26.35 | | 26.40 | | 26.45 | | 26.50 | | 26.55 | | 26.60 | | 26.65 | | 26.70 | | 26.75 | | 26.80 | | 26.85 | | 26.90 | | 26.95 | | 27.00 | | 27.05 | | 27.10 | | 27.15 | | 27.20 | | 27.25 | | 27.30 | | 27.35 | | 27.40 | | 27.45 | | 27.50 | | 27.55 | | 27.60 | | 27.65 | | 27.70 | | 27.75 | | 27.80 | | 27.85 | | 27.90 | | 27.95 | | 28.00 | | 28.05 | | 28.10 | | 28.15 | | 28.20 | | 28.25 | | 28.30 | | 28.35 | | 28.40 | | 28.45 | | 28.50 | | 28.55 | | 28.60 | | 28.65 | | 28.70 | | 28.75 | | 28.80 | | 28.85 | | 28.90 | | 28.95 | | 29.00 | | 29.05 | | 29.10 | | 29.15 | | 29.20 | | 29.25 | | 29.30 | | 29.35 | | 29.40 | | 29.45 | | 29.50 | | 29.55 | | 29.60 | | 29.65 | | 29.70 | | 29.75 | | 29.80 | | 29.85 | | 29.90 | | 29.95 | | 30.00 | | 30.05 | | 30.10 | | 30.15 | | 30.20 | | 30.25 | | 30.30 | | 30.35 | | 30.40 | | 30.45 | | 30.50 | | 30.55 | | 30.60 | | 30.65 | | 30.70 | | 30.75 | | 30.80 | | 30.85 | | 30.90 | | 30.95 | | 31.00 | | 31.05 | | 31.10 | | 31.15 | | 31.20 | | 31.25 | | 31.30 | | 31.35 | | 31.40 | | 31.45 | | 31.50 | | 31.55 | | 31.60 | | 31.65 | | 31.70 | | 31.75 | | 31.80 | | 31.85 | | 31.90 | | 31.95 | | 32.00 | | 32.05 | | 32.10 | | 32.15 | | 32.20 | | 32.25 | | 32.30 | | 32.35 | | 32.40 | | 32.45 | | 32.50 | | 32.55 | | 32.60 | | 32.65 | | 32.70 | | 32.75 | | 32.80 | | 32.85 | | 32.90 | | 32.95 | | 33.00 | | 33.05 | | 33.10 | | 33.15 | | 33.20 | | 33.25 | | 33.30 | | 33.35 | | 33.40 | | 33.45 | | 33.50 | | 33.55 | | 33.60 | | 33.65 | | 33.70 | | 33.75 | | 33.80 | | 33.85 | | 33.90 | | 33.95 | | 34.00 | | 34.05 | | 34.10 | | 34.15 | | 34.20 | | 34.25 | | 34.30 | | 34.35 | | 34.40 | | 34.45 | | 34.50 | | 34.55 | | 34.60 | | 34.65 | | 34.70 | | 34.75 | | 34.80 | | 34.85 | | 34.90 | | 34.95 | | 35.00 | | 35.05 | | 35.10 | | 35.15 | | 35.20 | | 35.25 | | 35.30 | | 35.35 | | 35.40 | | 35.45 | | 35.50 | | 35.55 | | 35.60 | | 35.65 | | 35.70 | | 35.75 | | 35.80 | | 35.85 | | 35.90 | | 35.95 | | 36.00 | | 36.05 | | 36.10 | | 36.15 | | 36.20 | | 36.25 | | 36.30 | | 36.35 | | 36.40 | | 36.45 | | 36.50 | | 36.55 | | 36.60 | | 36.65 | | 36.70 | | 36.75 | | 36.80 | | 36.85 | | 36.90 | | 36.95 | | 37.00 | | 37.05 | | 37.10 | | 37.15 | | 37.20 | | 37.25 | | 37.30 | | 37.35 | | 37.40 | | 37.45 | | 37.50 | | 37.55 | | 37.60 | | 37.65 | | 37.70 | | 37.75 | | 37.80 | | 37.85 | | 37.90 | | 37.95 | | 38.00 | | 38.05 | | 38.10 | | 38.15 | | 38.20 | | 38.25 | | 38.30 | | 38.35 | | 38.40 | | 38.45 | | 38.50 | | 38.55 | | 38.60 | | 38.65 | | 38.70 | | 38.75 | | 38.80 | | 38.85 | | 38.90 | | 38.95 | | 39.00 | | 39.05 | | 39.10 | | 39.15 | | 39.20 | | 39.25 | | 39.30 | | 39.35 | | 39.40 | | 39.45 | | 39.50 | | 39.55 | | 39.60 | | 39.65 | | 39.70 | | 39.75 | | 39.80 | | 39.85 | | 39.90 | | 39.95 | | 40.00 | | 40.05 | | 40.10 | | 40.15 | | 40.20 | | 40.25 | | 40.30 | | 40.35 | | 40.40 | | 40.45 | | 40.50 | | 40.55 | | 40.60 | | 40.65 | | 40.70 | | 40.75 | | 40.80 | | 40.85 | | 40.90 | | 40.95 | | 41.00 | | 41.05 | | 41.10 | | 41.15 | | 41.20 | | 41.25 | | 41.30 | | 41.35 | | 41.40 | | 41.45 | | 41.50 | | 41.55 | | 41.60 | | 41.65 | | 41.70 | | 41.75 | | 41.80 | | 41.85 | | 41.90 | | 41.95 | | 42.00 | | 42.05 | | 42.10 | | 42.15 | | 42.20 | | 42.25 | | 42.30 | | 42.35 | | 42.40 | | 42.45 | | 42.50 | | 42.55 | | 42.60 | | 42.65 | | 42.70 | | 42.75 | | 42.80 | | 42.85 | | 42.90 | | 42.95 | | 43.00 | | 43.05 | | 43.10 | | 43.15 | | 43.20 | | 43.25 | | 43.30 | | 43.35 | | 43.40 | | 43.45 | | 43.50 | | 43.55 | | 43.60 | | 43.65 | | 43.70 | | 43.75 | | 43.80 | | 43.85 | | 43.90 | | 43.95 | | 44.00 | | 44.05 | | 44.10 | | 44.15 | | 44.20 | | 44.25 | | 44.30 | | 44.35 | | 44.40 | | 44.45 | | 44.50 | | 44.55 | | 44.60 | | 44.65 | | 44.70 | | 44.75 | | 44.80 | | 44.85 | | 44.90 | | 44.95 | | 45.00 | | 45.05 | | 45.10 | | 45.15 | | 45.20 | | 45.25 | | 45.30 | | 45.35 | | 45.40 | | 45.45 | | 45.50 | | 45.55 | | 45.60 | | 45.65 | | 45.70 | | 45.75 | | 45.80 | | 45.85 | | 45.90 | | 45.95 | | 46.00 | | 46.05 | | 46.10 | | 46.15 | | 46.20 | | 46.25 | | 46.30 | | 46.35 | | 46.40 | | 46.45 | | 46.50 | | 46.55 | | 46.60 | | 46.65 | | 46.70 | | 46.75 | | 46.80 | | 46.85 | | 46.90 | | 46.95 | | 47.00 | | 47.05 | | 47.10 | | 47.15 | | 47.20 | | 47.25 | | 47.30 | | 47.35 | | 47.40 | | 47.45 | | 47.50 | | 47.55 | | 47.60 | | 47.65 | | 47.70 | | 47.75 | | 47.80 | | 47.85 | | 47.90 | | 47.95 | | 48.00 | | 48.05 | | 48.10 | | 48.15 | | 4 | |

MUNCIE, HARTFORD & FT. WAYNE RY. CO.

POWER HOUSE STEAM REPORT.

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[illegible]

MUNCIE, HARTFORD & FT. WAYNE RY. CO.

POWER HOUSE ELECTRICAL REPORT.

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[illegible]

The only tickets, besides park tickets, sold are commutation books on which a reduction of 25 per cent from the cash fare rate is made, bringing the commutation rate to about 1½ cents per mile. To stimulate traffic to the park, which is at Eaton, round trip tickets good after 6 p. m. are sold at the rate of 25 cents from Muncie and Hartford and 35 cents from Montpelier.

Passengers are given hat checks on which the section number to which they have paid is punched, although this method is varied by the conductors; one of these checks is reproduced herewith full size.

Special cars are furnished at the following rates: Muncie to Bluffton, \$50 for the round trip; Muncie to Montpelier, \$35 for the round trip; Muncie to Hartford, \$25 for the round trip; Muncie to Eaton, \$15 for the round trip.

The Muncie, Hartford & Ft. Wayne Railway Co. has a capital of \$1,000,000 and will issue \$1,000,000 in bonds.

The officers and operating staff are: President, S. M. Hexter, Cleveland; vice-president, A. L. Johnson, Muncie; secretary, F. M. Osborne, Cleveland; assistant secretary, A. Lewenthal, Cleveland; treasurer, J. C. Gilchrist, Cleveland; manager, Louis Hexter, Cleveland; superintendent, L. J. Shlesinger, Eaton; master mechanic, H. J. Lake; chief engineer, A. L. Bowen; roadmaster, C. C. Jacobs; Chief Lineman, R. L. Stacey.

E. P. Roberts & Co. were the engineers for the company during construction.

An interesting series of car tests has been made on this road, including tests on passenger cars in regular service, gravel cars, work cars, etc., which includes the current consumption of cars and trains running at various speeds on level track, grades and curves. A complete report of these tests, including a large amount of interesting data, will be given in the next issue of the "Review."

Conductors' Transfer Boxes.

The Brooklyn Rapid Transit Co. has adopted a new system whereby conductors deposit transfer slips in boxes which have been placed in the cars, instead of having to leave the cars at various depots to deposit them. At the end of every half trip the conductor seals the transfers collected in an envelope and drops it into the box within the car. The side of the box is glass, and as the envelope falls face upward the inspectors can see at a glance by the endorsement on the envelope whether the conductor made the deposit of transfers at the end of his last trip. When collected from the boxes at the close of the day all the envelopes are ready, sorted. The new plan not only saves the conductor's time, but it also economizes clerical work and expedites the checking up of the transfers.

The company has also abandoned all its street transfer stations except two and the passenger now receives his transfer when he pays his fare.

Columbus, Greensburg & Richmond Traction Co.

The Columbus, Greensburg & Richmond Traction Co., with headquarters at Indianapolis, Ind., was incorporated November 20th with a capital of \$1,000,000 and on November 24th elected officers as follows: President, Amos K. Hollowell; vice-president, Harris F. Holland; treasurer, Milton O. Reeves; secretary and manager, Charles N. Wilson; general counsel, Thomas E. Davidson. The board of directors comprises Messrs. Reeves, Holland, Hollowell and Wilson, and Messrs. August M. Kuhn, W. P. Myer and Walter McConaha.

The company proposes to build a double-track road on a private right of way from Richmond, Ind., to Louisville, via Greensburg, and this will be followed by a line to Indianapolis. The line will connect directly with the Appleyard system of Ohio, and it will have eight connections with Indianapolis over other lines. The company proposes later to build a belt line from Columbus, Ind., to Shelbyville, then to Rushville, Connersville, Brookville, Batesville, North Vernon and back to Columbus.

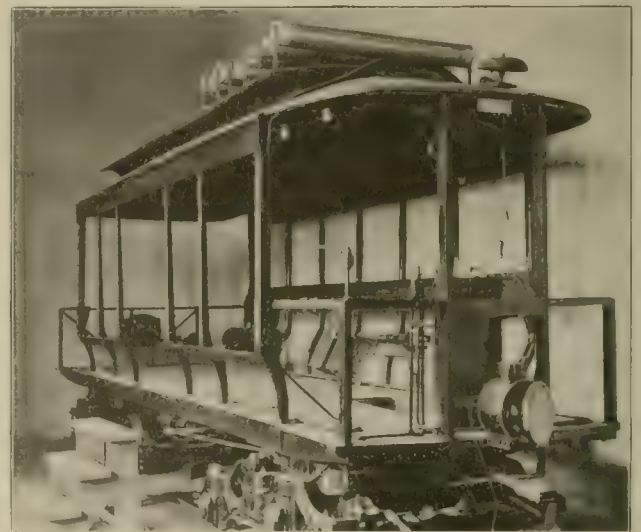
Construction will begin early in the spring, the surveys and other preliminary details being well under way, and the company is getting along nicely as regards financing. There will be erected a \$450,000 power house at Greensburg and extensive shops at Connersville. Two parks will be opened along the line, one at Harts-ville and one at Connersville. The road is intended for passengers, freight and mail. Electric locomotives will be used for hauling freight. The third-rail system may be adopted.

A School for Conductors and Motormen.

The Los Angeles Railway Co. recently established a school where its numerous trainmen may receive the proper education and training to fit them for their duties. The company employs about 275 conductors and a like number of motormen, and is constantly increasing this force, and the school was established to facilitate a thorough and uniform training for all.

A space in one of the car barns has been partitioned off and fitted up for instruction purposes. An ordinary open trailer car was rebuilt and equipped with complete electrical and air brake apparatus; all the seats were removed and all of the wiring brought out in plain sight, so as to be easily traced. The wires are all tagged and diagrams on the wall of the room are lettered and numbered to correspond. The air compressor and motor are mounted on the floor of the car and are readily accessible. In order to run the motors without moving the car, the drive wheels have been jacked up clear of the track, the followers only resting on the rails. Extra resistances have been placed in the motor circuits to prevent them from attaining too great a speed. Trap doors are placed over each motor, and these, when removed, leave the motors in full view. The headlight and interior wiring is the same as in ordinary cars. There is a pit under the car to afford access to the parts under the body.

On the walls of the room are numerous diagrams showing the wiring details of different equipments, also drawings of the air



INSTRUCTION CAR IN MOTORMEN'S SCHOOL.

valve; and in addition to these there are air valves, controllers of various types and a trolley base, all of which may be dissected at the pleasure of the students. A raised platform in one corner of the room is provided with benches so that in case a large class is to discuss some point they may be seated while the instructor lectures and demonstrates from the front platform of the car.

It is not, as a great many people suppose, an easy matter to become a motorman or a conductor, and the company's records show that after having passed the physician's and other preliminary examinations about 25 per cent of the students resign before their final examination, or fail to make the necessary showing in the earlier stages. The applicant for a position as motorman or conductor is first interviewed by the assistant superintendent and is given an application blank to fill out. This blank is 8½x14 in. in size and contains, besides the usual questions as to age, physical description, relatives, habits, etc., a schedule blank in which must be stated fully where and how the applicant has been employed since leaving school, it being stipulated that each year must be fully accounted for. References are also required, of course.

The applicant is next given an order to the examining physician, and he must not only pass a good physical examination, but his eyesight and hearing must be shown to be of the best. If the applicant is fortunate enough to pass these examinations his

application is placed on file and his record investigated while he awaits a call to work.

The company has about 190 men on its extra list, and when from any cause this number runs down, notices are sent out to 10 or 20 of the men whose applications are on file. Such of these as are still desirous of employment report to the assistant superintendent and are usually given a talk by the superintendent himself. In this talk their relations to the company and general duties are outlined. They are then required to furnish a \$500 bond from one of the regular bonding companies; this costs them \$2.50 a year. They are also given an order for their outfit, which in the case of conductors is a punch, badge and a book of the company's rules; the motormen receive pliers and a screw-driver, a badge and a book of rules. These outfits are furnished by the company free.

The applicant is now turned over to the student instructor. He is first questioned as to his age, previous experience, etc., and these are noted in a book in which his records as a student are also kept. The students are then taken to the class-room and conductors and motormen alike are given a complete explanation of the car mechanism and instruction in regard to operating the car. The wiring is traced and explained, the air equipment thoroughly gone over and the students are then left by themselves to trace out the wiring, examine the air mechanism, brakes, rods, shoes, controller, trolley base and other parts. The company furnishes copies of "The Motorman and His Duties" for the men to study.

Before the student is put on a car he must be able to answer, among others, the following questions:

Trace the course of the current through all of the electrical equipment on the car. Give description and uses of electrical equipment.

Name and describe different types of motors—their general appearance, their horse-power. What are field coils, suspensions, bearings, cases, commutators, armatures, brushes, brush holders?

Describe shoe hangers and locate goose neck, adjusting rods, brake beams, floating bar, equalizer bar, piston; air compressor, governor—their action.

After having mastered these points the men are put on the cars in regular service in charge of experienced men. The conductors serve 18 or 20 days and the motormen from 14 to 18 days. The men are kept out in this way until they are acquainted with every route over which the company operates; the conductors must know all the streets over which the car passes on each route, the transfer points and rights of way, and who are entitled to ride free. The motormen must know the routes, the rules of right of way and the use of circuit breakers.

When the conductors are ready to leave their traveling instructor they are put on the front end of the car for two days; the motormen do not, however, act as conductors.

The time spent on each line is recorded on student cards, which are attested by the regular man who is acting as instructor. These cards are $8\frac{1}{2}$ in. square and are ruled so that the date, number of the run, the car run and car number may be entered against the line the student is working on, also whether a. m. or p. m., together with the name of his instructor, the name of the regular carman and the total time spent by the student on each line. During this training novices receive no pay whatever. Having passed this period they are now ready for their final examination, which is by no means an easy one. They are given a set of searching questions on equipment and operation to see if they remember the class room instruction. These questions are printed on a card, $8\frac{1}{2} \times 8\frac{1}{2}$ in., and comprise in addition to those mentioned, and several relating to the topography of the city, and what to do in cases of emergency and accident, nearly 100 questions anent transfers—how, when, where and to whom issued. etc. The applicant must be thoroughly posted on these questions.

If the men are found lacking they are given further drill and perhaps sent out on the cars again as students. A standing of at least 94 per cent is required in the final examination. Having satisfied himself that the candidates are competent to be put on runs by themselves the student instructor makes out his report to the superintendent and the men are placed on the extra list, where they must await their turn for a regular run.

A Suspended Railway Project for Hamburg, Germany.

With the rapid increase of the population in the large cities of Germany, the question of sufficient transportation facilities becomes more and more acute, and this is also the case in many of the cities of the United States. Some data will, therefore, be of interest regarding the project of a suspended railroad in the city of Hamburg, which has been worked out very elaborately by the "Continentale Gesellschaft fuer Elektrische Unternehmungen," Nuremberg. On account of the success which attended the operation of the suspended railway at Barmen-Elberfeld, this new system of transportation has attracted considerable attention from those interested in this question, so that at the present time several large cities are contemplating the introduction of this system. The city of Hamburg has been negotiating for the last ten years for the construction of an extended system of elevated railways connecting Hamburg and its densely populated suburbs. Extended investigations have been made as to the growth of population and the number of people circulating in the city districts, on the existing street car lines, etc. The following table gives an interesting comparison between Berlin, Hamburg and New York.

| Towns | Population | | Increase in Population 20 Years | | Increase in Street Cars 20 Years | |
|----------|------------|-----------|------------------------------------|------------|-------------------------------------|---------------|
| | 1880 | 1900 | 1880 | 1900 | 1880 | 1900 |
| Hamburg | 469,000 | 650,000 | 67 per cent | 10,140,700 | 8,084,000 | 75.2 per cent |
| Berlin | 1,123,700 | 1,840,000 | 64 per cent | 6,200,000 | 414,682,400 | 66.6 per cent |
| New York | 1,049,700 | 2,250,000 | 117 per cent | 28,000,000 | 986,000,000 | 112 per cent |

From this table it can be seen that following the growth of the population the number of people circulating upon the street car lines increases at a very much higher rate than the population. Although the population of New York is 177 per cent. greater than that of Berlin, the number of people riding on the street car lines and the elevated lines in New York is 238 per cent. of that of Berlin. It was therefore deemed wise in laying out the plans of the projected railway in Hamburg, to provide for the present and future increase of the population at least to some extent, the expected

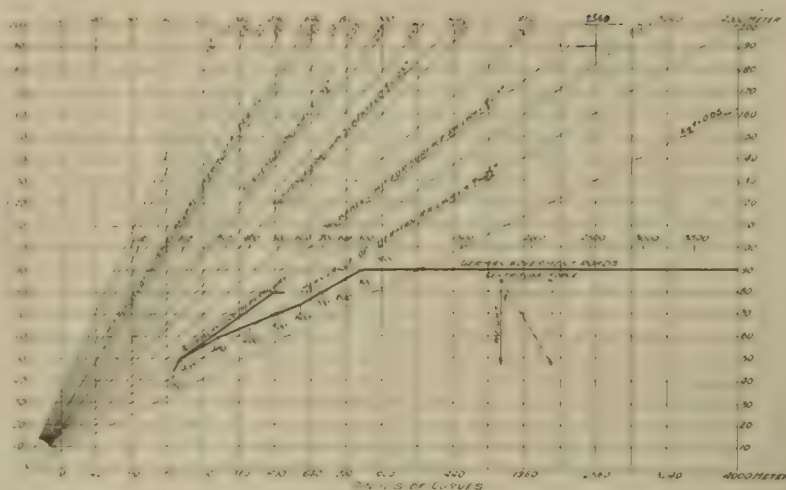
development of the city. Based upon these conditions and upon the result of thorough investigations, a road has been projected of which the accompanying map outlines the general directions. The project involves the construction of the first section, $13\frac{1}{4}$ miles long, the cost of which will be \$7,050,000. Five years will be re-



quired to build this project. To consider the relative cost of the style of road may be gained from the statement that the section above outlined will cover a considerably larger area than the former project for surface lines, and yet the cost will be nearly 50,000,000 less than that of the surface road. Some of the former

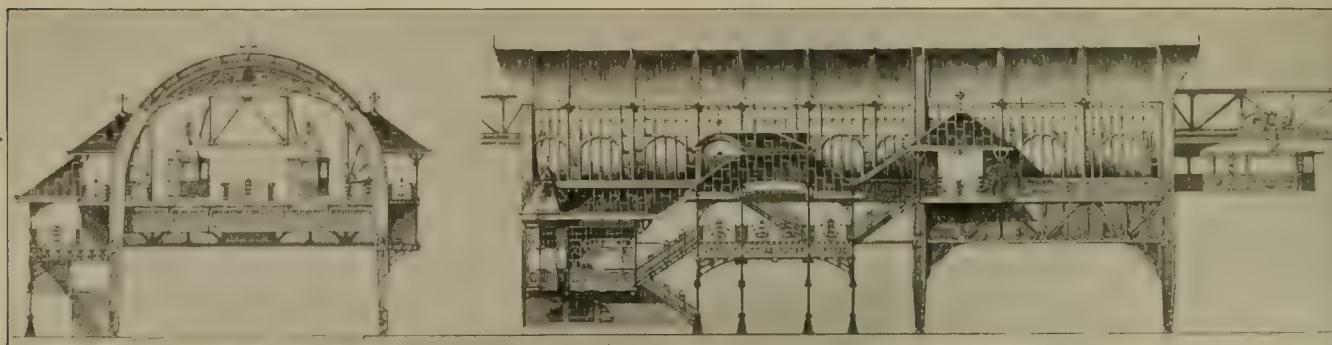
projects for elevated and surface roads for Hamburg have been accepted, but it is expected that this suspension mono-rail of the Langen system will have the approval of the city officials on account of the numerous advantages which it doubtlessly possesses over the other systems proposed.

The following description gives some of the principal advantages claimed for this system. On account of its typical construction, this system very largely increases the facility of transportation beyond the limits of the common two-rail system, as all danger of running off the track is eliminated, and even the shortest curves can be made at the same high speed attained on straight runs. On account of the suspension of the car from a single rail, the car body as a whole can yield to centrifugal force and take an oblique position according to the resultant of the two acting forces, gravity and centrifugal force. The experiments on the Barmen-Elberfeld railroad have shown that a declination of $12\frac{1}{2}$ degrees of the car from the vertical is not objectionable to the passengers in the car, and this declination corresponds to a speed of 35 miles per hour on a curve of 270 ft. radius. This would be absolutely impossible for an ordinary train running on two rails, as derailment would be the consequence. Comparing suspended railroads with surface railroads built according to the rules of the German Government, it results that the radii of curves of a suspended railroad may be only



RATIO OF SPEED TO CENTRIFUGAL FORCE ON CURVES.

common elevated railroad the structure requires nearly double this width, which circumstance allows the suspended railways to run even in the narrowest streets where ordinary elevated railways would be impossible. For the same reason, and on account of the peculiar construction of the suspended railway as shown herewith,



LONGITUDINAL AND TRANSVERSE SECTION OF SUSPENDED RAILWAY STATION.

about one-sixth of that of an ordinary railway assuming the same speed. The accompanying diagram shows the ratio between the centrifugal force and weight for speeds up to 125 miles per hour and radii of curves up to 13,000 ft., and shows clearly the advantage which the suspended mono-rail system has in this respect over the ordinary two-rail system. The lines of the road can follow exactly the lines of the streets, and the corners can be turned without



STATION FOR SUSPENDED RAILWAY.

removing adjacent houses while maintaining the regular speed of city railways, about 25 to 35 miles per hour. Also it must be further taken into consideration that the width of the elevated structure for a suspended railroad is only equal to the distance between the center line of the tracks, whereas, in the case of the

it is evident that the Langen system darkens the streets much less than the usual elevated structures.

In case of a car running on two tracks there is always some noise resulting from shocks produced by the inequality in the parallelism of the rails; as the Langen railway only employs one rail the noise is greatly reduced on account of lack of resonance of the structure, as the road bed of the common elevated railway forms a compact structure, whereas in the Langen system it consists mainly of two beams. Furthermore, the suspended car can be built much lighter than an ordinary car on account of the fact that the vertical parts of the car withstand a tensile strain instead of being compressed, and on account of the lack of lateral torsion. For this reason, the iron trusses and girders of the overhead system need not be so heavy, resulting in cheaper cost of construction as compared with the common elevated railway. The following table gives some data as to the cost of construction of different underground railways, and shows that the Hamburg elevated railway would be about 50 per cent cheaper than the cheapest underground railway of the list.

COST AND LENGTH OF DIFFERENT CITY RAILWAYS.

| Cities | Opened | Steam Underground Rys. | Length in Mile. | Cost of Construction. Million Dollars per Mile |
|---|--------|----------------------------------|--------------------|--|
| London | 1863 | Metropolitan Ry. | 10.65 | 2.41 |
| | 1871 | Metropolitan District Ry. | 7.25 | 2.99 |
| | 1886 | Common End Line | 1.75 | 7.62 |
| Electric Underground Lines in Construction and Approved | | | | |
| London | 1900 | Central London | 6.5 | 2.12 |
| | | Great Northern & Strand Ry. | 6.37 | 2.104 |
| Paris | 1900 | Metropolitan, First Sec- tion | | 1.16 |
| Hamburg | | Elevated, Suspended Ry. | 13.25 | 0.6 |

To all these advantages may be added that of a very low consumption of current. At the maximum speed of 32 miles per hour the current consumption of the Barmen-Elberfeld line was 1.1 kw hours per car mile, and the consumption per ton mile .08 kw. hours. This consumption is lower than that of any other elevated railroad, and the principal reason for it is the fact that the mono-rail system

one of these stations. This arrangement makes it necessary for each car to be accompanied by one conductor. The trains are designed to consist of three cars, the trains running at intervals of 2½ minutes. The cars shown herewith are much larger than the usual street car and have a seating capacity for 85 passengers. The arrangement of seats is similar to the cars of the New York elevated



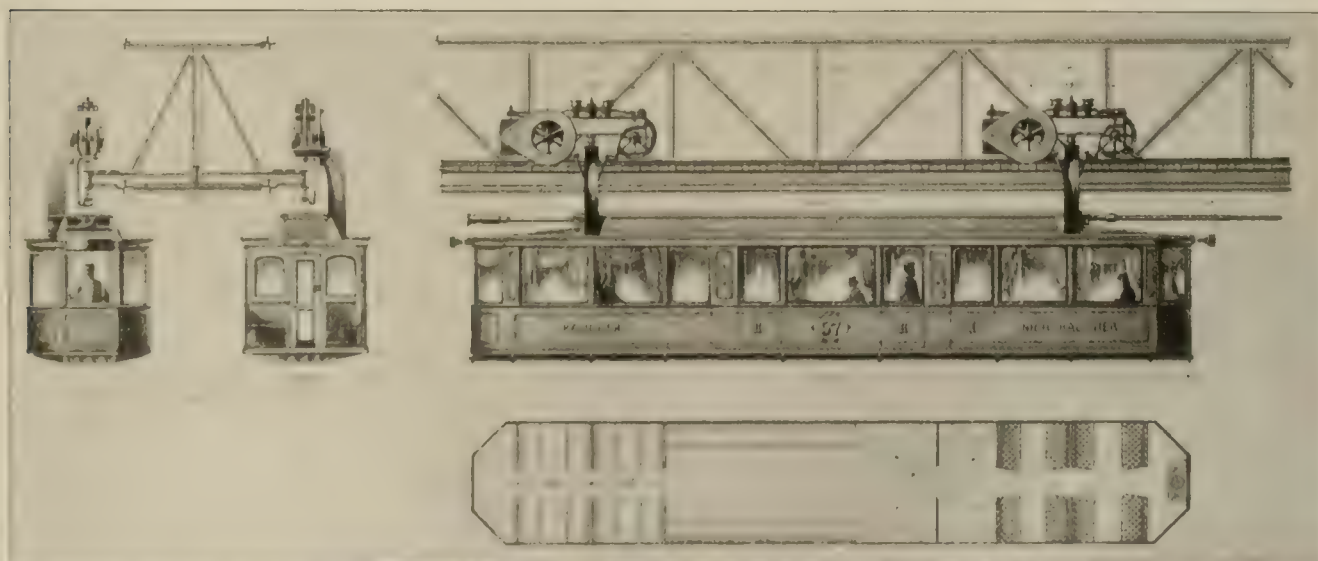
OVERHEAD CONSTRUCTION FOR SUSPENDED RAILWAY

has a considerably lower traction co-efficient than the ordinary roads. The number of wheels in the Langen system is two instead of four for each truck, and the whole weight of the car is utilized for traction. There is no doubt that in coupling the wheels mechanically by means of two rails, losses of energy are produced which are avoided in the mono-rail system.

As to the detail of construction of the Hamburg elevated rail-

ways, but differ in that the entrance to the car is made in the center and not at the ends of the car.

Special attention has been paid to the block signals, and the system proposed is that of Mr. Natalis, chief engineer of the Schuckert Co., of Nuremberg. This system has worked very satisfactorily for two years on the Barmen-Elberfeld railroad and avoids the defects of many systems in use.

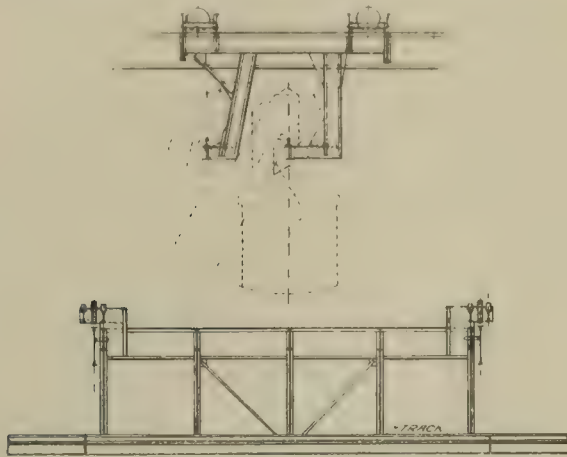


LONGITUDINAL AND TRANSVERSE ELEVATIONS OF STRUCTURE AND CAR. (Dimensions in meters.)

the following system may be suggested. In order to avoid the danger of passengers getting off and aboard the car, the stations are to be provided with three platforms, the outer ones being for the entrance and the middle platform an exit. The accompanying illustrations show the general arrangement of

The Natalis system is absolutely automatic and each train in passing a signal throws it upon "stop," and only after the train having passed the succeeding signal and thrown it to "stop" can the preceding signal go back to "clear track." Each train therefore protects itself by the stop signals. If it happens that the train does not throw the signal to the "stop" position, the preceding

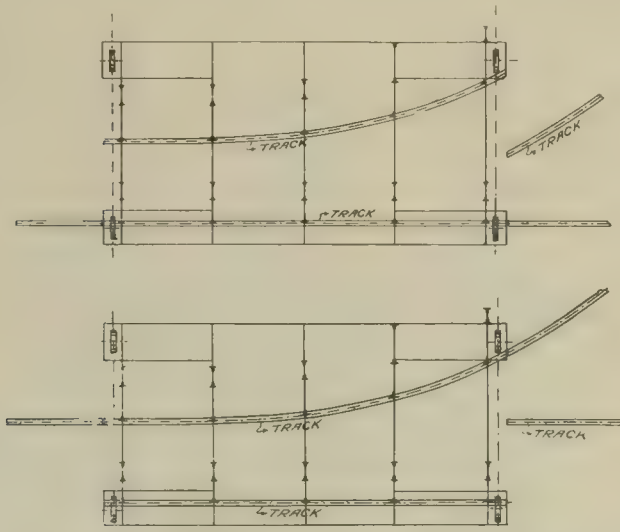
signal does not go back to "clear track," and the train is always protected. As signals are ordinarily observed by the motorman only, it sometimes happens that he overlooks a signal when the train is running. In order to avoid this, arrangements are made that only out-bound signals are used, which serve at the same time as in-bound signals for the next station. These signals are watched when the train is starting. If, therefore, one of the out-bound signals indicates "clear track," it is a sure sign that the preceding train has left the next station. The signal can not be overlooked as



END AND SIDE ELEVATIONS OF OVERHEAD SWITCH.

in starting it must be observed by two men, the motorman and the conductor of the last car. If the latter sees the signal "clear track" he closes the doors and gives the sign for starting to the motorman.

For switching a train from one track to another transfer switches are used which are shown herewith. After being put into position this switch is locked mechanically and then the signal thrown upon "clear track," after which the switch for the current can be cut in. The overhead switch can only be unlocked when the signal is brought to the "stop" position and when the current is cut off from the train. At the end of the main and branch lines, loops are provided such as are largely used in the United



PLAN OF OVERHEAD SWITCH SET FOR STRAIGHT AND BRANCH TRACK

States, but which have never been employed to any extent in Europe. The radii of the loops vary between 45 and 75 ft.

As previously mentioned the iron structure is very light, and the supporting girders are spaced 90 ft. apart, which is nearly double the space generally used on elevated railroads. The current for trains is supplied by iron rails which lay under the girders. The Shuckert multiple unit control system is provided so that the whole train can be operated from either platform of any car. Air brakes are used exclusively.

The contact rail is divided into several sections so that if a short circuit occurs it can be isolated upon the section. Telephone lines are also provided so that each station is connected with the main office, and bare double wires run along from station to station, and, in case of emergency, the conductor can connect the telephone, which is carried in the car, to the lines and thus communicate with the next station.

It has been calculated that 93,000,000 passengers can be transported during the year with this new railway system for Hamburg.

Prefer One Motorman in Cab.

Following a recent accident on the Brooklyn Elevated R. R., the second motorman idea was revived, on the theory that the death of the motorman on the rear train led to the collision. Mr. Frank M. Baker, State Railroad Commissioner, of New York, is quoted as stating that he is not in favor of the two-motormen plan, and his experience has shown him that the men are not in favor of it, either. If one man were to run the train, another standing by would annoy him and distract his attention, even if there were no talking between the two. There are signals in the motorman's box by which the conductor or guard can attract his attention at any time, while in the ordinary elevated train it is practically impossible for anything to happen to the motorman without its becoming known.

Mr. J. F. Calderwood, the superintendent of the Brooklyn Rapid Transit Co., is also quoted as saying that the second motorman idea is not feasible. One man, feeling the responsibility on him alone, would use every precaution, while two men might between them grow careless or neglect their duty.

A Reward for the Firemen.

As an incentive to do careful work the Elmira Water, Light & Railroad Co., of Elmira, N. Y., pays the firemen at its power house on a competitive basis. There are three firemen and three helpers on each shift, and each set of men receive 10 per cent increase in wages for each $\frac{1}{2}$ lb. of coal per kw. h. below $7\frac{1}{2}$ lb. per kw. h. consumed during their firing, reckoned on a monthly average basis. If they go over an average of $7\frac{1}{2}$ lb. per kw. h. a deduction of 10 per cent is made in their wages. The standard of $7\frac{1}{2}$ lb. of coal per kw. h. is taken as the average economy of production for this station. The object is of course to encourage the men to take a greater interest in their work and exercise caution in firing and in the general care of the fires. The coal is weighed as it comes to the boilers; a record is kept of the steam pressure throughout the day's run by means of a Bristol recording gage; and from these data, together with the total output of the station for the period, the performance for each shift is determined.

Trolley Rights on Private Way.

The Massachusetts railroad commissioners denied the petition of the Springfield Suburban Street Railway Co. for approval of locations in Springfield, Ludlow and Wilbraham, Mass., and issued an unique order in the case. One of the legal questions raised at the time of the hearing related to the forfeiture of all rights in the streets for violations of the conditions incident to the granting of locations. The commissioners declare this to be contrary to law. Regarding the construction of street railways over private lands, the board says that there is no general law permitting street railways to build for long distances on such locations. The commissioners also state that they favor control of local transit by a single company, and that "history has repeatedly proved that such competition, after a fitful existence, always gives way under the compelling force of business principles to the consolidation of competing companies, leaving behind evils which are lasting in their effect."

According to the decision of the referee in the tax arrears case of the City of New York vs. the Manhattan Railway Co., the company owes the city \$307,185.13 on account of the old West Side and Yonkers corporation, now the Ninth and Sixth Ave. elevated lines below 83d St.

Dispatching on Double Track Roads.

BY ORLANDO W. HART.

Since the adoption by the American (steam) Railway Association, at its fall meeting, of the report of the committee on "train rules" recommending the use of block signals in lieu of train orders, on double track roads, the report has been widely circulated through the press and more or less briefly discussed. There seems to be some misunderstanding as to the exact import of the new rules, the impression having gained ground among electric railway men that by the amended rules the steam roads have decided to rely, under certain conditions, entirely upon the block signals, instead of upon telegraphic train orders as formerly. The opinion has been expressed that if the steam roads can safely use the block signal on double track roads in lieu of train orders, the electric railways should be able to do the same.

It is with the view of correcting this error that the following article has been written. The situation has not changed materially from what it was before this action was taken, and the electric roads are still at a disadvantage, owing to their limited control system of operation.

Nearly every one who has carefully studied the subject admits that conditions can occur on double track, not properly guarded, which are fully as dangerous, if not more so, than any found on single track. While accidents do not occur as often as on single track, it is their very infrequency which makes them dangerous.

The fact must be borne in mind that the signal system used on steam roads have been brought to a much higher degree of efficiency and reliability than those on electric roads.

As a matter of fact, the new rule adopted by the steam railroad association is an advancement in the use of the train order system.

In brief, the action of the steam roads will be found in the following rule adopted, and which is in four sections:

1. On portions of the road so specified on the time-table, trains will run with the current of traffic by block signals whose indications will supersede time-table superiority.
2. The movement of trains will be supervised by the superintendent or train dispatcher, who will issue instructions to signalmen when required.
3. A train having work to do which may detain it more than — minutes, must obtain permission from the signalman at the last station at which there is a siding before entering the block in which the work is to be done. The signalman must obtain authority to give this permission from the superintendent or train dispatcher.
4. Except as affected by these rules, all block signal and train rules remain in force.

It will be readily seen by these rules that it was not intended to abandon the use of train orders, but instead of being sent to the conductor and engineer of a train, as the custom formerly was, the orders are now to be sent to the signalman, who will then, by means of his semaphore signals, direct the movements of the train which the orders are intended to govern, consequently saving the time formerly required to stop the train and sign for orders. The system possesses the additional advantage of enabling the dispatcher to correct any error immediately, if one be made.

The plan adopted was the system which has been in operation on the lines of the Chicago, Burlington & Quincy R. R., and in outline consists of the following: On portions of the double rail designated on the time-table, block signal towers are placed, which are manned both night and day by an operator who acts as signalman, and to whom all orders are sent by the dispatcher, and who governs all trains entering his block thereby.

On allowing a train to enter his block, the signalman will block all trains of the same direction, and by automatic means the signals are locked and cannot be restored to safety till the train has left the block. Should the automatic lock fail, manual service can be substituted upon an order from the proper authority. When word is received from the signalman in the next tower that the train has left the block, and entered the next, the block now being clear, may be released, and may be entered with the current or traffic, upon a clear indication being shown from the signal tower. It is true that the train proceeds without orders, but it is not so in the case of a single track, where the signal is not automatic, and the train must be signalled by the dispatcher. By the method the system of operation is greatly improved, owing to the fact that

all trains are of the same standing, and there is no chance for conflict as to trains.

Electric railways operating under high speeds must keep pace with all the actions of the steam roads, and in a great measure be governed by steam railroad experiences, and it has been the experience that just as serious results may be obtained on double tracks as on any other part of the system.

The use of train orders is as imperative on double track as on single, and no measures for safety used on single track should in any way be relaxed by the introduction of double tracks. Passing points should be maintained by schedule, so as to separate the cars at proper distances, and also a system of communication and signaling should be installed, whereby the dispatcher can, at will, stop, hold, and communicate with all cars under his control. The operation of cars on double tracks solely by the use of automatic block signals is, in the opinion of the writer, undesirable and dangerous and is far worse than no system at all, for it teaches the crews to regard the signal as a safety rather than a cautionary measure.

Steam railroads use automatic block signals only as a precaution, and the systems they use, owing to the existing conditions of their track, are far more reliable than most of those offered to electric roads. Managers of electric railways should guard their whole system, whether single or double track, in the same manner, teaching employes that the same danger exists on double tracks as on single and for the sake of safety the same safeguards should be used in operating on double tracks as on single tracks.

Chicago Union Traction Co.

November 16th the commissioner of public works denied the request of the receivers for permits for overhead trolleys over certain cable tracks and November 19th the receivers applied to the federal court for an order to compel the city authorities to show cause why the improvements which had been directed by Judge Grosscup should not be made at once. The application cited an ordinance of Feb. 4, 1885, under which the city agreed to the use of overhead trolleys by the North and West Side companies for connecting the then existing electric lines. The receivers also referred to the injunction of last July by which the city officials were restrained from interfering with the operation of the lines until the effect of the 99-year act is determined. Orders for the improvements were issued last June and the receivers stated that they had ordered 100 cars, to be delivered December 15th, and made contracts for poles, wires and other appliances. November 21st the local transportation committee finally decided to refuse to grant the permits.

Judge Grosscup set December 3d for hearing the petition of the receivers for making the changes, and January 16th for hearing the argument on whether the order for the permits shall be made permanent. At that time the whole matter of the 99-year act will come up, as the company claims the right to make the changes under this act and the city denies it.

December 3d the corporation counsel appeared before Judge Grosscup and denied the constitutionality of the 99-year act and stated that it never conferred power upon the company to operate its cars by other than animal power.

December 10th, at the continued hearing, Judge Grosscup said that the object of the court was to improve the service and that the plan under consideration contemplated the expenditure of \$4,000,000 or \$5,000,000. December 11th the judge announced that he would not consider, in passing upon the petition, any of the underlying questions involved in the 99-year act controversy. December 17th the judge ordered the Lincoln Ave. and Blue Island Ave. lines equipped with the overhead trolley system.

Mr. William K. Vanderbilt, jr., arrived in Chicago December 4th and inspected the Union Traction Co.'s system, it being stated that he is to become financially interested in the company.

Abutting Property Owners' Easements.

Justice Bischoff, in the Supreme Court at New York December 7th, decided adversely to the Metropolitan Elevated R. R., the Manhattan Railway Co.'s predecessor, in a suit brought to recover damages for the maintenance of the elevated structure in front of the complainant's property in Sixth Ave. He set forth that he had been debarred of his light and other easements. The company contended that long occupancy gave it prescriptive right.



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ANNUAL INDEX.

The annual index for the current year—Vol. XIII of the "Street Railway Review"—forms a part of this number, and attention is directed to the fact in order that the index may not be overlooked when sending the "Review" to be bound. Attention is also again called to the four numbers of the "Daily Street Railway Review," published in September last; these constitute pages 551 to 710 of the volume for 1903, and should be bound with the 12 monthly numbers to have the volume complete.

THE "STREET RAILWAY REVIEW" OF LONDON.

We take pleasure in announcing that beginning with January, 1904, we shall issue a journal devoted to electric railway and tramway interests, to be published in London, England, and to bear the same name as this publication—"Street Railway Review." This progressive step of the "Review" is the first attempt on the part of any journal of this character, either here or abroad, to publish a paper which shall be international in fact as well as in name. This undertaking was determined upon only after a most careful canvass of the European field by our president, Mr. F. S. Kenfield, who has been abroad engaged in this work for several months past.

It is recognized everywhere that America has been the pioneer in electrical railway work, and the stupendous development in this field—first street railways proper, then interurban lines, and most recently high speed roads designed to carry freight as well as passengers—has given her a lead which it is reasonable to suppose will not be lost either soon or readily. Among the things favoring this development of one of the most important applications of electricity may be mentioned the liberal laws designed to encourage private enterprise; the prosperous industrial conditions obtaining here during the latter 80's and early 90's when the electric railway was just being introduced, and again since 1896; the boldness which manufacturing concerns have ever shown in making experiments looking to the improvement of either method or product, and perhaps most important of all, the willingness of railway managements to invest capital in new projects. The history of the electric railway in America is full of lessons by which the entire world has been eager to profit, although we are willing to admit that there is neither "all the good" nor "nothing but good" in America. There are directions in which European practice was well advanced before Americans began to give the subjects serious consideration.

While foreign readers who are interested in tramways fully appreciate the "Review," there is a demand abroad for a tramway journal which shall not only be a true exponent of American ideas and make available the experience of American roads, but shall also be in close touch with European conditions. We recognize this demand as being one justified by recent advances and the present situation abroad and to meet it the London "Street Railway Review" will be established.

Our foreign "Review" will have at the outset all the prestige which a successful career of thirteen years has given to this paper. With editorial and business offices in London we shall be able to cover the whole European field in the same thorough manner that we now reach America, and there is a further advantage in this arrangement because of the large number of tramway enterprises in other parts of the world backed by British capital and maintaining London offices. The superiority of an international journal from the standpoint of foreign readers is readily apparent, but we trust that the better opportunity we shall have for presenting interesting points of European practice to American subscribers will prove quite as advantageous to them. To patrons who are desirous of further extending their export trade the European connection of the "Review" offers exceptional opportunities.

The editorial department of the London office will be for the present in charge of Mr. C. B. Fairchild, jr., who for the last three years has served so acceptably as eastern editor of the "Street Railway Review."

INTERURBAN TRAFFIC.

What receipts can be reasonably expected? This is the vital question that is asked when capital is offered an opportunity to embark in a new enterprise, and upon the answer and the proof submitted to substantiate that answer depends the decision of the capitalist. When an interurban electric railway into new territory

is the project under discussion a preliminary survey will enable a competent engineer to estimate accurately the initial cost of the road and its equipment. The cost of operating is also readily approximated by an experienced man familiar with the conditions. But on the matter of probable receipts there is usually a very large element of guess—the information at hand often does not justify the word "estimate."

Were the data on population served and fares collected, which are in the possession of companies already operating, available they would furnish a basis for determining with a considerable degree of accuracy the prospects of projected roads. Information of this character is made public by few companies, however, and the engineers reporting on proposed railways have generally to rely on results within their own professional experience, or perhaps on the courtesy of personal friends.

In connection with the description of the Muncie, Hartford & Ft. Wayne Railway, which appears in this issue, we are fortunate in being able to present data on the population of the territory served and an analysis of the receipts from the day the first section of the road was opened until the close of November, making this one of the most valuable articles on interurban work that has ever been presented to the railway public. We feel that the management of the railway company is to be heartily congratulated on the liberal spirit which actuated it in thus making public its traffic returns for the general information and advancement of the industry.

To recapitulate some of the facts regarding population and traffic as affecting this road: The population of the towns through which the line passes (including the southern terminus, Muncie, 32,000) is 48,600 for the 28.2 miles between Muncie and Montpelier, this being the portion of the line to which the figures in the tables for the months from May to September, inclusive, apply. The rural population of the townships through which the line runs is 14,100 additional, probably one-third of this population being within one mile of the railway. This makes the available population in towns and within one mile of the road 53,300 persons. Including the whole of May, though the line from Hartford to Montpelier was not opened until May 7th, the number of passengers paying fare from May 1 to September 30, 1903, was 390,844, or 2,555 per day. That is, 5 per cent of the available population made a trip one way each day, or the number of rides per capita per year is about 18. The average fare per passenger for this term was 16.5 cents, making the receipts per capita per annum \$2.08. This figure is somewhat too high, being based on traffic for five warm months, and probably \$2.50 per capita per annum will more closely represent the income per capita per annum. Passenger receipts per car-mile for 9½ months range from 30.2 to 37.1 cents, the mean of the ten averages being 33.2 cents.

The classification of passengers according to the length of their ride, or amount of fare paid, a result readily secured with the type of fare register used, is also an interesting one which will be found of value in making estimates for projected roads of the same general character. Roughly, about one-quarter of the business is from short riders, one 5-cent fare each, and nearly all the rest is town to town; that is, the number of passengers traveling from one town to another town is from two to three times the number of passengers entering or leaving the cars at rural stations.

Apropos of the rates of fare on electric railways which come into competition with steam lines the Muncie, Hartford & Ft. Wayne has demonstrated that there is no necessity to cut below the standard 2-cent per mile rate in order to secure local passenger business. The more frequent service is quite as effective for inducing traffic as is a low fare, and the feeling seems to be general that some of the earlier electric roads made serious mistakes in establishing rates of fare much less than 2 cents per mile.

MATERIAL AND SUPPLIES ACCOUNTING.

In this issue we publish an article on this subject by Mr. W. S. Dimmock, general manager of the Tacoma Railway & Power Co and the Puget Sound Electric Railway Co., in which the author presents a set of carefully designed blanks for stores accounting and describes the manner in which they are intended to be used, giving such explanations as do not appear from the forms themselves.

The theory on which these blanks have been designed is that

when valuable material is handled the records that are kept should be such as will enable those in responsible charge to promptly detect waste, carelessness or dishonesty, so that losses from these causes can be prevented. Further, that what is worth doing is worth doing thoroughly, and adequate records can be most easily kept by means of carefully prepared forms. Mr. Dimmock's method of stores accounting is based on the report on this branch of accounting that was presented at the Detroit convention of the Street Railway Accountants' Association, and approved by that body, and it is presented as a manager's idea of an accounting system that will best assist the management in administering this department, and with the hope that others interested in the subject will discuss and criticize the scheme.

We believe that no exception can be taken to what Mr. Dimmock has assumed as his "axiomatic principles." Differences of opinion will most probably arise on the question of whether it is expedient for a given company to adopt so complete an accounting system, and on the details of the individual forms; on these points discussion is invited.

A. C. VERSUS D. C. TRACTION SYSTEMS.

An interesting paper on the above subject was recently read by Mr. P. M. Lincoln before the electrical section of the Canadian Engineers' Society, Montreal, in which the author reviews the European practice in the direction of alternating current railway motors and equipment and afterwards takes up the consideration of the single phase alternating current motor for railway work which has been developed by the Westinghouse company. Our readers are familiar with the general design of this system which was given in a paper read by Mr. B. G. Lamme before the American Institute of Electrical Engineers and published in the "Review" for Oct. 20, 1902. Further details of this system, including a description of the general design and characteristics of the motor and the method of control by means of an induction regulator were also published in the "Review" for Aug. 20, 1903.

In addition to the details which we have already published in regard to this alternating current railway system, the paper by Mr. Lincoln contains an interesting estimate of the cost of equipping an interurban road 60 miles in length, first with the third-rail direct current system and secondly, by the alternating current system under consideration. The schedule speed on the proposed road is taken at 30 miles per hour, the cars running half an hour apart. The number of stops is assumed at 30, giving runs two miles long. The weight of the direct current car complete is 35 tons and the weight of the alternating current car is 41.3 tons.

In these estimates the cost of the electrical equipment of the power stations is practically the same for both systems and the cost of the high tension lines is slightly higher for the alternating current systems. In coming to the sub-stations, however, the relative economy of the alternating current system first makes itself apparent. In the first place, one less sub-station is possible with the alternating current system than with the direct current system, as the high tension current of the power station is fed directly into the overhead trolley system. The item of rotary converters for the direct current station is entirely absent, of course, in the alternating current station; the switchboards at the latter station are considerably cheaper than those of the former sub-stations, although the difference in the cost of the switchboards is made up by the installation of auxiliary signaling lines for operating the sub-station switches from a distant point. Taking the total sub-station equipments, however, the alternating current system shows a saving of over \$30,000 under the conditions just named.

It is, however, in the low tension distribution system where the most marked saving in first cost of the alternating current system appears. The cost of installing 63 miles of 60-lb. conductor rail and of bonding the same length of the main track for the direct current system is estimated at \$182,700. Against this is given for the alternating current system the same length of No. 0000 trolley wire installed, the bonding of the main track and 15 miles of pole construction not included in the high potential line, all of which is estimated at \$91,300, so that in this portion of the installation a saving of over \$90,000 is estimated. To offset these gains the cost of car equipments is considerably higher for the alternating current system, being about \$40,000 greater for the 12 equipments assumed. The total first cost of the complete electrical equipment, however,

shows a difference of about \$48,500 in favor of the alternating current system.

It is now generally conceded that in the development of the electric railway which is to come, namely, the building of long distance roads comparable in extent to the steam roads of the country, some form of alternating current motor is essential in order both to overcome the present limitations of voltage of the direct current system and also to avoid the use of rotary transformer sub-stations. While the rotary transformer has been perhaps the most important factor in developing long distance electric railroading up to the present time, it now seems apparent that its limit of usefulness has been reached, and if greater distances are to be achieved in future electric railway construction both the high first cost of the rotary transformer sub-station as well as the high cost of attendance which it entails must be avoided. While it is, as yet, too early to predict the success of any particular scheme of alternating current railroading, the number of workers in this field at present leaves but little doubt that a successful system of this character will be forthcoming within a short time.

Mechanical and Electrical Association.

A meeting of the executive committee of the American Railway Mechanical and Electrical Association was held at Cleveland December 7th, and the principal features of the program for the next annual convention determined upon. The members of the committee present were: President Olds, Alfred Green, W. O. Mundy, T. J. Mullen, H. H. Adams and Walter Mower. Other active members of the association in attendance were Thomas Farmer and W. W. Annable.

The subjects assigned for papers at the next convention were: "Wheels," "Maintenance and Inspection of Electrical Equipment," "Power Houses," "Plans for an Ideal or Universal Street Car Body," "Plans for an Ideal Shop."

Mr. Adams was appointed a committee, with power to select his associates, to report upon the standardization of shop account forms.

It was determined to have the program include a "Question Box," which will be handled by the secretary.

The gentlemen in attendance at the meeting were in the evening entertained at dinner by Mr. Harry Ransom, of the National Electric Co.

Crawfordsville, Ind., Controversy.

Judge Baker, of the United States Circuit Court, sitting at Indianapolis on November 20th, sustained the demurrers of the Consolidated Traction Co. and of the city of Crawfordsville to the complaint of the Indianapolis & Northwestern Traction Co. The effect of this ruling is to leave the Indianapolis & Northwestern company, which has built 20 miles of road from Lebanon to Crawfordsville, without any franchise rights in the city of Crawfordsville. It is understood that the order to tear up the tracks of the Indianapolis & Northwestern company at Crawfordsville, reference to which was made in the "Review" for October, as being suspended until the hearing on the principal case, will now go into effect. Judge Baker's decision also removed the prohibition against the Consolidated Traction Co. building in Crawfordsville, and it is announced that the company will proceed at once to complete the city system.

Chicago City Ry. Franchise.

November 30th the Chicago city council extended the Chicago City Railway Co.'s franchise 90 days, or until February 29th. The rights of the company on certain trunk lines, which expired July 30th last, had been extended until November 30th. December 2d a series of public hearings began on the tentative franchise ordinance which is in the hands of the local transportation committee, and which, it is expected, will be disposed of before the company's temporary franchise expires in February.

There was such a heavy fall of snow in the vicinity of Dunkirk, N. Y., December 5th, that the cars of the Dunkirk & Fredonia Railroad Co. were blocked all night half way between the termini.

Chicago Elevated Traffic.

The traffic of the South Side Elevated Railroad Co. in November was the largest in the history of the present company, due to the strike of the Chicago City Railway Co. From November 12 to 25 it exceeded by 10 per cent the traffic of any similar period during the World's Fair. The average number of passengers per day during this period was 206,000 and the average for the entire month was 143,398. This compares with an average of 83,299 in November, 1902, an increase of 72.15 per cent. The largest day's traffic was 229,535 on November 14th.

The daily average of the Metropolitan West Side Elevated Railroad Co. was 114,148, as against 110,289 for November, 1902, an increase of 3,859, or 3.5 per cent.

The daily average of the Northwestern Elevated Railroad Co. was 72,422, compared with 67,236 in November of last year, a gain of 4,186, or 6.23 per cent.

November traffic figures for the Lake Street Elevated Railway Co. show a daily average of 43,319, a gain of 863 per day, or 2.03 per cent.

Pascagoula Street Railway & Power Co.

In order to provide yard room for its increasing freight business, the Pascagoula Street Railway & Power Co., of Scranton, Miss., is electrifying part of the old Moss Point & Pascagoula R. R., which extends from Scranton to Moss Point.

The company has notified the Scranton authorities that it will be ready to assume charge of the water works and electric light plant December 29th, and the city has appointed a committee to inspect the street car system and report whether the conditions of transfer of the public utilities have been complied with.

December 3d the company transmitted current for lighting the streets of Moss Point for the first time.

Kansas City Notes.

The new steel double-deck bridge over the Kaw River at Central Ave., which is being built by the American Bridge Co., to replace the bridge swept away by the flood of June 1, 1903, will be completed about February 1st. All the bridges which were destroyed by the flood are being rebuilt. That across the Blue River is practically finished. It was formerly single-tracked, but is now double-tracked.

The Metropolitan Street Railway Co. has changed the name of the Northeast division to the Forest Park division, on account of the line having been extended to a new park of that name.

The Kansas City & Olathe Electric Railway Co. is pushing construction on its interurban and hopes to begin operating by May 1st next. The intention is to enter the city over the Metropolitan tracks, if possible, by way of the Southwest Boulevard through Rosedale. This will be the first interurban out of Kansas City.

The Kansas City-Leavenworth line is also trying to get permission to enter the city over the Metropolitan tracks.

Trailer cars are now run on the 15th St. line. This line was recently changed from cable to electric, and the old summer cable cars have been labeled "smoking cars." They are very popular.

The several lines of the Metropolitan now loop in the downtown district by having all the principal lines of the city use two of the three principal streets in the retail section.

Electrically-operated switches are rapidly taking the place of switchmen in Kansas City and are giving satisfaction under trying conditions.

Fires Caused by Fallen Feed Wire.

One of the Chicago & Joliet Electric Railway Co.'s feed wires connected with the Lemont and Summit stations broke December 15th and, falling across the Santa Fe and other railroads and Western Union telegraph wires, caused a series of fires on the Romeo, Joliet & Spencer line. The crossed current set fire to the depot at Romeo, the telegraph station at Joliet, and also to the depot at Spencer. A number of Western Union connections between Chicago and Kansas City and St. Louis were burned out.

The Massachusetts Electric Companies.

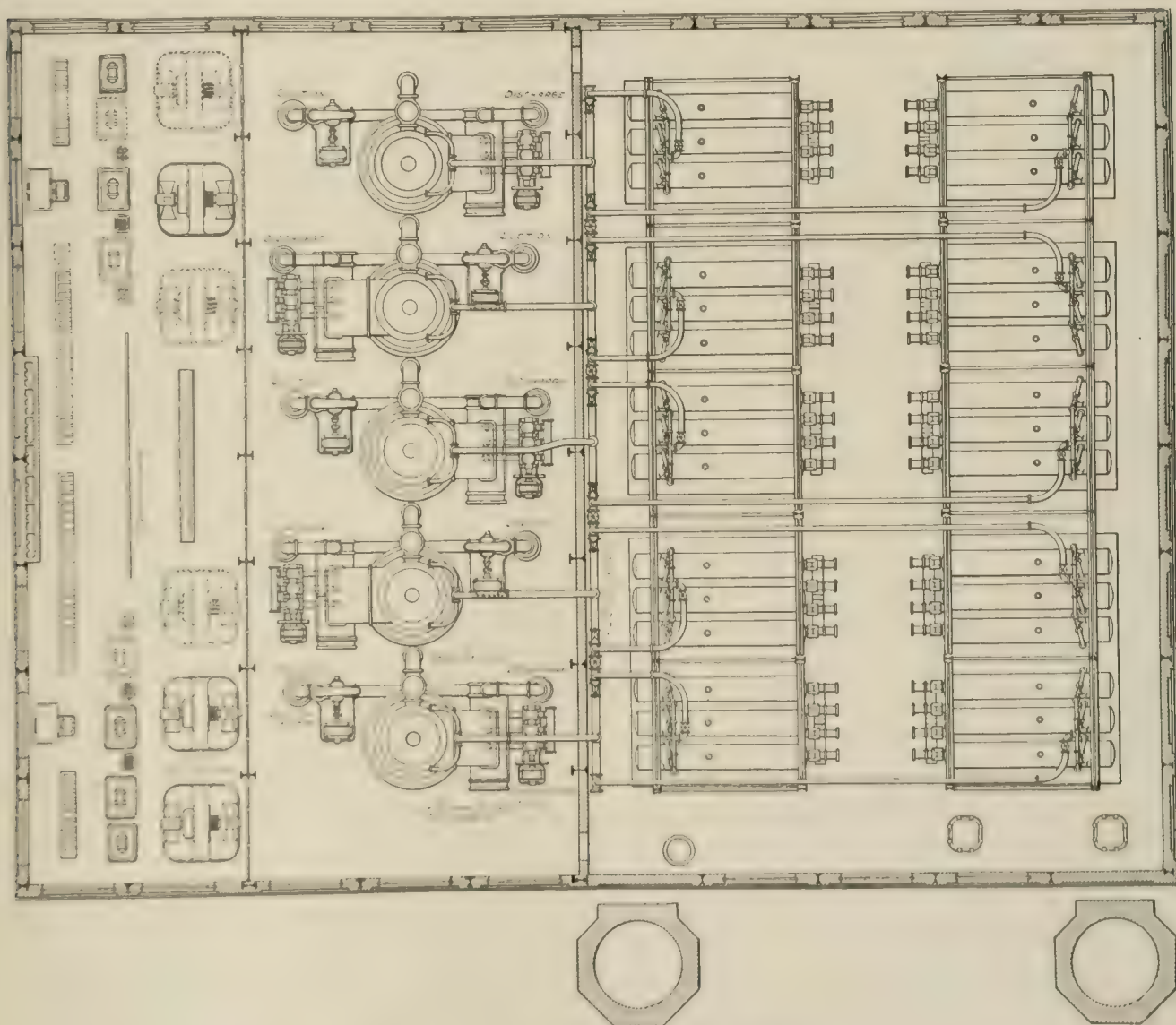
New Power Generating and Distributing System Description of the New Quincy Point Steam Turbine Power House.

Announcement was made in the "Street Railway Review" for Feb. 20, 1903, that the Massachusetts Electric Companies, operating approximately 850 miles of electric railway track north and south of the city of Boston, were about to install a complete new high tension alternating system for supplying current to all the lines included in the Massachusetts Electric Companies' properties, power

for many of the minor details connected with steam turbine work.

The Newport station has been in operation for several months, and it can be stated authoritatively that despite minor difficulties which might well be expected at any new station, the Newport plant has been operating in an economical and satisfactory manner.

Through the courtesy of various officials of the Massachusetts



PLAN OF QUINCY POINT POWER STATION

see the system to be generated in three new steam turbine alternating current central stations which were to supersede some 13 engine-driven direct current stations scattered over the territory served. We were able to draw out and make a brief outline of the general scheme, but the details of the plan had not been fully perfected. At the time of writing the announcement we also gave a complete description with plans of the small combined electric lighting and railway station at Newport, R. I., which contained three 1,000-h. p. steam turbine generators, and which was built somewhat in accordance with the best design

Electric Companies, we are enabled to make here the first detailed presentation of the general scheme for substituting a high tension alternating system for the direct current system heretofore used, and we are also enabled to give complete plans of the Quincy Point power house which is the first of the three alternating current central stations to be built.

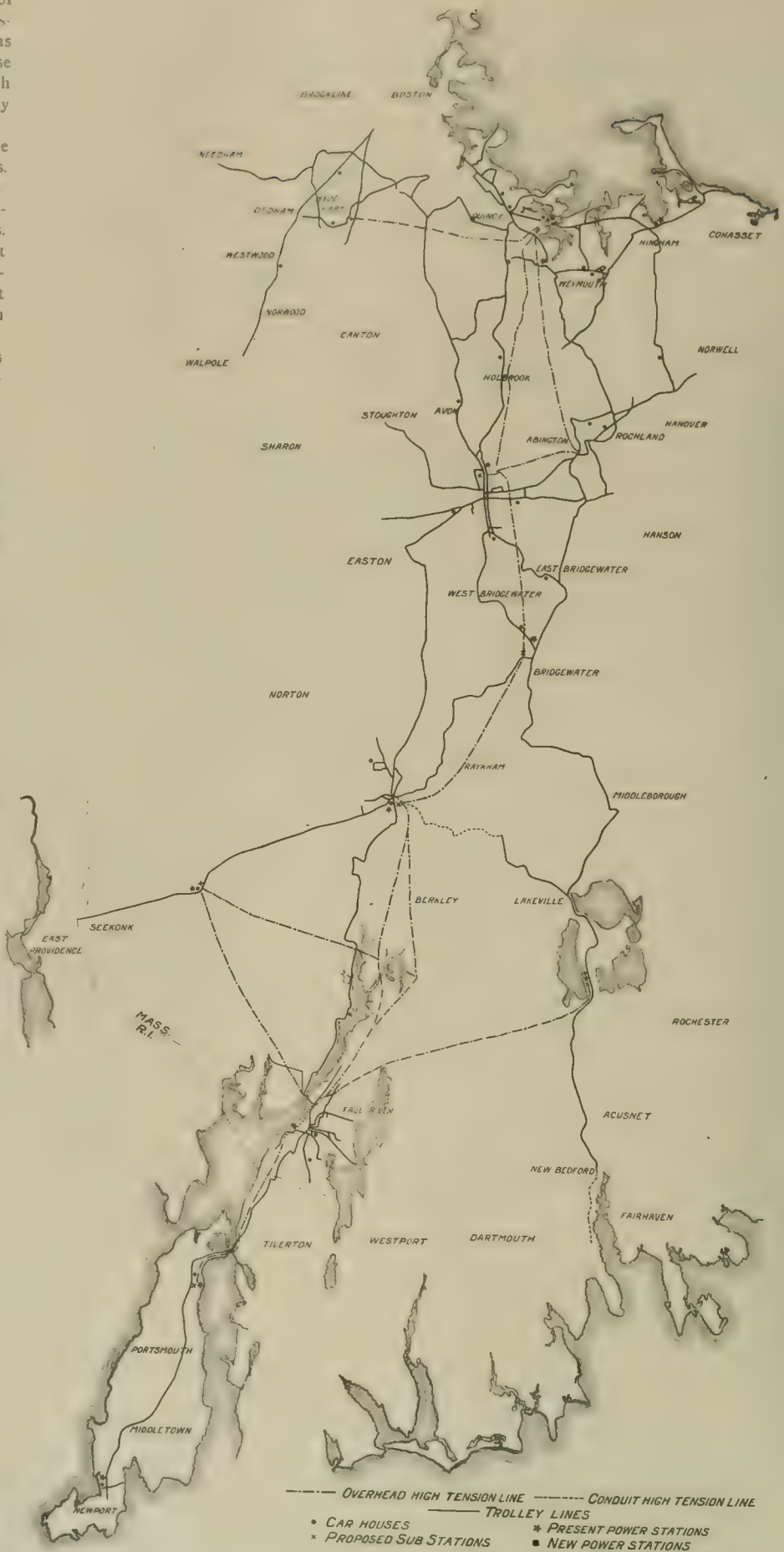
Briefly the Massachusetts Electric Companies control 850 miles of electric railway track, covering a strip of territory comprising the extreme eastern portion of Massachusetts for a distance of about 60 miles from the Atlantic coast and extending north from the city

of Boston to and into the state of New Hampshire, and south from the city of Boston to and into the state of Rhode Island. The lines north of Boston, known as the Boston & Northern division, comprise about 455 miles of track. The lines south of Boston, designated as the Old Colony system, comprise about 400 miles of track.

The lines north of Boston now receive power from 10 separate power stations. Five of these power houses will be displaced by one steam turbine station, aggregating 9,000 h. p. located at Danvers, Mass. Plans for this development have not yet been fully perfected and work for the present will be confined to the rearrangement of the power facilities on the lines south of Boston.

The southern or Old Colony division is now operated from 11 direct current stations, distributed irregularly over the territory served. These will all be superseded by two steam turbine central stations, one aggregating 12,000 h. p. in steam turbine capacity located at Fall River, and one of 15,000 h. p. capacity at Quincy Point, near Quincy, Mass., and eight miles from Boston. The Fall River plant has been laid out for three 3,000 h. p. turbo-generating units, and the Quincy Point power house for four 3,000 h. p. units with room in each station for an additional unit. The turbines are of the Curtis vertical type, as made by the General Electric Co. The generator is mounted directly on the upper end of the turbine shaft, and the turbines are run at 750 r. p. m. (For complete description of the Curtis turbo-generator see the "Street Railway Review" for April 20, 1903.) Both of these central stations will generate alternating current at 13,200 volts, 3-phase, 25 cycles, and the current will pass at this voltage to the 3-phase transmission line without step-up transformers. This voltage was selected as possessing the most desirable characteristics for railway service. In the present stage of the art, it is a comparatively simple matter to build generators that will develop 13,000 volts within the armature coils. Moreover, this pressure does not interpose serious difficulties in the construction and maintenance of the high tension line, and losses are avoided incident to stepping up the voltage for transmission purposes.

Alternating current from the two central stations will be received in nine sub-stations, distributed over the territory so that each sub-station will serve an area of about 5 miles in each direction from the sub-station location. The size and number of rotary converter units at each sub-station will be proportioned to the load to be carried at each. The 13,200-volt, 25-cycle, 3-phase current will be received from the transmission line at each sub-station and transformed to 350-370-volt alternating current for conversion and distribution to the trolley converters. The rotary converters and transformers will be furnished by the General Electric Co. and a novelty will be introduced inasmuch as each rotary will be served by one 3-phase transformer instead of three single-phase transformers as are commonly used in electric railway work. In other words, the three

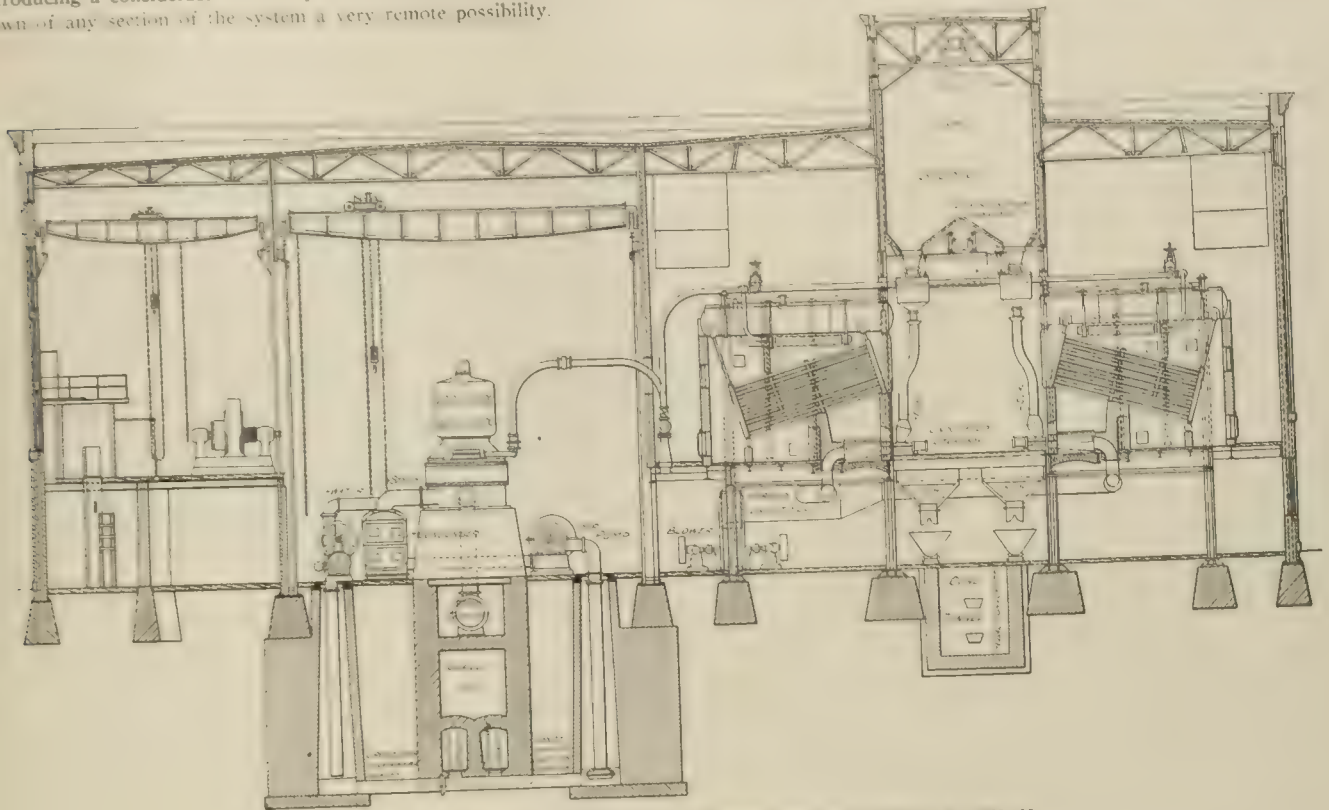


MAP OF THE MASSACHUSETTS ELECTRIC COMPANIES' SYSTEM

transformers will be combined into a single piece of apparatus. The two central generating power houses will be tied together so that each station can supply various combinations of sub-stations, thus introducing a considerable flexibility and rendering a complete shut-down of any section of the system a very remote possibility.

Bridgewater. Designed for four 300-kw. rotary units of which three will be installed at once.

Launton. Designed for four 750-kw. units of which three will be installed at once. At this sub-station there will also be a 300-



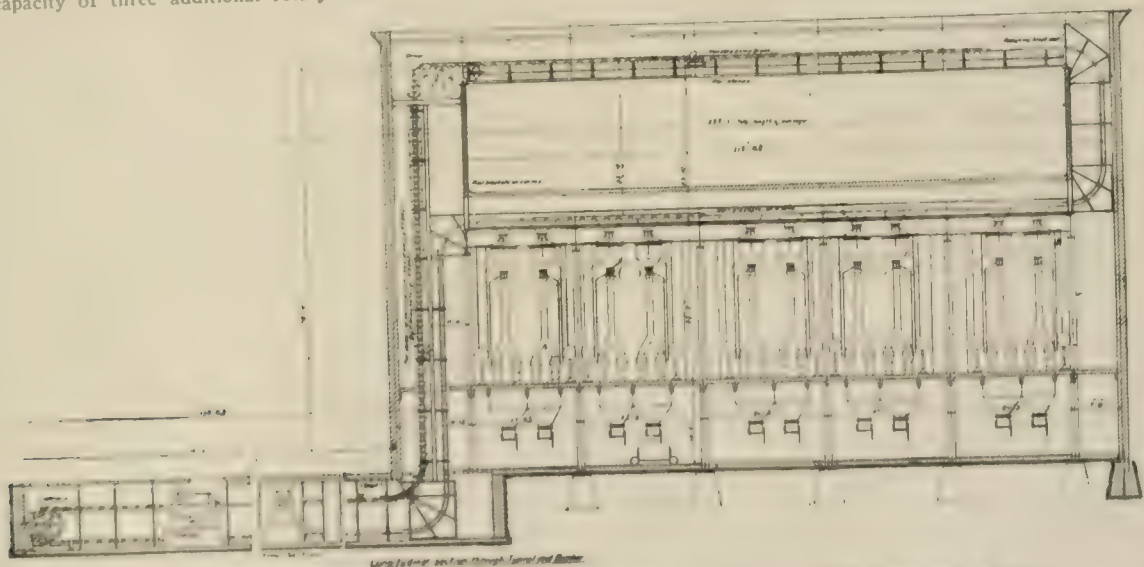
LONGITUDINAL SECTION THROUGH QUINCY POINT POWER STATION

The nine sub-stations with their location and capacity are as follows:

Quincy Point. This sub-station is located in one division of the main power house and will contain three 750-kw. rotary converters with their attending transformers. The station is laid out for an ultimate capacity of three additional rotary units.

kw. booster driven by an induction motor to supply the Rehoboth extension, which is a long line running into the country and somewhat away from the general territory served.

Fall River. The sub-station at Fall River will be located in a section of the central generating station at this point and will probably be laid out for six 750-kw. rotary units.



COAL HANDLING APPARATUS AT QUINCY POINT STATION. (JOHN A. MEAD & CO.)

Rehoboth. Designed for four 750-kw. rotary units of which three will be installed at once.

Milford. Designed for four 200-kw. rotary units, of which three will be installed at once.

Atsugi. Designed for four 200-kw. rotary units, of which three will be installed at once.

Lakeville. Designed for four 200-kw. rotary units of which three will be installed at once.

Portsmouth, R. I. Designed for four 300-kw. units of which three will be installed at once.

Except in the size and number of units, the sub-stations will be very similar in design, the idea being in each case to simplify the

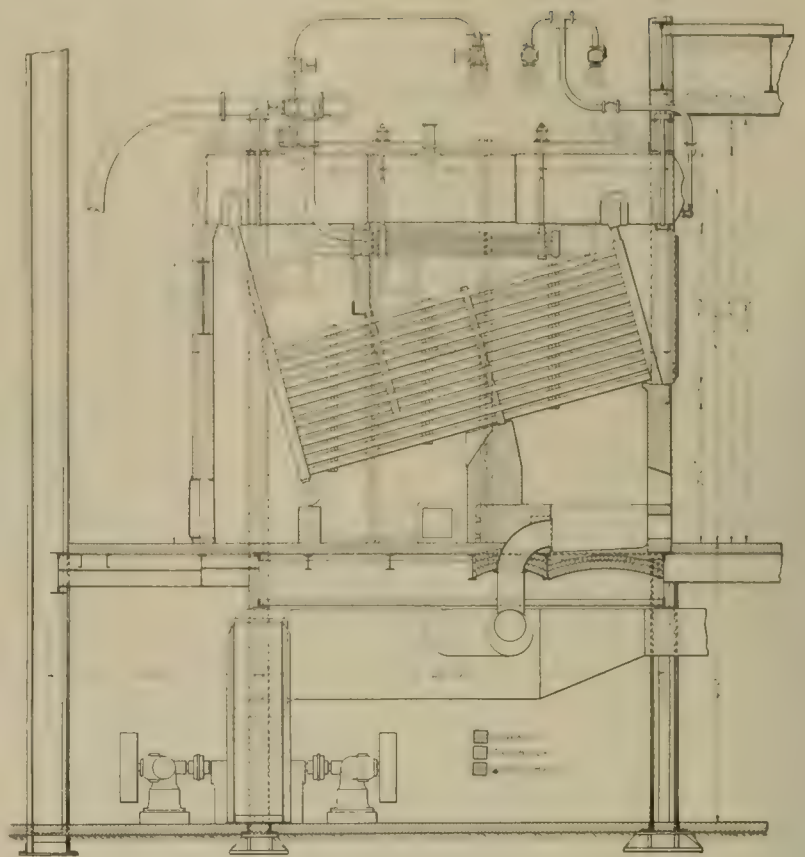
wiring as much as possible. In the sub-station design particular effort has been made to reduce the high-tension wiring within the station, and to make the runs of high tension cables as short as possible, and at the same time keep the cables out of sub-cellars as much as possible. At three of the sub-stations, the high-tension wires enter the building from underground conduits. The cables for each unit rise to the main floor through conduits and pass direct from the cable bells to the old switches, making a short run. By another short run, they pass to the transformers and then direct to the rotaries. There is therefore no crossing or recrossing of high tension wires. From the rotaries the cables pass direct to the d. c. switchboard and out. Each unit is controlled from independent panels, placed conveniently near the transformers. It will thus be seen that on the switchboard where the instruments and cables are bunched together everything is low tension.

The accompanying sub-station plans show the arrangement at the Brockton sub-station which is the first one that will go into operation, and which is typical of the others.

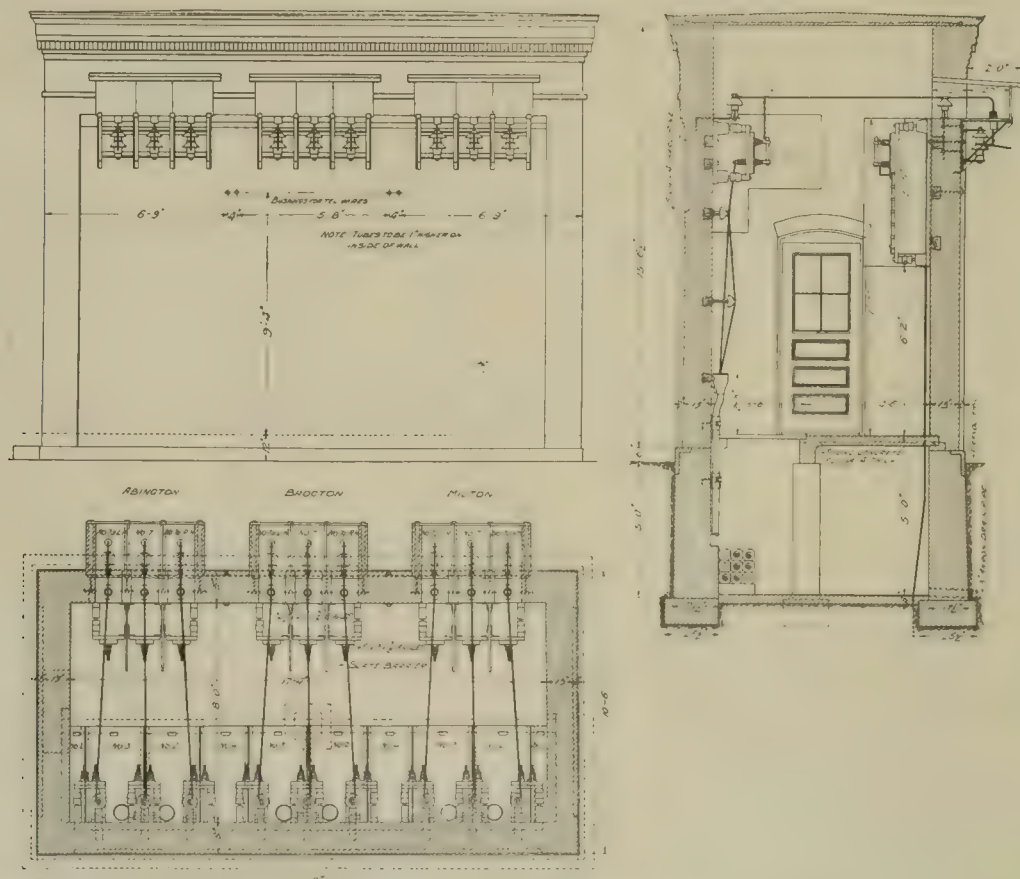
Transmission Line.

The distribution system for the Old Colony division calls for about 100 miles of high tension transmission lines for carrying the 13,200-volt current from the two central power houses to the various sub-stations. The transmission line as designed by the engineers of the company has a number of features that are somewhat unique. Its most prominent characteristics are strength and stability.

The transmission wires for carrying the high tension current are strengthened aluminum cables, equivalent to 262,000 c. m. capacity. On straight runs the wires are carried on 35-ft chestnut poles, measuring not less

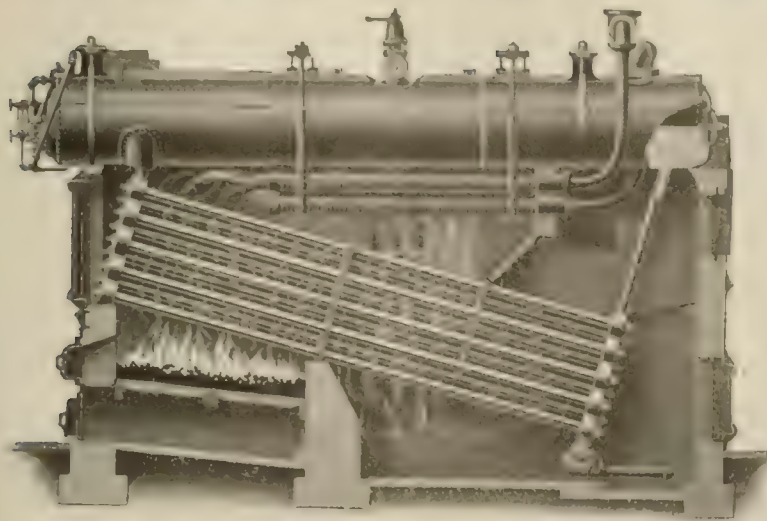


ELEVATION OF BOILER SHOWING SUPERHEATER.



PLAN, ELEVATION AND SECTION OF QUINCY TERMINAL HOUSE

than 13 in. at the butt and 8 in. at the tip. The poles are cut with gins for the crossarms. In a perfectly straight cross arm will be placed in position during the whole run, as



APPLICATION OF FOSTER SUPERHEATERS TO WATER-TUBE BOILERS

only one set of transmission lines will be installed at first. When it becomes necessary to put in a double transmission system the second row of crossarms will be added. For the present the three wires of the transmission line will be carried flat, occupying three pins of the top crossarm as shown in the drawings. An extra wire for emergency

avoidance of transpositions was one of the factors which influenced the adoption of an initial voltage of 13,000.

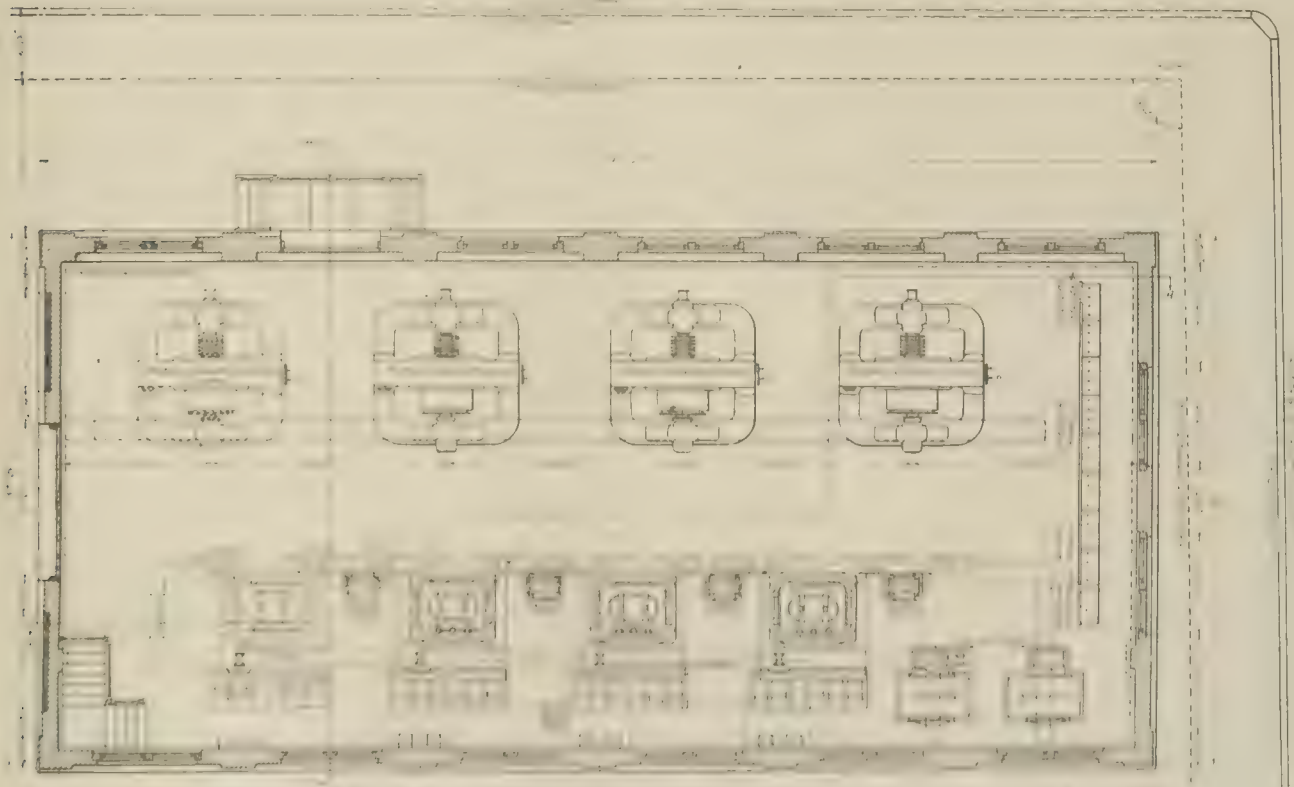
The crossarms are 4 x 6 in. hard pine and are attached to the poles in a novel way. Instead of using two lag screws or one bolt as is commonly done, the arms are held in place by two $\frac{5}{8}$ -in. bolts which pass clear through the arm and the pole, the opposite side of the pole being counterbored to receive the bolt heads. The arms are braced by 2 x 2 x $\frac{1}{4}$ -in. angle iron braces, fastened to the pole by two $\frac{1}{2}$ x 4 in. lag screws and to the under side of the arms by double $\frac{1}{2}$ -in. bolts. The details of this construction are shown in the drawings. All iron used in pole line work is galvanized and all bolts are square head, extra heavy.

For angle construction, the poles are not less than 38 ft. long and heavier at butt and tip than the straight run poles. The angle poles have double crossarms thoroughly braced and tied together as shown in the drawing.

On straight run work the wires are carried on Locke No. 100 double petticoat porcelain insulators with galvanized iron pin which is cemented to the insulator. On angle poles a special insulator is used, designed to be carried between the two crossarms and to give extra strength.

The pole locations for turning angles were all determined by a standard system, the idea being, when turning angles, to have practically the same angle of strain at each individual situation. The scheme for the location of poles for all angles is reproduced herewith.

The Old Colony system serves a large number of villages, towns and independent municipalities and it therefore became necessary in a number of instances to carry the high tension lines under



PLAN OF PROPOSED SUBSTATION

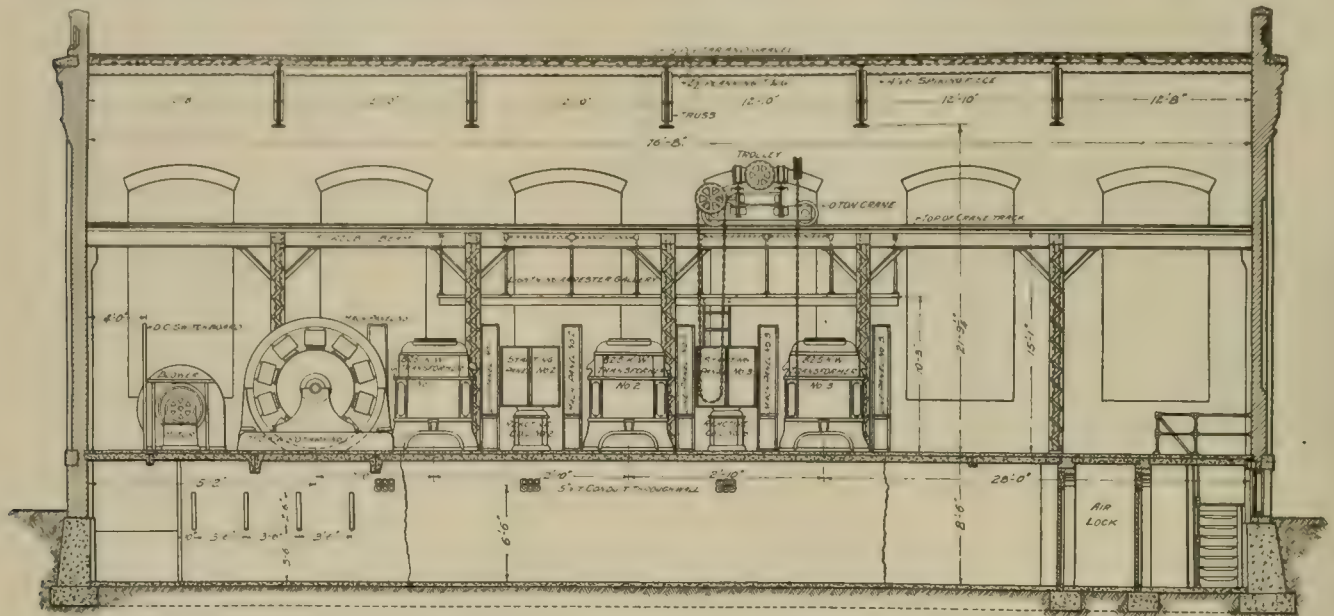
ground, where passing through populated centers. As it became necessary to do this in several places, it was thought best to adopt a standard design for a terminal house in which to locate disconnecting switches, lightning arresters, etc., at each point where the high tension wires enter or leave the ground. The general arrangement of these houses will be understood from the drawings.

ground, where passing through populated centers. As it became necessary to do this in several places, it was thought best to adopt a standard design for a terminal house in which to locate disconnecting switches, lightning arresters, etc., at each point where the high tension wires enter or leave the ground. The general arrangement of these houses will be understood from the drawings.

All underground cables were furnished by the Standard Underground Cable Co. and are carried in H. B. Camp single $3\frac{1}{2}$ in. vitrified clay conduits. At each terminal house the cables leave the conduits and are brought up along the inside wall of the house in conduits to cable bells at which point each cable circuit is divided into a duplicate system so that if one cable is out of order the other

building a concrete retaining wall at approximately the line of mean low water level and utilizing the ash from the power house for filling material.

The new turbine station is a combined steel and brick building 160 ft. long x 121 ft. wide. The general arrangement of the various bays will be at once evident from the drawings accompanying this

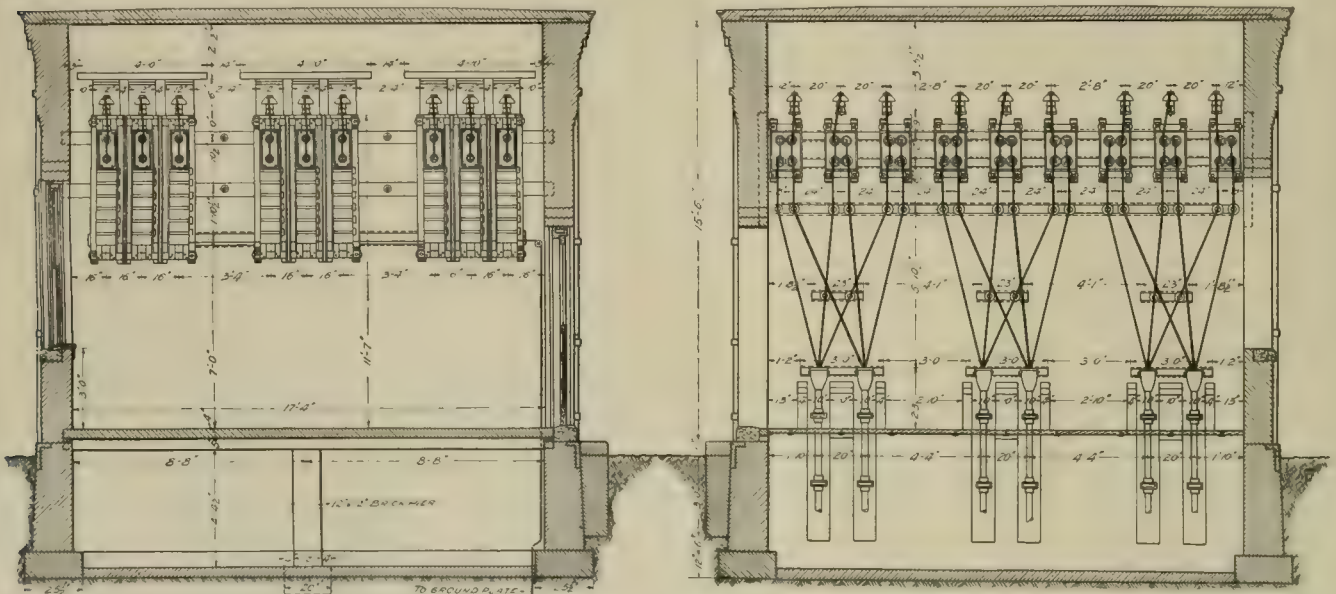


SECTION ON A. A. BROCKTON SUB-STATION.

one will carry the current and prevent a complete shut-down. After passing through switches, the duplicate cables again unite into one circuit and the lines pass from a special anchorage insulator on the outside of the wall direct to the high tension pole line. The high tension pole is located entirely on a private right of way 50 ft. wide upon which the company has purchased the right to trim and clear as much as may be necessary to thoroughly protect the line.

article. All of the foundations of the building, including the foundations for the turbine units, are of concrete mixed in the proportion of one part portland cement, two parts sand and 5 parts broken stone. This concrete was put in during the summer with fresh water mixture. The station is laid out for five 3,000-h. p. turbo-generator units, only four of which, however, will be installed immediately.

As pointed out in the description of the Newport turbine station



SECTIONS THROUGH BROCKTON TERMINAL HOUSE.

A complete private telephone line connects all the terminal stations, sub-stations, power houses and offices of the company.

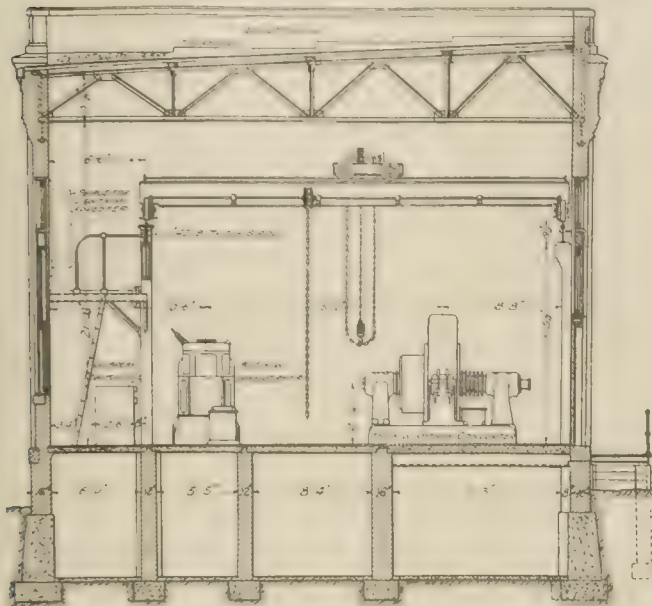
Quincy Point Power House.

The Quincy Point turbine station is located on tide water in the city of Quincy on property which has been partly reclaimed by filling and to which it is proposed to make extensive additions by

previously referred to, an interesting feature in connection with the design of a turbine station of this kind is the arrangement for condensing the exhaust steam from the turbines inasmuch as the efficiency of the turbine is very materially influenced by the degree of condensation secured.

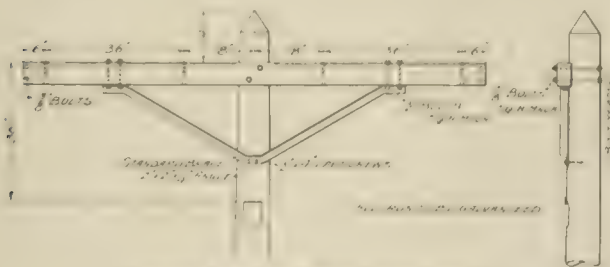
In this instance, the turbine units are arranged along a center line, immediately over a double concrete sewer, one of the sewers

being the suction or intake, and the other the discharge. The intake sewer takes salt water from the river at the front of the building and the discharge sewer empties into the river on the opposite side of the building. The sewers are formed entirely of concrete with arched roofs, the lower line of the sewers being about



SECTION ON B. B. BROCKTON SUB-STATION.

24 ft. below the floor level of the turbine room. The sewers proper are 6 ft. high by about 3 ft. wide, and the condensers receive and discharge water from and into the sewers through wells located at each turbine unit. It will be understood that each turbine has its own motor-driven circulating pump for raising the condensing water from the suction sewer and its own condenser located as close to the turbine exhaust as possible. The condensers are of the Wheeler surface type. From the plans it will be seen that the water is drawn from the suction sewer near by, the circulating pump crosses over to the condenser and after passing through the condenser is immediately returned to the discharge sewer, both the intake and discharge pipes going down to the bottom of the respective sewers and thus establishing a practically perfect siphon. The hot water of condensation passes from the condensers to three storage tanks, each 20 ft. long by 6 ft. in diameter which are located in the boiler room and which per-



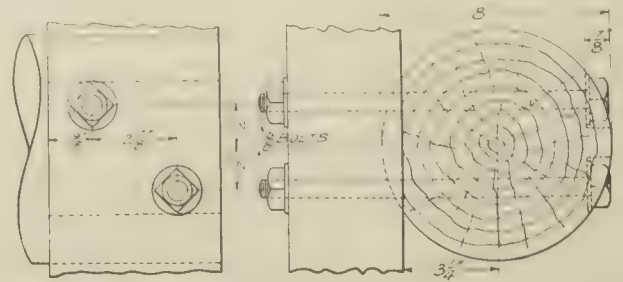
CROSS ARM FOR STRAIGHT RUN

form the office of a combined hot well and storage. These tanks are also connected to the city water mains and if the supply of hot water in the tanks falls below a predetermined quantity, the city mains are automatically connected, and water is taken from the city supply.

All of the air pumps and circulating pumps in the turbine room are driven by constant speed alternating current motors, these being supplied with current from a cable main which is carried around the entire station, taps being taken off to each motor. This cable main is supplied with 3-phase, 25-cycle current at 370 volts by the railway transformers in the Quincy Point sub-station, immediately adjacent to the power house.

It will be noted from the plans of the power house and from the fact that the turbine units are arranged alternately right and left handed,

this layout bringing the condensers in staggered relation to each other; that is, the first unit has its condenser on the right hand side and the second unit has its condenser on the left hand side and so on alternately. This arrangement was decided upon as it made a very material saving in floor space, although, as will be



CROSS SECTION OF STRAIGHT LINE POLE AND CROSS ARM.

understood, it places certain of the condenser suction intakes on the side adjacent to the discharge sewer and vice versa, the arrangement requiring that the suction and discharge pipes of two of the units be brought down underneath one or the other of the sewers in order to make connection with the proper one.

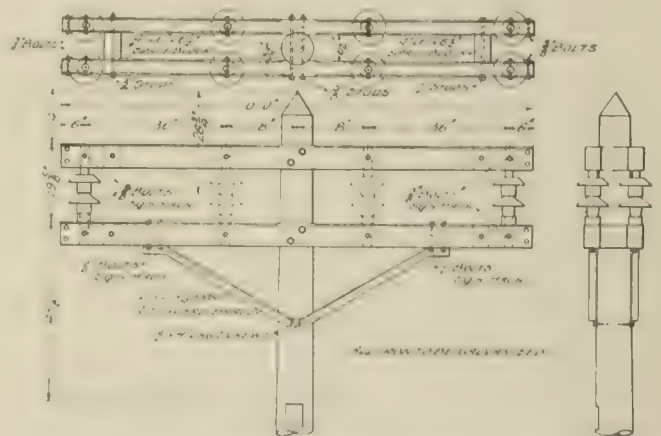
Any of the turbines can be run non-condensing, if absolutely necessary, the free exhaust from all the units being led into a concrete tunnel located over the condensing water sewers.

Boiler Room.

The boiler equipment consists of eight 750-h. p. water tube boilers arranged in two lines facing each other. The boiler settings are carried upon I-beams, the boiler room floor being 14 ft. above grade, this arrangement giving room beneath the boilers for dumping the ashes directly into hand-carts running over tracks upon the grade level to the water edge where the ashes will be used as filling material for creating new land adjoining the present power house property.

Superheating Steam.

It has been demonstrated that the steam turbine presents a con-



CROSS ARMS FOR ANGLE CONSTRUCTION

dition where superheating is practically a necessity. Numerous tests show not only an improvement in thermal efficiency by the addition of superheating, but also a considerable increase in the capacity of the turbine machine. The advantage is evident of having perfectly dry steam following the law of a perfect gas instead of a mixture of steam and water to pass through the numerous small orifices. Moreover, the friction of the rapidly revolving buckets in the surrounding medium is an important item and it has been found that this friction is much less when the steam is superheated.

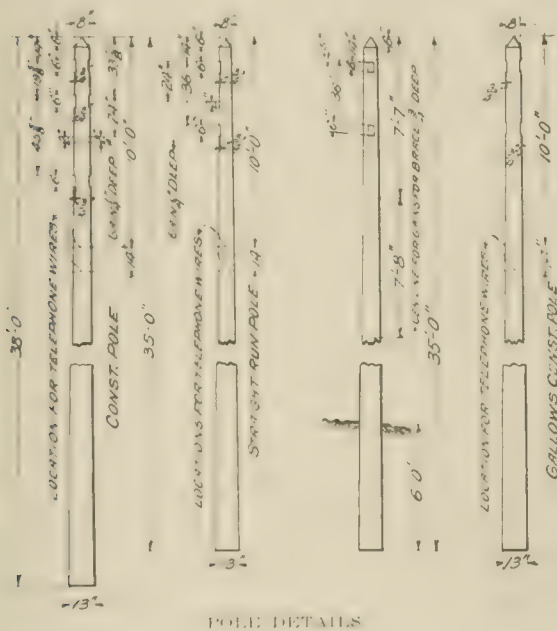
By condensing the exhaust of a steam turbine, its economy is improved to even a greater extent than in a steam engine, and in consequence a good vacuum is of much importance. Superheated steam, because of its greatly reduced density, always produces a better vacuum—a given volume of superheated steam when con-

is built of concrete with brick lining, and the arrangement is such that the coal, after being crushed to the proper degree of fineness by the coal crusher mechanism, drops into the lower horizontal line of the conveyor in the tunnel. The coal crusher mechanism is of the self-contained direct connected electrically driven type, and so arranged as to be readily adjusted to crush the coal to any degree of fineness that may be desired for automatic stoking. The coal crusher mechanism is also so arranged as to by-pass small coal not necessary to be crushed without operating the coal crusher mechanism, by simply swinging back the baffle plate away from the crusher roll and permitting the coal to pass down and through the crusher mechanism into the hopper and chute under the crusher, which will deliver the coal into the lower horizontal line of the conveyor.

The conveyor system installed at this station is of the well-known McCaslin overlapping gravity bucket conveyor type, manufactured and installed by J. A. Mead & Co., 11 Broadway, New York City.

The conveyor driving mechanism is of the self-contained direct connected electrically driven type and is located in the upper left hand corner of the boiler room next adjacent to the elevated coal bunker. The upper line of the conveyor moves from right to left and conveys, elevates and delivers the coal from the coal crusher mechanism into the elevated coal bunker above the boiler room.

A movable dumping carriage is provided, for automatically de-



living the coal from the upper horizontal line of the conveyor into the elevated coal bunker at any point or points along its travel, and so arranged as to fill the elevated coal bunker without trimming. This movable dumping carriage is controlled by the operator at the wheel shown on the upper left hand corner of the illustration next adjacent to the conveyor driving mechanism, and is so arranged that the movable dumping carriage can be moved either forward or backward as may be desired. The conveyor buckets after discharging the coal into the elevated coal bunker, pass down and under the elevated coal bunker to the vertical riser of the ascending track where it changes direction downwardly and along to the coal crusher mechanism and thus the operation is continued.

The horizontal, vertical and curved portions of the trackway for the conveyor and movable dumping carriages, consist of steel T-rails supported by spacers.

The conveyor tightener mechanism for taking up the slack in the endless chain conveyor is located at the left hand end of the tunnel next to the coal crusher mechanism. The capacity of the coal crusher and conveyor machinery for this station will be sufficient to handle the coal from the power house at a speed of 100 tons per hour.

The electric motors for operating the coal crusher and coal conveyor are of the a. c. variable speed type, wound for 220 volts.

to full speed. This is a desirable feature since with this type of motor the capacity of the coal crusher mechanism and conveyor can be so regulated that the coal crusher mechanism will not deliver a greater quantity of coal to the conveyor than the conveyor can properly dispose of.

The coal is delivered from the elevated coal bunker into the eight suspension weighing hopper scales, and when the weight has been taken is delivered through the down spouts into the automatic stokers. The ashes are delivered from the automatic stokers into the ash hoppers under the boilers from which they are delivered into the tip cars and removed from the ash room and used for filling in the property next adjacent the power house site. The weighing scales, ash cars, and track system are also furnished and installed by J. A. Mead & Co. The capacity of the elevated coal bunkers is about 1,000 tons.

It is the idea eventually to build a coal storage bunker near the site of the power house and close to the water's edge so that the coal will be delivered from the vessels directly into this bunker. The bunker will be supported on trestle work so that the hand cars can run underneath and receive coal from hoppers in the bottom of the bunker. The hand cars will then haul the coal to, and dump their contents into, the hopper of the coal crusher mechanism in the tunnel. This arrangement will permit of a storage capacity sufficient to hold 6,000 tons of coal in addition to the 1,000-ton capacity contained within the power house itself. It is believed by having this auxiliary coal storage bunker outside the power house that risks of fire, caused by spontaneous combustion, will be largely reduced, and in addition a considerable economy in room within the power house building is effected.

It is the intention to have the Quincy Point turbine station in partial operation in the spring. The Brockton sub-station will go into operation about Feb. 1st, 1904, and the other sub-stations will follow as soon as they can be built and equipped. In the meantime, a temporary power house is being built on property adjoining the Quincy Point station and this will supply 13,200-volt current to the Brockton sub-station until the turbine station at Quincy Point is ready for operation. This temporary plant will contain one 2,500-h. p. Cooper corliss engine, direct connected to an 1,800-kw. General Electric alternator, delivering 3-phase 25-cycle alternating current at 13,200 volts.

The entire scheme of high tension and construction of power station and sub-stations has been developed by the department of motive power and machinery of the Massachusetts Electric Companies as follows: C. F. Bancroft, superintendent of motive power and machinery; G. W. Palmer, jr., electrical engineer, in general charge of all construction work and design of main stations, sub-stations, and high tension lines; W. N. Sheaff, on the mechanical engineering of the Quincy power station; C. W. Jones, in charge of Quincy Point power station construction; J. F. Cobb, in charge of sub-station construction; George W. Blodgett, engineer in charge of high tension line surveys and construction.

A. R. M. & E. A. Compendium.

We have received from the secretary and treasurer of the American Railway Mechanical and Electrical Association, Mr. Walter Mower, of the Detroit United Ry., a compendium of the association, which has just been published. It is a clear, concise summary of the purpose for which the association was formed, and the needs leading up to its inception, and it contains, besides the list of officers and the constitution and by-laws, addresses to general managers, master mechanics, chief engineers and electricians, calling attention to the importance of the organization and its scope; also an abstract taken from the report of the 21st annual convention of the American Street Railway Association, showing the origin of the new association, and an extract from the address of the president of the American Street Railway Association, Mr. W. Caryl Ely, delivered at the Saratoga convention, in which is emphasized the worth of the new association. Brief appreciation is made of the active or junior membership accompany the compilation, which is excellently illustrated, and bound in pamphlet form, 18 pages, 4 1/2 x 6 3/4 in.

The Public Service Corporation of New Jersey recently issued an order prohibiting conductors and motormen from entering a saloon while on duty or within a short time previous to going on duty.

Materials and Supplies Accounting.

BY W. S. DIMMOCK, MANAGER TACOMA RAILWAY & POWER CO. AND PUGET SOUND ELECTRIC RAILWAY CO.

The writer has always been deeply interested in railway accounting and was, he believes, the only general manager of a railway company who attended the organization meeting of the Street Railway Accountants' Association, but no claim is made of being an

- 4½. Bin Label.
5. Storekeeper's Record.
6. Accountant's Record.
7. Report of Bills Approved.

Form No. 1.
A. B. & C. Ry.

REQUISITION FOR MATERIAL AND SUPPLIES.

SHEET NO.

Storekeeper: This department needs the following Articles within... days.

| QUANTITY | | | | | | | Description | For What Purpose | RECEIVED | | | | | | Charge Account |
|----------|------|------------------------------|------|---------------|------|--------------|-------------|------------------|------------------------|-----|------|-------------------|-----|------|----------------|
| ON HAND | | DUE ON PREVIOUS REQUISITIONS | | LAST RECEIVED | | Now Required | | | STOREKEEPER'S MANIFEST | | | MEMO. REQUISITION | | | |
| Amt. | Name | Date | Amt. | Date | Amt. | Amt. | | | Date | No. | Amt. | Date | No. | Amt. | |
| | | | | | | | | | | | | | | | |

Approved Manager Signed In charge

FORM NO. 1-25 HORIZONTAL LINES—SIZE OF ORIGINAL, 10¼ x 15¼ in

Form No. 2.
A. B. & C. Ry.

REQUISITION ON PURCHASING AGENT.

REQ. No.

Purchasing Agent: Please furnish the following articles within... Days

| Lot No. of Quantity on Hand | Quantity now on Hand. | Name. | Quantity Due from Previous Requisitions. | LAST RECEIVED. | | NOW REQUIRED. | | Quantity Approved for Delivery. | Description. | For What Purpose. | Purchasing Agts. Order Number. |
|-----------------------------|-----------------------|-------|--|----------------|---------|---------------|---------|---------------------------------|--------------|-------------------|--------------------------------|
| | | | | Date. | Amount. | Date. | Amount. | | | | |
| | | | | | | | | | | | |

Approved Manager Signed Storekeeper.

FORM NO. 2-17 HORIZONTAL LINES—SIZE OF ORIGINAL, 8¼ x 13 IN.

authority on the subject. The system of Material and Supplies Accounting described in this article represents the ideas of one who is seeking to make the accounting department of the greatest assistance to the management, and is presented to the readers of the "Review" with the hope of eliciting criticism and discussion that will be of benefit to all interested. The general scheme is based upon the report on Material and Supplies Accounts presented at the Detroit meeting of the Accountants' Association and adopted by it.

In undertaking to develop a set of blanks adequate for the purpose of accurately recording the receipt and disposition of valuable goods, the following principles were accepted as axiomatic.

1. The most important thing for a manager is to show satisfactory results.

2. To know whether results are good or otherwise they must be subjected to an analysis based on an efficient system of accounting.

3. While the need of such analysis is recognized in the case of a smaller non-paying property, the importance of it is greater when the property is larger, because the opportunities for wasteful leaks, and the corresponding savings, are greater.

4. The essentials in the accounting for property are that the record show where, when, why, and at what cost the property was purchased; the individuals responsible for its custody; where, when and on whose authority the property was expended; and especially to locate and prevent carelessness and waste.

5. It is easier to keep such a record by using carefully designed forms than to rely on unsystematic memoranda.

The forms which were regarded as necessary in order to carry out the requirements enumerated in clause 4. are 15 in number as follows:

1. Requisition on Storekeeper.
2. Requisition on Purchasing Agent.
3. Order of Purchase.
4. Lot Number Record.

Form No. 3

ORDER OF PURCHASE

Note this Order No. ... on your invoice

A. B. & C. RY.

To 190

Please furnish this Company with the following articles, mailing Invoice for Each Consignment, the same day shipment is made, Direct to our Purchasing Agent at.....

| DEPARTMENT | | QUANTITY | | Description of Article | PRICE | |
|------------|--------------------|----------|------|------------------------|--------|-----|
| Letter | Requisition Number | Amount | Name | | Amount | Per |
| | | | | | | |

19 Horizontal Lines.

CONDITIONS
(4 Horizontal Lines.)

| | |
|---------------|------------------|
| Ship to..... | Via..... |
| Within..... | Terms..... |
| APPROVED..... | SIGNED..... |
| Manager | Purchasing Agent |

Immediately on Receipt of this Order fill out this Blank and mail to our Purchasing Agent.

A. B. & C. RY.

Receipt of your Order No..... is hereby acknowledged and accepted, subject to all of the conditions thereon. Shipment will commence..... and be completed.....

Date of Return Mailing..... 190
..... Consignor

FORM NO. 3—SIZE OF ORIGINAL, 9 x 12¼ IN.

8. Report of General Storekeeper.
- 8A. Report of Branch Storekeeper.
9. Cost Sheet.
10. Manifest of Goods Expended.
11. Memorandum of Transfers.
12. Emergency Requisition and Record.
13. Notations for Invoices.

To these might be added, for convenience, a form to be used by the purchasing agent in asking for bids.

Also for the rubber stamp (Form 13) might be substituted a form of invoice to accompany the order of purchase, requiring that to receive attention all bills be rendered on the company's own forms. The use of such a form would perhaps entail some inconvenience for those furnishing the material and supplies, but would insure uniformity and hence convenience in filing.

The column headings and general appearance of the various forms enumerated are shown herewith with the addition of memoranda of

On a number of the blanks there appears an approval line for the manager. On small roads in many cases this will be used—on larger roads it will not be necessary, but as the blanks are made to cover all kinds of conditions they should be complete in detail. One of the main criticisms at the Detroit convention in regard to this system was whether the results obtained would warrant the labor in keeping up the system. It was decided that there was no

Form No. 4a.

Lot No.

| QUANTITY | | Description |
|----------|------|-------------|
| Amount | Name | |
| | | |

FORM NO. 4a-5 HORIZONTAL LINES—SIZE OF ORIGINAL.
5 1/4 x 3 1/2 IN.

Form No. 4

LOT NUMBER RECORD.

A. B. & C. Ry.

Dep't. Letter

Lot Nos. to

| Lot Number | UNIT COST | | DISTRIBUTION OF COST | | Date | Order Number | Description | FROM | | Bill or Cost Sheet Number | Received Report Number | Remarks |
|------------|-----------|-----|----------------------|----------|------|--------------|-------------|-----------|---------|---------------------------|------------------------|---------|
| | Amt. | Per | Labor | Material | | | | Consignor | Address | | | |
| | | | | | | | | | | | | |

FORM NO. 4-50 HORIZONTAL LINES—SIZE OF ORIGINAL, 17 1/2 x 15 1/4 IN.

Form No. 5.

A. B. & C. Ry.

STOREKEEPER'S MEMO. OF MATERIAL AND SUPPLIES RECEIVED AND DISTRIBUTED.

| | | | | | | | | | | | | | | |
|-------------------|--|--|---------------------------------------|--|--|--------------|--|--|---------------|--|--|------------|--|--|
| Stored at | | | Purchasing Agent's Order Number | | | Lot No. | | | Date | | | 190... | | |
| Description | | | | | | | | | Maximum | | | | | |
| From | | | | | | | | | Minimum | | | | | |
| Address | | | | | | | | | | | | | | |
| Received Reports | | | Date | | | Date | | | Date | | | Date | | |
| | | | No. | | | No. | | | No. | | | No. | | |
| | | | Amt. | | | Amt. | | | Amt. | | | Amt. | | |

| | | | | | | | | | | | |
|---------------|--------------|------|---------------|--------------|------|---------------|--------------|------|---------------|--------------|------|
| Date Sent Out | Manifest No. | Amt. | Date Sent Out | Manifest No. | Amt. | Date Sent Out | Manifest No. | Amt. | Date Sent Out | Manifest No. | Amt. |
| | | | | | | | | | | | |

FORM NO. 5-21 HORIZONTAL LINES—SIZE OF ORIGINAL, 9 1/2 x 7 1/4 IN.

Form No. 6

A. B. & C. Ry.

ACCOUNTANT'S RECORD OF MATERIAL AND SUPPLIES RECEIVED AND DISTRIBUTED.

| | | | | | | | | | | | | | | |
|-------------------|--|--|---|--|--|----------------|--|--|--------------|--|--|---------------|--|--|
| Stored at | | | Purchasing Agent's Order No. | | | Amt. \$ | | | Lot No. | | | Bill No. | | |
| Description | | | Freight Charges as per Invoice No. | | | Amt. \$ | | | | | | | | |
| From | | | Cartage and Handling | | | Amt. \$ | | | | | | | | |
| Address | | | | | | Total \$ | | | | | | | | |
| | | | Unit Cost \$ | | | | | | | | | | | |
| Received Reports | | | Date | | | Date | | | Date | | | Date | | |
| | | | No. | | | No. | | | No. | | | No. | | |
| | | | Amt. | | | Amt. | | | Amt. | | | Amt. | | |

| | | | | | | | | | | | |
|---------------|--------------|------|---------------|--------------|------|---------------|--------------|------|---------------|--------------|------|
| Date Sent Out | Manifest No. | Amt. | Date Sent Out | Manifest No. | Amt. | Date Sent Out | Manifest No. | Amt. | Date Sent Out | Manifest No. | Amt. |
| | | | | | | | | | | | |

FORM NO. 6-21 HORIZONTAL LINES—SIZE OF ORIGINAL, 9 1/4 x 7 1/4 IN.

the size of the blank and number of lines. The wisdom of adopting such a system may be questioned by some, but the reasons of advantage on this point is doubted, because the size of each sheet was determined by the number of columns and lines needed to record the data it was desired to show in each case. To limit the size to a few lines would require undue crowding or an undue number of sheets. Also the objection as to lack of uniformity in size while possible when all the blanks are considered together is more serious when it is remembered that the blanks are not used together but by different persons in separate offices and at separate times.

more work about this system than any other system perfect enough to have no leaks; but in comparing it with a system wherein requisitions were filled from memory or upon memorandum papers was unfair as the work entailed herein would naturally show up as greater.

That there are greater chances for loss in the supply department than any other connected with a railway goes without saying, therefore better safeguards should surround the department even at an additional expense than generally exist.

The detailed explanation of the use to which the several forms are to be put is as follows:

Form No. 1—Requisition on Storekeeper for Material and Supplies. This is to be made in duplicate, by the head of department issuing it, the original being sent to the storekeeper and the duplicate retained by the department. Before reaching the storekeeper it is, however, sent to the manager for approval.

For convenience it should be made in two sizes; the larger size (about 10¼ by 15¾ in. with 25 horizontal lines) for the ordering of monthly supplies as accurately as can be anticipated on the first

chasing agent issues Form 3 in triplicate, sending all three copies to the manager for approval and investigation. When approved and returned the purchasing agent sends the original to the party who is to furnish the article, the duplicate to the storekeeper, and retains the triplicate. However, before sending the duplicate to the storekeeper it is first sent to the accountant, who enters it on his Lot No. Record (Form 4) and also enters the necessary information in the spaces so provided on the duplicate, fills in the number, de

Form No. 7
A. B. & C. Ry.

REPORT OF BILLS APPROVED BY PURCHASING AGENT

Sheet No.

| Bill Number | Date | Bought of | Address | Order Number | Total Amount | DISCOUNT | | Deductions for Freight, etc. | Net Amount | Check | Charge to Store Account | CHARGE TO OTHER ACCOUNTS | | Date Sent to Auditor |
|-------------|------|-----------|---------|--------------|--------------|----------|------|------------------------------|------------|-------|-------------------------|--------------------------|--------|----------------------|
| | | | | | | Rate | Amt. | | | | | Account | Amount | |
| | | | | | | | | | | | | | | |

Purchasing Agent

FORM NO. 7—3 HORIZONTAL LINES—SIZE OF ORIGINAL, 15 x 13½ IN.

Form No. 8
A. B. & C. Ry.

GENERAL STOREKEEPER'S REPORT OF MATERIALS AND SUPPLIES RECEIVED.

Sheet No.

Accountant:

We have this day received for stores the following articles.

| Order Number | Lot Number | Quantity | | Description | Stored at | Branch Received Report No. | Condition | From | |
|--------------|------------|----------|------|-------------|-----------|----------------------------|-----------|-----------|---------|
| | | Amt. | Name | | | | | Consignor | Address |
| | | | | | | | | | |

Storekeeper.

FORM NO. 8—25 HORIZONTAL LINES—SIZE OF ORIGINAL, 13½ x 10½ IN.

Form No. 8A
A. B. & C. Ry.

BRANCH STOREKEEPER'S REPORT OF MATERIAL AND SUPPLIES RECEIVED.

Sheet No.

General Storekeeper:

We have this day received at the following articles.

| Quantity | | Description | Condition. | From | |
|----------|------|-------------|------------|-----------|---------|
| Amount | Name | | | Consignor | Address |
| | | | | | |

Signed

In charge.

FORM NO. 8A—20 HORIZONTAL LINES—SIZE OF ORIGINAL, 10 x 8¾ IN.

Form No. 9
A. B. & C. Ry.

COST SHEET.

Sheet No.

Accountant: The following is a detailed statement of the cost of

Made for Dept. Purchasing Agent's Order No.
Charged against Account.

| Dates | Hours | Rate | Per | Amount | Material Used | | | This space will be filled in by Accountant | | |
|-------|-------|------|-----|--------|---------------|----------|-------------|--|-----|--------|
| | | | | | Lot Number | Quantity | Description | Price | Per | Amount |
| | | | | | | | | | | |

Signed

FORM NO. 9—33 HORIZONTAL LINES—SIZE OF ORIGINAL, 9 x 9½ IN.

of the month, and a much smaller size to be used from time to time for a single article or more, as the demand may arise for various materials and supplies during the month. The column at the extreme right is provided for convenience in case of some special and particular charge.

Form No. 2—Requisition on Purchasing Agent. When Form 1 has been approved by the manager and sent to the storekeeper who finds that he does not have the articles on hand, he immediately makes out Form 2, in duplicate, sending the original to the purchasing agent and retaining the duplicate.

Form No. 3—Order of Purchase. On receipt of Form 2 the pur-

scription, etc., on Forms 4½, 5 and 6, then sends the duplicate and Forms 4½ and 5 to the storekeeper.

If the order is on the company's shop to be manufactured by the company the original order is also sent to the accountant, who enters the number assigned to it, to enable the shop department to make the correct charges against this number.

The two left-hand columns on the blank herewith do not appear on the "Original", these two columns, together with another column at the left for the Lot Number, appear on the second and third copies only.

When making the copy for the storekeeper a short carbon may

be used in case it is deemed advisable to not allow the storekeeping department to become familiar with prices, etc.

Form No. 4—Lot Number Record. This is kept by the accountant, and should explain itself.

Form No. 4½—This contains simply the Lot Number, and the description of the material, to be made by the accountant at the time

Form No. 7--Record of Bills Approved by the Purchasing Agent. The purchasing agent makes up this blank in duplicate, sending the 'original to the accountant and retaining the duplicate.' This is checked with Form 3.

Form No. 8—Storekeeper's Receipt of Material & Supplies, is made in duplicate by the storekeeper, sending the original to the

Form No. 10

A. B. & C. RY.

MANIFEST FOR MATERIAL AND SUPPLIES ISSUED

Sheet No. _____

From General Store-room to..... Department

| DEPT. REQUISITION | | Lot Number | QUANTITY | | Description | Charge | Account Number |
|-------------------|--------|---------------|----------|------|-------------|--------|-------------------|
| Letter | Number | | Amount | Name | | | |
| | | | | | | | |

Received the above

.....
Storekeeper

FORM NO. 10-13 HORIZONTAL LINES—SIZE OF ORIGINAL, 9 x 6½ IN.

Form No. 11

Form No. 11
A. B. & C. RY.

MEMORANDUM OF MATERIAL AND SUPPLIES
RETURNED TO STORES OR TRANSFERRED

Sheet No.

| | | | |
|--------|--|----|--|
| From | | To | |
| Charge | | | |

| QUANTITY | | New, Second-Hand or Scrap | Description | Value | Lot Number | Credit Account | Amount |
|----------|------|------------------------------|-------------|-------|---------------|-------------------|--------|
| Amt. | Name | | | | | | |
| | | | | | | | |

Received the above

Signed _____

FORM NO. 11-13 HORIZONTAL LINES—SIZE OF ORIGINAL, 9¼ x 7 IN.

Form No. 12

A. B. & C. Ry.

MEMORANDUM
REQUISITION FOR MATERIAL AND SUPPLIES.

No.

Storekeeper: This..... Department needs the following articles for IMMEDIATE use, regular Requisition for which will be furnished promptly.

[illegible]

Signed

FORM NO. 12—SIZE OF ORIGINAL, 7 $\frac{1}{4}$ x 4 $\frac{3}{8}$ IN.

the duplicate order (Form 3) is sent in to him. This form is then sent to the warehouse to be loaded on the barrel placed in some proper place where these orders are to be stored.

Forms Nos. 5 and 6—These are partially filled in by the accountant (as stated in explaining Form 3) and completed by the accountant and the storekeeper when the bill and articles arrive. The storekeeper determines the necessity of keeping a Stock Ledger.

accountant, retaining the duplicate. This is checked with the duplicate of Form 3 by the storekeeper and reported accordingly.

Form No. 8A—Branch Storekeeper's Report of Material and Supplies Received. This is made in duplicate at the branch, the original going to the general storekeeper who makes out the regular received report (Form 8) to the accountant. The duplicate is retained at the branch office.

Form 'See' of Cost Sheet. Has blank, i. e. for article made in the

Conditions Which Affect the Resistance of a Bonded Rail Joint.

BY CHARLES R. STURDEVANT

The total ohmic resistance of a bonded rail joint, not including that of the splice bars, is equal to the sum of four distinct resistances. Of all the factors which determine the track losses, these alone may, within certain limits, be controlled. Of these resistances, the first to be considered, the most uncertain and usually the greatest, is the contact resistance between the two copper terminals and the steel rails in which the terminals are compressed or expanded. The second is the resistance of the copper contained in the two terminals. The third is that of the flexible part or body of the bond which connects the terminals. The fourth is the resistance of the two joints or unions between the body of the bond and its two terminals.

When copper and steel surfaces are pressed together into close contact, as when the shank of a copper bond terminal is compressed or expanded into a closely fitting hole drilled in steel, the ohmic resistance of the contact will depend upon the physical condition of each surface, the area of the contact surface, and the contact pressure. To insure a low contact resistance, both surfaces should be made smooth and very clean. The importance of this precaution does not seem to be generally well understood. To neglect it will invariably cause a wasteful loss of energy. For example, if the surface of the copper be tarnished or but slightly oxidized, the contact resistance with a given pressure will in consequence be increased from two to five times. The presence on the steel surface of a very thin fresh coating of oxide will multiply the contact resistance 160 times, or more. A heavy coating of rust, slowly formed during a long period of time, enormously increases the contact resistance. A thin film of oil or white lead, or any substance of this nature, will increase it from 5 to 60 per cent. A thin coating of tin on the copper does not materially affect the contact resistance, nor does it prevent oxidation or corrosion of the joint as is often supposed. Amalgamating the terminals will slightly reduce the contact resistance, especially if either contact surface be rough. It is equivalent in results to applying a very high contact pressure, one considerably above that possible to apply in practice.

The contact resistance between cast copper and steel is from 10 to 15 per cent greater than that between forged copper and steel. This is probably due to the fact that the conductivity of cast copper as ordinarily used in terminals is always much lower than that of forged copper, and it is more crystalline and has a smaller elasticity of volume. The former will therefore not make such a low resistance contact with the steel as the latter under similar conditions.

While the presence of moisture between the surfaces does not materially affect the initial contact resistance, it will lead to a rapid corrosion of the surfaces. If the contact surfaces are thoroughly clean and dry when placed together, and if the terminals be properly compressed and riveted over the edges, there should be little or no corroding or rusting of joints for an indefinite period.

With a given pressure the contact resistance will vary inversely with the area of actual contact. The nominal contact area is determined from the average current density allowable, and this may be taken at 90 or 100 amperes per square inch for forged terminals, or less than this for cast terminals. Since the average resistance of steel used for service rails is about 11.5 times that of commercial copper of equal section, the area of contact surface for each terminal should be from 10 to 12 times that of the sectional area of copper in the body of the bond, for equal losses. If the opposite surfaces of the rail adjacent to the circumference of the hole be well cleaned, the additional contact surface thus gained when using the compressed type of terminal is as effective as that about the walls of the hole. This additional contact area will often amount to 30 per cent or more, depending on the dimensions of the terminal, and usually it cannot be utilized with the pin-expanded terminal because in the latter case the steel about the pin, the two faces will be forced away from the sides of the rail section. If the wall of the hole on the surface of the terminal be very rough or uneven, the contact area, as measured, is considerably less than if both surfaces be smooth. A pin-expanded hole is not so effective as a drilled hole, the contact resistance being from 10 to 20 per cent more in the former case, and the drilled hole does not give so good results as a reamed hole.

The contact resistance between copper and steel will gradually decrease as the pressure is increased, until a critical point is reached at a pressure considerably beyond that applied in practice. This is true with either the compressed or the pin-expanded type of terminal, and whether the surfaces be rough or smooth, clean or otherwise. The pressure applied axially to the faces of a $\frac{7}{8}$ -in. terminal should be about 25 tons and the work should be done with considerable care to insure good results. A compressed terminal can usually be made to fill a hole more effectively, when the contact surfaces are rough or uneven, than a pin-expanded type which is limited by the relative dimensions of the various contact parts.

When a solid copper terminal is gradually compressed into a closely fitting hole in steel, by a pressure greater than the counter pressure or resistance offered by the walls of the steel, the hole will be slightly increased in diameter and both metals will be subjected to great stresses in sections adjacent to the contact surface. If the distorting stress be small, upon its removal the wall of the hole will spring back to its original diameter, owing to the elasticity of the steel; and likewise, the copper terminal, owing to its elasticity of volume, will slightly increase in diameter upon the removal of the confining wall of steel. Even if the metals are strained considerably beyond their elastic limit and the deformations become partially permanent both will spring back a little, tending to resume their former dimensions, when the restraining forces are removed. This restitution pressure is ever present and forces the surfaces into close contact. If, however, the distorting force be suddenly applied, as by a blow or sudden shock on the terminal, the resulting momentary elastic distortions will be much greater than when steadily applied, and the elasticity of both metals will be greatly injured. Therefore, a terminal which is hammer-riveted into a hole will never give as low a contact resistance as one which is compressed. And similarly, considering the pin-expanded type, the contact resistance will be greater when the pin is hammered than where it is steadily pressed into the terminal.

It is interesting to note in this connection that the combined reactions of the two metals, which would take place upon the removal of the distorting stresses, is many times the actual difference of contraction which takes place upon any reduction of temperature likely to occur. That is to say, if a terminal be well compressed, it will not be loosened by the usual atmospheric changes of temperature; the contact pressure will to a small extent be temporarily decreased, not wholly relieved.

If a forged bond terminal $\frac{7}{8}$ -in. in diameter be compressed, under the most favorable conditions, in a rail section $\frac{1}{2}$ in. thick the contact resistance should be as low as 0.000023 ohm. This would cause a loss in 176 bonded joints (one mile of 30 ft. rails) of only 8.1 watts per hundred amperes flowing through the rail. And, further, if the track be maintained in good condition, the joint would deteriorate but slightly, if any, during the life of the rail. If any or all of the conditions be ignored, the loss of energy may be any number of times 8.1 watts and it will usually increase with time. With one exception all the conditions mentioned, affecting the contact resistance and to a large extent the permanency of contact, are under the direct personal control of the man who installs the bonds, and it remains with him to render the contact resistance very great or inappreciable, and the rail bond investment a loss or one which would bring in good returns. Is it, then, good policy to place this work in the hands of a man who is wholly ignorant of the electrical requirements of a good bonded joint?

The terminals of a bond are made of cast copper, cold rolled copper, or drawn copper, and with one exception they are cast or forged to the ends of the flexible portion or body of the bond. In one make of bond the body and terminals are actually one continuous piece, the terminals being forged out of the strands which constitute the flexible body of the bond, thus wholly eliminating the joint resistances between the body and terminals. The conductivity of cast copper as ordinarily used for bond terminals is very low, averaging about 34 per cent of that in the forged terminals and in some cases being as low as 26 per cent. As is generally known, this is caused by the presence of a sub-oxide of copper in the metal, which is readily absorbed when the copper is in a molten state, or by the presence of another metal purposely alloyed with the copper to facilitate its working, or by both. The resistance of the two terminals, though seemingly very small, often constitutes a large percentage of the resistance of the whole bond, especially when the bond is short and the terminals are cast.

The body of the bond serves as an electrical circuit connecting the terminals and it has to successfully withstand very severe physical conditions. It is subjected to certain vibratory strains and it must be capable of extension and contraction. Hence it is built up of several small annealed copper strands either rectangular or circular in section to give it flexibility, and the strands are bent or crimped to allow variations in length. Increasing the length of the body of a bond or decreasing its sectional area will increase both its flexibility and its ohmic resistance. The capacity of the bond is fixed according to the average strength of current flowing through the rail, and the density of current in the copper, which is usually taken at 1,200 amperes per square inch of section. The return current, like the outgoing current, is usually much heavier near a generating station than at extremities of the line and the bonding system should therefore be tapered like the feeder system. That is, large bonds should be used where the strength of current is greatest, and small ones where the current is light. The resistances are practically the same for bodies of different makes of bonds similar in length and capacity and having an equal degree of flexibility.

The resistance of the joint where the body is united to the terminal will depend largely upon the thermic states of the metals at the time of their union. If both be in a molten condition and if they blend or commingle, then there will be no contact resistance. But this is a condition which is exceedingly difficult to obtain in practice, especially when the parts are forged together. As a consequence, in most cases, the union is a physical, not a molecular one, and the two surfaces will be separated by a thin film of oxide which will offer an appreciable resistance.

It rests with the engineer who selects the bond to determine largely what its resistance shall be. This will be modified by the length and section of the body, by the kind of metal in the terminals and by the character of the union, if any, between body and terminal. And it is not a question of first cost, for a low resistance bond, one whose forged terminals are integral parts of the body, can be sold as cheaply as a high resistance bond.

Tennessee Notes.

The reconstruction work on the Nashville Railway & Light Co.'s system, which has been under way five months, is progressing satisfactorily considering that the streets are paved either with granite or bituminous macadam. More than 14 miles of 70-lb. T-rails have been laid. Work on the South Spruce St. line, from Broad St. south to Fogg St., has been completed, and the reconstruction of the line between Nashville, West Nashville and the state penitentiary nearly so. Travel is very heavy on the latter line, and it is being double-tracked. Work has been begun on the South Nashville lines, by placing improved curves and crossings at Broad and College Sts. and Broad and Cherry Sts. The line on First St., between Woodland and Oldham Sts., is also being rebuilt. The improvements are proving more expensive than was anticipated, owing to the poor condition of many of the streets and the extra ballasting required. In order to double-track Belmont Ave., the street will have to be widened five feet and the abutments have agreed to give the necessary land in order to secure the improvement.

The traffic receipts of the Nashville Railway & Light Co. continue to show gains of about 15 per cent over corresponding periods of the previous year. The record for handling passengers which was made last Fourth of July was broken one day recently on the occasion of Barnum & Bailey's circus giving afternoon and evening performances, when 133,000 passengers were cared for without accident, 46,000 of them being handled through the new transfer station. As many as 56 trains were run on the Broad St. line during the heaviest of the travel.

Mr. James B. Armstrong, secretary to the mayor of Nashville, has patented an original device designed to throw switches without getting off the car. It is a small wheel attached to the car, and operated by a pedal, and is provided with a spring which throws it back to normal when the motorman releases it. Nashville Railway & Light Co. officials have agreed to give it a trial.

After a fight extending over several months, St. Louis capitalists have been granted a franchise for a street railway in Memphis. The new company will be known as the City Street Railway Co. The principal promoters are Mr. Corbin H. Spencer, vice-president of the World's Fair Association; Mr. J. G. McGannon and Mr. L. G. McNair.

The Nashville & Lewisburg Electric Railway Co. has been financed and will build its proposed 52-mile electric interurban system early in the spring. The company will do a passenger, freight and parcel express business, but expects to derive most of its revenue from freight. The offices as well as the power house will be located at Nashville. It will cost \$1,000,000 to build the road.

Mr. C. M. Henley, of Columbus, O.; Judge M. D. Smallman, of McMinnville, Tenn.; Mr. W. B. Bellis, of Indianapolis, Ind., and Messrs. John M. Gaut, T. S. Weaver and W. G. Anderson, of Nashville, directors of the McMinnville, Woodbury & Nashville Electric Ry., recently met at Nashville and increased the capital stock from \$10,000 to \$1,000,000. Later, when it is decided to build beyond McMinnville into the coal lands, the capital will be increased to \$2,500,000. It is stated that a contract has been awarded to a construction company, of which Mr. Joseph Ellis is president, and that the preliminary work has been begun. The proposed road will be 70 miles long. Electricity will be used for passenger traffic and steam for freight. The franchises and rights of way have been obtained. Mr. H. H. Zigler, of Columbus, will probably be general manager.

Mr. C. W. Ruth, of Pittsburg, has disposed of his interest in the Tennessee Interurban Railway Co. to Messrs. Thomas A. Perry, jr., and H. A. Gross, also of Pittsburg, and Mr. Perry has been elected president of the company and Mr. Gross vice-president. Mr. J. H. Connor, of Nashville, is general manager. It is expected that the system will be built next spring.

With the completion of the proposed interurban roads which will enter Nashville, over 200 miles of electric railways will center at that city, exclusive of the local system, which is 70 miles long.

Strikes of the Month.

The strike of the Chicago City Railway Co. employees, which began November 12th, as reported in the "Review" for November, was declared off November 25th, after the men had been idle 13½ days. It was essentially a victory for the company, the only material difference between the company's original proposition and the provisional agreement assented to by the men being in the company's willingness to arbitrate the wage scale. The terms of the agreement are practically as follows: The company and men agree to arbitrate wages, the present scale to be set aside and the actual worth of labor to be estimated. (This may raise some wages and lower others.) Two propositions are made for the routing of cars, the men to take their choice. One is a minimum of 8 hours and a maximum of 11, all within a limit of 15 hours; the other alternative is an opportunity to earn 10 hours' pay in 15 hours. The company retains the right to discharge, discipline and hire its men without interference of the union in any way, the shop to be open to union and non-union men alike. The company agrees to take back all of the striking employees except those who have been guilty of violence since November 12th. This includes those who went on sympathetic strikes. All but 45 of the men were taken back to work, and President Hamilton stated that the 45 will be taken back if the courts find that they have not committed acts of violence. Owing to the vigilance of the police, there was very little rioting during the strike compared with former strikes, and although a number of persons were assaulted, no one was killed. President Hamilton, acting for the company, presented the chief of police \$5,000 to be distributed at his discretion. It was recommended, however, that all or part be given to the Police Benefit Association.

November 28th the conductors and motormen employed by the Marquette City & Presque Isle Railway Co., of Marquette, Mich., went out on strike because the company refused to grant their demand for 20 cents per hour, an increase of 3 cents. With the exception of one car, the system was completely tied up. The car that was in operation was manned by the superintendent. December 2d non-union men began to replace the strikers, and all but one line was opened. Regular service on all lines was re-established December 3d. There was no rioting.

The New York railroad commissioners refused the Buffalo & Williamsville Electric Railway Co. permission to use the third-rail system.

Recent Street Railway Decisions.

EDITED BY J. I. ROSENBERGER, ATTORNEY AT LAW, CHICAGO

FAILURE OF PERSON IN VEHICLE TO LOOK AND LISTEN FOR CAR NOT NECESSARILY NEGLIGENCE.

Memphis Street Railway Co. vs. Riddick (Tenn.), 75 S. W. Rep. 924, June 9, 1903.

The supreme court of Tennessee holds that it was not error to charge the jury that, while it is ordinarily the duty of a person traveling on the street in a vehicle to look and listen for the approach of cars, yet this is not an absolute rule of law; but it is for the jury to say, in view of all the proof, whether the plaintiff was guilty of contributory negligence in failing to look and listen.

ABUTTER CANNOT HAVE ORDINANCE SET ASIDE FOR INEXPEDIENCY, BUT IS ENTITLED TO COMPENSATION BEFORE CONSTRUCTION OF COMMERCIAL STREET RAILWAY.

Lange vs. La Crosse & Eastern Railway Co. (Wis.), 95 N. W. Rep. 952, July 3, 1903.

An owner of land abutting on a street, the supreme court of Wisconsin holds, owns the fee to the center of the street subject only to the public easement. But he is not entitled to have an ordinance authorizing a commercial street railway company to construct and operate an electric railway in the street nullified and set aside on the mere ground of inexpediency or impropriety. He has, however, the right to compensation, as a condition precedent to the placing of such track, etc., in front of his premises.

FRANCHISE REQUIREMENT AS TO FARE MAY HAVE EXTRATERRITORIAL EFFECT.

Vining vs. Detroit, Ypsilanti, Ann Arbor & Jackson Railway (Mich.), 95 N. W. Rep. 542, June 23, 1903.

It being provided by a village franchise that the company should be entitled to charge at the rate of one and one-half cents per mile between any two points on its line between certain cities, the supreme court of Michigan holds that such provision could not be evaded on the ground that to enforce it would be to give the franchise extraterritorial effect, and that such construction ought not to be given as to extend the force of the ordinance or franchise beyond the limits of the village. It holds the provision binding on the company.

PROHIBITION AGAINST DIGGING ALONG EDGE OF HIGHWAY NO RESTRICTION ON CONSTRUCTION OF STREET RAILWAY THEREIN.

Freud vs. Detroit & Pontiac Railway Co. (Mich.), 95 N. W. Rep. 559, June 23, 1903.

A statute prohibiting digging, plowing or scraping nearer than within eight feet of the margin of the highway, without the consent of the owner of the premises adjacent thereto, which is a mere limitation on the right of the overseer of highways to enter upon this eight-foot strip in building or improving the public highway, the supreme court of Michigan holds, does not prohibit the construction of a street railway within eight feet of the margin of the highway, the power to construct the railway on a highway, the tracks of a street railway company being located in the "road" or "highway," and not in the "margin" of the highway.

INSUFFICIENT EVIDENCE OF AMOUNT OF PROFITS LOST BY SUSPENSION OF OPERATION OF ROAD.

Rested Bay Line Railway Co. vs. Rested Bay Line Mfg. Co. (Vt.), 44 S. E. Rep. 926, June 9, 1903.

The amount of loss of profits caused by the suspension of the

operation of an electric railway for a time, the supreme court of appeals of Virginia holds, was not sufficiently shown by proof of the number of fares received on five consecutive days immediately preceding the suspension, and on eight consecutive days after the resumption of traffic, deducting from the estimated gross receipts lost based thereon the cost of fuel and an estimate of the cost of the skilled labor employed. The court says that there are many other charges incident to the operation of an electric railway which must be deducted from the gross receipts in order to ascertain the profits in the business.

INJURY TO PEDESTRIAN BETWEEN CARS ON CROSSING DUE TO LATERAL MOVEMENT OF ONE FROM CURVE DUTY NOT TO PERMIT CARS TO MEET THERE.

Schwartz vs. New Orleans & Carrollton Railroad Co. (La.), 34 So. Rep. 607, Nov. 17, 1902. Rehearing June 8, 1903.

The act of the company in creating upon one of the most frequented crossings of the city of New Orleans an insidious danger, namely, from the lateral movement of a car on a curve at the crossing, where a person might find himself between such car and one passing on an adjoining track, the supreme court of Louisiana holds to constitute actionable negligence, when the company could have avoided creating such danger by not permitting the cars to pass each other upon the crossing. This danger, the court says, might have been avoided without material impairment of the efficiency of the service by simply not permitting the cars to meet on the crossing, and it was incumbent upon the company to do so. It should have known of this danger and guarded against it.

STATUTE AUTHORIZING RESERVATION OF SPACE FOR ELECTRIC RAILWAYS NEAR SIDE OF WAY NOT UNCONSTITUTIONAL AS IMPOSING AN ADDITIONAL SERVITUDE.

Fisher vs. Milton Street Railway Co. (Mass.), 67, N. E. Rep. 663, June 18, 1903.

Chapter 121 of the Massachusetts Statutes of 1895, which forbids the granting of any location for the track of any street railway in Milton, except in ways in which special space for the use of street railways shall have been reserved prior to such location of tracks, and except within the limits of such reserved space, and which further authorizes the selectmen of the town to lay out, and the town to accept and allow, such space for the use of street railways in any townway or highway heretofore or hereafter laid out within the town, the supreme judicial court of Massachusetts holds is not unconstitutional as purporting to authorize the imposition of an additional servitude upon the land previously taken for streets and highways in Milton, without providing for compensation to the owners. The railway considered in this case was an electric street railway.

STOPPING OF BICYCLIST IN FRONT OF A CAR WITH OUT LOOKING BACK MOTORMAN SHOULD WARN OF APPROACH OF CAR.

Zolpher vs. Camden & Suburban Railway Co. (N. J.), 53 Atl. Rep. 449, June 18, 1903.

It is not necessarily negligent for a traveler upon a bicycle to stop upon the track in front of an approaching car, without looking behind him, the court of errors and appeals of New Jersey holds, when the usual audible warning of the car's approach by bell or gong, is not given by the motorman. In this case a bicyclist, who had been riding on the right-hand side of the street until he came to a pile of stones which obstructed his passage, turned onto

the track, and, afterwards, on account of a high wind, had to get off his wheel, which he did without looking around. It was proven that he got safely on the track at least twelve feet in advance of the car. The court says he was not bound to look behind after he was fairly on the track. It then became the duty of the motorman to give warning, and to exercise reasonable care to avoid a collision.

TURNING TO RIGHT ONTO ANOTHER TRACK OF VEHICLE MEETING CAR.

Adams vs. Camden & Suburban Railway Co. (N. J.), 55 Atl. Rep. 254. June 15, 1903.

It is not an act of negligence, *per se* (by itself), the court of errors and appeals of New Jersey holds, for the driver of a carriage, whether of burden or pleasure, in passing over the public roads of the state where the track of any street railway company may be laid, when either met or overtaken by the cars of such company, to keep to the right, upon other tracks of the company even though such carriage, by turning to the left, might have avoided both meeting, and being overtaken by the company's cars. Again, it holds that the defendant company was bound to take notice that the law required other carriages or vehicles using the parts of the highway covered by its car tracks, upon meeting its cars coming from an opposite direction, to keep to the right, except it was perilous to do so, and to control its overtaking cars, in anticipation that such other carriages might so turn upon its car tracks, in obedience to the law, at any instant.

NO AUTHORITY TO CONDEMN LONGITUDINAL STRIPS OF RAILROAD RIGHT OF WAY.

Indianapolis & Vincennes Railroad Co. vs. Indianapolis & Martinsville Rapid Transit Co. (Ind. App.), 67 N. E. Rep. 1013. June 25, 1903.

The power to condemn land which has theretofore been appropriated to public use, the appellate court of Indiana holds, must be conferred by the legislature in express terms or by necessary implication. Under the Indiana act of 1901 the transit company was authorized "to construct its road upon or across any stream of water, water course, road, highway, railroad or canal, so as not to interfere with the free use of the same, which the route of its road shall intersect in such manner as to afford protection for life and property, but the corporation shall restore the stream or water course, road or highway, thus intersected, to its former state," etc. The right to cross intersecting highways and railroads thus in terms conferred by the language used, the court says, does not purport to authorize the appropriation of a railway right of way longitudinally in whole or in part. Neither is such power conferred by necessary implication. Wherefore, the transit company, it holds, did not have that power.

PASSENGER ALIGHTING FROM CAR AT ONCE BECOMES TRAVELER ON PUBLIC THOROUGHFARE—CARE REQUIRED IN PASSING BEHIND CAR AND OVER OTHER TRACK—DUTY OF LOOKING AND LISTENING.

Indianapolis Street Railway Co. vs. Tenner (Ind. App.), 67 N. E. Rep. 1044. June 25, 1903.

The plaintiff on alighting from a car walked around the rear end of it and started to cross the other track, when she was struck by another car. The appellate court of Indiana, division No. 2, holds that when she alighted from the car on which she had been riding, she at once became a traveler upon a public thoroughfare, and as such the law cast upon her the responsibilities of her surroundings and environments. In crossing over the street car tracks so as to reach the sidewalk, where she desired to go, she was under obligations to use ordinary care and precaution for her own safety, and such ordinary care and precaution must be measured by the situation in which she was placed and the surroundings and conditions that confronted her. With knowledge of the manner in which cars were operated on the tracks, she was required, in the exercise of ordinary care for her own safety, to look and listen for approaching cars. To the extent that the car from which she alighted was an obstruction, shutting off her view of approaching

cars, she was bound to use greater care than under ordinary circumstances.

A CITY MAY BIND ITSELF TO DO ALL PAVING EXTENDING TO THE REPAIRING OF THE FOUNDATION UNDER A STREET RAILWAY.

City of Detroit vs. Detroit United Railway (Mich.), 95, N. W. Rep. 736. June 30, 1903.

The supreme court of Michigan does not agree with the contention that a city cannot bind itself by contract to do all the paving or repaving or repairing of the pavement in a street, covering the foundation necessary for the support of a street railway track, although the construction and use of a street railway requires a heavier and stronger foundation than is required in the other portions of the highway used by lighter vehicles. It says that the street railway law does not in any way relieve the municipality from the responsibility of maintaining the highways in a reasonably safe condition for public travel, and, as it cannot shift its liability to a railway company by contracting with it for the maintenance of the way, it would seem that it should be authorized, if it is not under a legal obligation, to repair the way when out of repair, whatever the cause. The laws presuppose a highway maintained by the public, and the court is of the opinion that it is not beyond the authority of the public officers to build a highway that will support such traffic, even though it need a heavier pavement than ordinary traffic requires. It is also of the opinion that it cannot be said that the city engages in work of internal improvement by making a contract whereby it shall construct and repair its highways and pavements, instead of allowing the railroad company to interfere with them.

SUFFICIENT COMPLIANCE WITH STATUTE GIVING RIGHT TO TAKE POSSESSION OF LAND NEEDED TO CROSS RAILROAD—RIGHT NOT SUSPENDED BY APPEAL.

Wabash Railroad Co. vs. Ft. Wayne & Southwestern Traction Co. (Ind.), 67, N. E. Rep. 674. June 5, 1903.

Interurban street railroad companies are expressly authorized by statutes in Indiana to construct their roads across any railroad in the state. When the proposed crossing is not within the limits of any street or highway, if the two corporations cannot agree upon the amount of compensation to be made therefor, or the manner of such crossing, the same must be ascertained and determined by commissioners to be appointed as is provided in the statute in respect to the taking of lands. In this case the filing of the instrument of appropriation in the office of the clerk of the proper court in which the land or interests to be appropriated were situated, the notice thereof given by the traction company to the railroad company, the action of the court thereon in the appointment of duly qualified appraisers, the award of the appraisers in writing assessing the amount of the damages sustained, and designating the manner of the crossing, and the payment by the traction company to the clerk for the use of the railroad company of the damages assessed, constituted, as the supreme court of Indiana thinks, a sufficient compliance with the statute under which the proceedings were taken, and authorized the traction company to take possession of the strip of land designated in the instrument of appropriation for the purpose of constructing the crossing. Nor does it consider that this right was lost or suspended by reason of the exceptions and appeal by the senior corporation, or railroad company.

LIABILITY FOR "RAILWAY SPINE"—COMPANY NOT LIABLE FOR PUNITORY DAMAGES AFTER CRIMINAL PROSECUTION OF NEGLIGENT EMPLOYEES.

Patterson vs. New Orleans & Carrollton Railroad, Light & Power Co. (La.), 34 So. Rep. 782 Feb. 16, 1903. Rehearing denied June 22, 1903.

The plaintiff sued the above and another company for damages for personal injuries sustained whilst a passenger in a street car, which, through the negligence of its servants, was collided with by a car belonging to such other company, against which he obtained a judgment for \$4,000. The plaintiff and the medical experts sworn

on his behalf testified that the injuries so received had resulted in partial paralysis. Upon the other hand, medical experts called on behalf of the company, whilst conceding that he was not responsible for his condition, and also conceding the possibility that such a condition might have resulted from the causes to which he attributed it, propounded the theory that he was suffering from "railway spine"; that is, that he was the victim of his imagination, and believed that he was paralyzed, whereas he was, in fact, affected by no physical ailment. But as it did not appear that he was any more likely to get well in the one case than in the other, and as, in neither case, was he responsible for his condition, the supreme court of Louisiana says that it was not clear that it would make any difference, for the purposes of the present claim, whether he was really paralyzed or was merely laboring under a fixed belief to that effect. Considering the whole evidence, however, the conclusion was reached that the company's theory was not sustained.

The actual wrongdoers, i. e., those in charge of the colliding car, having been prosecuted criminally, and, no doubt, punished if they deserved it, the court holds that there was no sufficient reason for awarding punitive damages against the company, which was only consequently liable as the principal is liable for the acts of his agent.

NEGLIGENCE IN EMPLOYING TOO YOUNG AND INEXPERIENCED MOTORMEN DUTY OF MOTORMAN SEEING A PERSON NEAR TRACK—INFERENCE FROM FAILURE TO STOP CAR IN SHORT SPACE AS POSSIBLE.

Crisman vs. Shreveport Belt Railway Co. (La.), 34 So. Rep. 718 Dec. 15, 1902. Rehearing denied June 22, 1903.

It is negligence, on the part of an electric railway company whose line traverses a city, the supreme court of Louisiana holds, to have one of its cars in the charge of a young man only 18 years old, whose experience in the handling of an electric car dates only 20 days back. For the shortcomings of such a motorman, in a case where the death of a human being has ensued, the car company will be held to the strictest accountability; and doubt as to whether the life of the deceased might not have been spared had the car been in the hands of a more experienced and more competent motorman will be construed against the car company.

The situation having been that the street was one thoroughfare, with continuous pavement from curb to curb, the car track being in the center, the rails flush with the surface, and nothing setting them off from the rest of the street; and that, as the car ran the deceased was riding on horseback somewhat ahead of the car, close enough to the track for his proximity to challenge attention (not so close, however, as to be within the line of danger), and that the car was gaining upon him, and that the street was somewhat crowded—the court holds, first, it was not negligence under the circumstances not to have checked the speed of the car before the actual emergency had arisen; secondly, it was incumbent on the motorman, under the circumstances, to prepare for emergencies by turning off his current and winding the slack out of his brake, and the failure to do the latter was negligence.

From the fact that the car was not stopped within the space within which it was possible to stop it, there arises an inference that the motorman was not as prompt or as energetic as it was possible for a motorman to be, and this inference overcomes the statement of witnesses that the motorman did all that was possible to stop the car.

LIABILITY FOR GIVING WRONG TRANSFER—TICKET A MERE TOKEN—PASSENGER NOT REQUIRED TO VERIFY ACTS OF CONDUCTOR.

Memphis Street Railway Co. vs. Graves (Tenn.), 75 S. W. Rep. 729 May 22, 1902.

The supreme court of Tennessee holds, that there was no error in charging the company with the duty of the defendant company, upon being requested to give a transfer, to furnish the plaintiff a proper transfer, and, if the conductor furnished the plaintiff a different transfer from the one called for, that would be the negligence of the conductor, and not the negligence of the plaintiff; that the plaintiff had the right to assume that the street car conductor would do his duty, in the presence of the plaintiff, and had a right to rely on

passage upon the transfer given him." It does not think the contention sound that passengers should be required to examine transfer tickets when handed to them, and verify the action of the conductor, and, if there is any defect in the ticket or any deviation from the request, to have it at once corrected, and, if he does not do so, he is guilty of such negligence as must bar his recovery.

The ticket, the court says, is a mere token, to be used for the convenience of the road. It is not the contract between the road and the passenger. It is a statement by the initial conductor to the subsequent conductor what the contract is, and what the passenger is entitled to, and, if it is not correct, the fault is that of the road. Nor can the passenger be required to verify the acts of the conductor, but they may presume that he acts correctly. The tickets or tokens are prepared by the company. They contain more or less of printed and other directions. Some passengers cannot read. Others are children. None of them have the time or opportunity in the rush of travel to scrutinize the ticket, and, in many instances, if they did, they could not understand the devices used by the company. The passenger has the right to presume the conductor has given him a proper ticket; and, if he make a mistake, it is the fault of the company, for which it is liable; and, if the passenger in good faith accept the ticket, he is not bound to stop and scrutinize it, to see that no mistake has been made.

REASONABLENESS OF REGULATION LIMITING TIME FOR USE OF TRANSFER—TRANSFER VOID AFTER EXPIRATION OF TIME LIMIT PUNCHED AND FARE MUST BE PAID ALTHOUGH THERE HAS BEEN NO OPPORTUNITY TO USE TRANSFER—REMEDY OF PASSENGER IN ACTION—EJECTION ONCE BEGUN MAY BE COMPLETED NOTWITHSTANDING SUBSEQUENT TENDER OF FARE.

Garrison vs. United Railways & Electric Co. of Baltimore (Md.), 55 Atl. Rep. 371. June 29, 1903.

A statute requiring the giving of a free transfer, when requested, upon the payment of each cash fare, which transfer shall be good at all points of intersection of lines of the company for a continuous ride, but the statute containing no specific provision declaring for what length of time the transfer shall be good, the court of appeals of Maryland says that it is obvious that it does not contemplate that no reasonable regulation shall be made upon the subject. In the nature of the case, regard being had to the character and the magnitude of the business of conveying on street cars hundreds of thousands of passengers, it would seem to be a very proper precaution for the company to protect itself against imposition by affixing to the transfers which it is required to issue a limit beyond which they should not be available for use. When thus limited they are void, and do not entitle the holder to ride on the cars after the expiration of the time specified by the punch marks. The statute makes the transfers good for a continuous ride. That language would seem to exclude the notion that there can be no time limit affixed. A continuous ride does not mean a ride interrupted by a considerable interval of time. If the time within which the transfer may be used expires by reason of the failure of the company to run its cars frequently enough, that fact does not make the transfer good, or authorize a conductor to honor it. In such circumstances it is the plain duty of the passenger to pay his fare. But he is not without remedy. If, by the company's fault, the transfer expires before the holder has had an opportunity to use it, and in consequence he is required to pay and does pay his fare, he would have his action against the company. But if it were held that, in spite of the expiration of the transfer, the conductor was still obliged to accept it, the company would be exposed to flagrant imposition without any means of protecting itself. The transfer, like a railroad company's ticket, is the evidence of the passenger's right to ride. If the transfer, like the ticket, is void on its face, it is not a token of the holder's right to be transported on the carrier's conveyance.

Furthermore, both upon authority and principle, it is clear, the court holds, that, when the conductor has given the passenger a reasonable time and opportunity to pay the fare, and the passenger has persistently refused to comply, and the conductor has begun the process of expulsion by stopping the car or by applying force to the passenger, when necessary, the passenger thereupon forfeits his right as a passenger, and his ejection may be completed, even though he may thereafter tender the performance demanded.

ELECTRIC RAILWAY NOT AN ADDITIONAL SERVITUDE—ABUTTER NOT ENTITLED TO COMPENSATION BECAUSE OF LOWERING OF GRADE—TRACKS MAY BE PLACED AT SIDE OF HIGHWAY—OWNERSHIP OF HIGHWAY BY PLANK ROAD COMPANY IMMATERIAL—SMOOTHNESS BETWEEN RAILS AND ADJOINING TRACK NOT REQUIRED—CROSSINGS MOST ABUTTER CAN ASK—CONSENT OF AUTHORITIES MAY BE ASSUMED.

Austin vs. Detroit, Ypsilanti & Ann Arbor Railway (Mich.), 90 N. W. Rep. 35. July 14, 1903.

The more important questions in this case were, according to the supreme court of Michigan: (1) Was the construction and operation of this electric trolley railroad an additional servitude? (2) Has an abutting owner a right to compensation by reason of the lowering of the grade of the highway? (3) Was it unlawful to place the railroad to the side of the highway, in proximity to the plaintiff's premises, and was he entitled to compensation therefor? (4) Did the fact that the highway in question was owned by a plank road company, or the changing of the grade of the highway to accommodate the railroad, affect the question?

Along the east side of the plaintiff's farm ran a steam railroad, cated, a few rods east of his house. The steam railroad was about which crossed the highway in question, on which his farm was located, eight feet above the natural surface of the ground bordering the highway, which its trains crossed above grade by means of a bridge. By consent of the plank road company, by which the highway was maintained, the traveled portion of the highway was widened and lowered, by grading, to accommodate the electric road, and a new bridge was built by, and at the joint expense of, the two railroad companies. The electric line was laid along the north side of the highway, near to the line of the street, nearly the entire width of the roadway, including the bed of the railway track being cut down to a uniform grade, so that the cut reached the level of the highway, as it therefore existed, some rods west of the plaintiff's house, which left the plaintiff's premises some three or four feet higher than the roadway where the cut was deepest, the ground being cut back to within a foot or two of his fence at the surface, and sloping thence to the track. A flight of five or six steps was built by the railroad company from the track up to the level of the land in front of the plaintiff's house. This action was brought to recover damages for an alleged injury to the plaintiff's premises, his contention being that the railroad company had no right to cut off or impair his access to the highway from his premises by lowering the grade for its track below the highway as it then existed, and by laying it so close to the line of the highway as to subject his fence and land to the danger of sliding into the highway.

Under these circumstances, the court decides the questions stated in the negative. It holds that the jury should not have been allowed to infer that the construction of the electric railroad constituted an additional servitude because of its location, or by reason of the excavation made for it, or for the impairment of access to the plaintiff's premises by reason thereof, and that there was no error in instructing the jury that damages were not recoverable because of the prevention of the hitching of teams, in front of the plaintiff's premises, under the declaration.

The court is of the opinion that the location of a railway in the center of the highway cannot be required by an abutting proprietor. It says, too, that it takes judicial notice that in rural districts the traveled portion of the road is but a small part of the land within the limits of the highway. It is manifest that in such places the railway may be more safely operated if built at one side and used separately. It was evident from the franchise that the authorities thought so in this instance, and required it to be kept away from the traveled portion. There was therefore no necessity for making a smooth way between the rails and adjoining the track, and it might have been imprudent to do so, thereby inviting travelers to unnecessarily drive in a place of danger. So long as it does not offer a comparatively insuperable obstacle to the use of the portion of the highway occupied by it for purposes reasonably necessary, and reasonable provisions are made by crossings for ingress and egress over it, and from adjoining premises, the owner of such premises cannot complain, if he could in any case, which the court does not decide.

If the public weal requires it, it is as much within the power of the public to lessen the grades for street cars as for wagons or auto-

mobiles. One of the statutes requiring the railway to be laid at the same grade as the highway, the court says that this was a proper provision, but it disbelieves that it was the intention that where this was not feasible, in view of existing grades, no railway could be constructed, or that the adjacent proprietors acquired rights to compensation in consequence. There is a manifest propriety, if not a necessity, that the township authorities provide for such general grades as may be advisable, and cause them to be made at the time a railroad is constructed, and there is, to the mind of the court, no impropriety in imposing upon the railroad the burden of these changes for the general public good. So long as the authorities do not object and take steps to prevent such changes as will permit of a proper construction of the road that they have authorized, we must assume consent, and the abutting proprietors cannot complain.

BOARDING CROWDED CAR—STOPPING CAR IMPLIED INVITATION TO TAKE SAME—NOTICE TO BE GIVEN WHEN STOPPING NOT INTENDED AS INVITATION—DUTY TO GIVE PASSENGER CHANCE TO GET SAFE PLACE BEFORE STARTING CAR—WHAT CONSTITUTES A PASSENGER—BURDEN OF PROOF AS TO TRESPASSER—CARE REQUIRED IN CONSTRUCTION AND OPERATION OF ROAD.

Jolly vs. Citizens' Street Railroad Co. (Ind.), 67 N. E. Rep. 935. June 16, 1903.

The mere fact that a car was "crowded" with passengers when the party by whom this action was brought attempted to take passage thereon, the supreme court of Indiana holds, would not alone constitute his act of negligence per se (by itself), or as a matter of law. Stopping the car as was customary was at least impliedly an invitation to those in waiting to take passage thereon if they so desired. If the company by stopping its car did not thereby intend or desire, by reason of the fact that it was already crowded, to invite persons waiting to take passage thereon, it ought to have given some warning or notice to that effect. As to whether the plaintiff was or was not guilty of contributory negligence in boarding the car in its crowded condition, and in exercising the care which he did, was a question of fact to be determined by the jury, under and in the light of all the attending circumstances, after being properly instructed by the court. The company, under the circumstances, having impliedly invited the plaintiff to become a passenger on its car, he had the right to assume that its servants in charge thereof would afford him at least a reasonable opportunity to secure a place of safety upon the car before it was started or put in motion.

As to whether the relation of passenger and carrier exists, under certain circumstances, is frequently a mixed question of law and fact. Such issue, where there is conflict of evidence in respect thereto, is one for the determination of the jury, under proper instructions, and is not to be decided by the court as a matter of law. This relation, in the absence of an express contract or agreement, may be implied from the attending circumstances in the case. The circumstances, however, must be such as will justify an implication that the person desiring passage has offered himself to the carrier, and that such offer has been accepted by the carrier. Or, in other words, the person desiring passage must in some manner indicate his intention of becoming a passenger, and place himself in the charge or care of the carrier. In this case, it appearing that the plaintiff was waiting at a point where it was customary to stop to receive passengers; that he desired and intended to take passage; that the car was stopped for the purpose of taking on passengers, and that he stepped upon the step of the rear platform and was at least endeavoring to move forward onto the platform, when he was injured through the alleged negligence of the company, the court holds that he was at least prima facie shown to have been a passenger at the time of the accident. If, under the circumstances, he got upon the car step merely as a trespasser, and not for the purpose of becoming a passenger for hire, as alleged and claimed, then the burden was upon the company to establish that fact.

The company, as shown, being a common carrier of passengers for hire, the law exacted of it the highest degree of care, skill, and diligence for the safety of its passengers in operating its cars and road, consistent with the mode of its conveyance, and likewise in the construction and maintenance of its tracks, roadway and machinery. But it was only liable for negligence, and could not be considered as an insurer of the safety of its passengers.

Financial.

The quarterly report of the Hudson Valley Railway Co., extending to September 30th, shows gross earnings of \$181,388; operating expenses, \$103,823; net earnings, \$77,565; fixed charges, \$94,122; net income, \$13,442.

The Aurora, Elgin & Chicago Railway Co. reported for October as follows: Gross earnings, \$38,878; operating expenses, \$20,079; net earnings, \$18,799.

The annual report of the Norwich (Conn.) Street Railway Co. showed net earnings of \$43,539, the operating expenses being \$71,990; surplus, \$7,672. The road carried 2,641,058 passengers.

The Montville Street Railway Co., of Norwich, Conn., reported net earnings for the past year of \$43,866; surplus, \$11,355. The operating expenses were \$51,249. It carried 1,583,626 passengers.

The New London Street Railway Co. reported for 1903 operating expenses of \$47,907; net earnings, \$22,936; deficit, \$499. The number of passengers carried was 1,535,279.

The Somers & Enfield (Conn.) Electric Railway Co. reported operating expenses for the past year as \$7,473; net earnings, \$4,601; surplus, \$3,941. It carried 250,501 passengers.

The Capital Traction Co., Washington, D. C., has given up its fire insurance on its different properties and has set aside \$100,000 of its 4 per cent bonds as its own insurance fund.

December 1st the regular quarterly dividend of $2\frac{1}{4}$ per cent was declared by the Chicago City Railway Co.

The Havana Electric Railway Co.'s earnings for October were reported at \$125,031 (Spanish silver), an increase of \$18,892 over October a year ago.

The Hartford & Springfield Railway Co.'s annual report showed gross earnings of \$71,202; operating expenses, \$43,804; net earnings, \$27,377; dividends and taxes, \$14,900. The capital is \$400,000; bonded indebtedness, \$456,000; cost of road and equipment, \$889,452. The road carried 1,311,597 passengers during the year.

The gross earnings of the Chicago Union Traction Co. in November were stated to have been nearly \$2,000 a day over the earnings in November, 1902.

The Buffalo, Dunkirk & Western Railroad Co., which is now building the last link in the Cleveland-Buffalo line, is selling its second million of bonds and is meeting with good success.

The Farmington (Conn.) Street Railway reported operating expenses of \$47,742 and net earnings of \$24,161 for the last fiscal year.

The Sao Paulo Tramway, Light & Power Co., of Brazil, reports gross earnings of \$109,200 and net earnings of \$77,000 during October, and net earnings of \$745,000 for the 10 months of the current year. Compared with last year this shows a decrease of 9.7 per cent in operating expenses for October, an increase of 16 per cent in the net earnings for that month, and an increase of 31.7 per cent in the net earnings for the 10 months.

The Detroit United Ry's. operating expenses for October were \$234,239, an increase of 17.5 per cent; the net earnings were \$150,028, an increase of 4.8 per cent, and the surplus was \$67,982. The operating expenses since January 1st increased 16.8 per cent and the net earnings 5.4 per cent.

The annual report of the Geneva, Waterloo, Seneca Falls & Canajoharie Traction Co. shows the gross earnings for the year ending September 30th at \$102,112, operating expenses at \$49,604, net earnings at \$52,508, and surplus at \$14,604. The road carried 1,023,748 passengers.

The statement of the Northern Texas Traction Co. for the first

months of the year shows as follows: Gross earnings, \$382,806; operating expenses, \$205,626; net earnings, \$177,239; fixed charges, \$92,212; net income, \$85,926. Taxes accruing to date were included in the fixed charges.

The Massachusetts railroad commissioners have authorized the Blue Hill Street Railway Co. to issue \$200,000 five per cent, 20-year bonds for the purpose of paying the floating indebtedness.

The expenses of the Boston Transit Co. for the year ending July 30, 1903, were \$1,278,918, making the total expenditure on the subways and tunnel \$8,121,214.

The Michigan Traction Co. has given a mortgage to the Knickerbocker Trust Co., of New York, to secure the payment of \$500,000 six per cent gold bonds payable in 20 years. The mortgage covers the line from Kalamazoo to Battle Creek, the Battle Creek and the Kalamazoo city railways, also the franchises granted by the villages of Comstock, Augusta and all places through which the road passes, including the spur to Gull Lake.

MILWAUKEE ELECTRIC RAILWAY & LIGHT CO.

The report of the Milwaukee Electric Railway & Light Co. for October shows gross earnings of \$262,917, as against \$238,313 in October of last year; net earnings, \$125,027, compared with \$123,411; fixed charges, \$73,049, as against \$68,814; net income, \$52,074, as compared with \$57,137. The surplus from January 1st to October 31st amounted to \$520,071, as against \$528,758 for the corresponding period last year.

N. Y., N. H. & H. R. R. TROLLEY COMPANIES.

The three trolley companies owned by the New York, New Haven & Hartford Railroad Co., in Connecticut, have filed annual reports as follows: The Worcester & Connecticut Eastern Railway Co. gave its operating expenses as \$100,373; net earnings, \$26,823; surplus, \$117,517; passengers carried, 2,464,000. The Meriden Electric Railroad Co. reports operating expenses of \$94,588; net earnings, \$54,880; surplus, \$15,601; passengers carried, 3,470,480. The Stamford Street Railroad Co.'s operating expenses were \$55,411; net earnings, \$27,542; deficit, \$15,956; passengers carried, 2,101,304.

MOLINE, EAST MOLINE & WATERTOWN CO. LEASED.

November 25th the Moline, East Moline & Watertown Railway Co. filed in the circuit clerk's office at Moline, Ill., an instrument by which it leases its railway, together with all its property and appurtenances to the Mississippi Valley Traction Co. for 50 years. At the same time a deed of trust or mortgage to the American Trust & Savings Bank, trustee, of Chicago, to secure the first mortgage bonds of the Mississippi Valley Traction Co., was filed. The amount given in the trust deed is \$600,000.

CONNECTICUT RAILWAY & LIGHTING CO.

The annual report of the Connecticut Railway & Lighting Co. shows that the gross earnings amounted to \$1,048,258; operating expenses, \$819,090; net earnings, \$229,168. The report shows a deficit of \$70,804, reported as due to "expenses due to strikes," the items under this head being \$13,578, \$12,682, \$47,496 and \$7,119, a total of \$80,875. The number of passengers carried for the last year was 25,020,237; number of employees, 900. Salaries amounted to \$19,202; wages, \$125,507. Damages paid amounted to \$10,506; legal expenses, \$24,272.

NEW BEDFORD & ONSET RY.

The annual report of the New Bedford & Onset Street Railway Co. for the year ending September 30th showed the earnings from operations to have been \$91,721; operating expenses, \$58,003; net earnings, \$32,817; fixed charges, \$24,634; surplus for the year, \$8,182. Number of passengers carried during the year, 1,023,748; average number employed, 45. The total assets are \$887,500; cost of road and equipment, \$666,810; capital stock, \$500,000; funded debt, \$280,000.

HOLYOKE STREET RAILWAY CO.

The annual report of the Holyoke Street Railway Co. for the year ending September 30th shows a deficit of \$7,482. The gross earnings were \$269,970; operating expenses, \$277,452; net income,

\$116,629; fixed charges, \$93,459; dividends, \$50,000; deficit at Mount Park, \$4,642. Number of passengers carried, 6,908,050.

UNION STREET RAILWAY CO.

The annual report of the Union Street Railway Co., of New Bedford, Mass., for the year ending September 30th showed the earnings to have been \$366,158; operating expenses, \$258,753; net earnings, \$107,400; fixed charges, \$55,237; net income, \$52,162; dividends (8 per cent on \$600,000), \$48,000; surplus, \$4,162. Number of passengers carried during the year, 6,964,930; average number employed, 240. The total assets are \$1,589,471; cost of railway and equipment, \$1,051,360; capital stock, \$900,000; funded debt, \$400,000.

DARTMOUTH & WESTPORT RY.

The annual report of the Dartmouth & Westport Street Railway Co. for the year ending September 30th showed the earnings from operation to have been \$145,656; operating expenses, \$102,945; net earnings, \$42,711; fixed charges, \$14,880; net income, \$27,830; dividends (8 per cent on \$150,000), \$12,000; surplus, \$15,830. Number of passengers carried during the year, 2,718,144; average number employed, 40. The total assets are \$286,292; cost of railway and equipment, \$259,742; capital stock, \$150,000; funded debt, \$90,000.

JOLIET, PLAINFIELD & AURORA R. R.

The Joliet, Plainfield & Aurora Railroad Co. has issued a circular in which are set forth briefly the physical features of the enterprise, as outlined in the "Review" for June, 1903, the progress which has been made in construction, and its character, and the estimated earnings, which on a very conservative basis are expected to amount to at least \$100,000 annually. From the earnings are to be deducted 55 per cent for operation and \$20,000 for interest, leaving \$25,000 for sinking fund and dividends. It is further anticipated that the bonds will be worth from three to six per cent premium before the road has been in operation two years. In support of this it is stated that the road is doing a phenomenal business, actually earning the interest on half its bond issue, the proportion covering the Joliet-Plainfield part of the line. In other words, the money necessary to pay the interest on the bonds covering this part of the road is being earned and is being set aside daily for that purpose, and no more bonds can be issued until the line is finished to Aurora, which, it is expected, will take place by June 1, 1904. The road is being built by the Fisher Construction Co., of Joliet.

MONTREAL STREET RAILWAY CO.

The October Statement of earnings and expenses of the Montreal Street Railway Co., exclusive of the interest on the Montreal & Park Island Railway Co., follows:

| | 1902. | 1903. | Increase. |
|-------------------------|-----------|-----------|-----------|
| Earnings from operation | \$179,432 | \$204,152 | \$25,019 |
| Miscellaneous earnings | 1,972 | 4,148 | 175 |
| Total earnings | 181,405 | 206,600 | 25,195 |
| Operating expenses | 66,418 | 110,708 | 12,290 |
| Net earnings | 84,986 | 95,891 | 10,905 |
| Fixed charges | 15,091 | 18,021 | 2,930 |
| Net income | 68,995 | 76,070 | 7,075 |

INTERURBAN STREET RAILWAY CO.

The Interurban Street Railway Co., of New York, reports for the quarter ended September 30th, covering the entire system, including the Third Avenue Railroad Co. and all leased and controlled properties, as follows:

| | | Increase. |
|-------------------------|-------------|-----------|
| Earnings from operation | \$5,570,212 | \$198,522 |
| Operating expenses | 2,761,600 | 25,578 |
| Net earnings | 2,808,612 | 172,944 |
| Other income | 370,924 | *55,702 |
| Total income | 3,178,836 | 117,240 |
| Deductions | 3,015,459 | 100,235 |
| Surplus | 163,377 | 17,007 |

*Decrease.

LAKE STREET ELEVATED.

The annual report of the Lake Street Elevated Railroad Co., of Chicago, for the year ended June 30, 1903, was given out December 5th. It shows a deficit of \$49,170, as against a surplus last year of \$3,693. Following is the statement:

| | 1902. | 1903. | Increase. |
|--------------------|-----------|-----------|-----------|
| Gross earnings | \$704,042 | \$834,059 | \$40,017 |
| Operating expenses | 409,155 | 465,491 | 56,336 |
| Net earnings | 384,887 | 368,568 | *16,319 |
| Fixed charges | 381,194 | 417,738 | 36,544 |
| Deficit | | 49,170 | 49,170 |
| Operating ratio | 51.53 | 55.80 | .0427 |

*Decrease.

INTERNATIONAL RAILWAY CO.

The statements of the International Railway Co., of Buffalo, and the Crosstown Street Railway Co., for the quarters ending Sept. 30, 1902-03, respectively, follow:

| | 1902. | 1903. | Increase. |
|-------------------------|-----------|-------------|-----------|
| Earnings from operation | \$909,060 | \$1,176,629 | \$177,569 |
| Operating expenses | 506,664 | 592,925 | 86,261 |
| Net earnings | 492,396 | 583,703 | 91,307 |
| Other income | 20,457 | 21,686 | 1,229 |
| Gross income | 512,854 | 605,390 | 92,536 |
| Fixed charges | 235,740 | 245,867 | 10,127 |
| Surplus | 277,113 | 369,522 | 92,409 |
| Operating ratio | .507 | .503 | *.004 |

*Decrease.

NORTHWESTERN ELEVATED R. R. CO.

The annual report of the Northwestern Elevated Railroad Co., of Chicago, for the year ended June 30, 1903, shows the following statistics of operation:

| | |
|--------------------|-------------|
| Gross earnings | \$1,642,456 |
| Operating expenses | 517,441 |
| Net earnings | 1,125,015 |
| Fixed charges | 941,605 |
| Surplus | 183,410 |

The assets are \$29,954,472, including \$28,589,089 cost of road and equipment; capital \$10,000,000; bonds outstanding, \$18,000,000.

LONG ISLAND TRACTION CO.

The annual report of the Long Island Traction Co. for the year ending September 30th shows operating statistics, as compared with the previous year, as follows:

| | 1902. | 1903. | Increase. |
|-------------------------|---------|----------|-----------|
| Earnings from operation | \$9,413 | \$17,514 | \$8,101 |
| Operating expenses | 6,320 | 12,282 | 5,962 |
| Net earnings | 3,093 | 5,232 | 2,139 |
| Other income | | 86 | 86 |
| Gross income | 3,093 | 5,318 | 2,225 |
| Fixed charges | | 127 | 127 |
| Net income | 3,093 | 5,191 | 2,098 |

The assets of the road are \$1,024,567, including \$995,057 cost of road and equipment; capital, \$750,000 common and \$250,000 preferred.

BOSTON ELEVATED RY.

The Boston Elevated Railway Co. reported to the railroad commission for the year ended September 30th:

| | 1902. | 1903. | Increase. |
|-------------------------|--------------|--------------|-----------|
| Earnings from operation | \$11,421,030 | \$11,959,514 | \$638,484 |
| Operating expenses | 7,862,571 | 8,259,860 | 397,289 |
| Net earnings | 3,458,459 | 3,699,654 | 241,195 |
| Other income | | 59,857 | 59,857 |
| Total income | 3,458,459 | 3,759,511 | 301,052 |
| Fixed charges | 2,836,560 | 2,932,556 | 95,996 |
| Net income | 621,899 | 826,955 | 205,056 |
| Dividends (6 per cent) | 600,000 | 798,000 | 198,000 |
| Surplus | 21,899 | 28,955 | 7,056 |

The rent of the subway was \$1,101 less in 1903 than in 1902. The balance sheet shows a surplus of \$2,327,688 and cash amounting to \$4,019,432.

ELGIN, AURORA & SOUTHERN.

The comparative statement of the Elgin, Aurora & Southern Traction Co. for October is as follows:

| | 1902. | 1903. | Increase. |
|-------------------------|----------|----------|-----------|
| Earnings from operation | \$33,648 | \$37,011 | \$3,363 |
| Operating expenses | 20,494 | 22,869 | 2,375 |
| Net earnings | 13,153 | 14,142 | 989 |

STREET RAILWAY REVIEW.

Dec. 20, 1903.]

| | | | |
|-------------------------|-----------|-----------|----------|
| Fixed charges | 9,040 | 9,172 | 123 |
| Net income | 4,104 | 4,900 | 865 |
| For four months: | | | |
| Earnings from operation | \$155,432 | \$172,002 | \$10,630 |
| Operating expenses | 83,418 | 94,450 | 11,041 |
| Net earnings | 72,014 | 77,612 | 5,598 |
| Fixed charges | 30,108 | 36,690 | 492 |
| Net income | 35,810 | 40,922 | 5,100 |

TOLEDO RAILWAYS & LIGHT CO.

The statement of operation of the Toledo Railways & Light Co. for October is as follows:

| | 1902. | 1903. | Increase. |
|-------------------------|-------------|-------------|-----------|
| Earnings from operation | \$124,487 | \$142,051 | \$18,164 |
| Operating expenses | 60,483 | 74,805 | 14,322 |
| Net earnings | 34,004 | 67,846 | 3,842 |
| Fixed charges | 38,832 | 41,245 | 2,413 |
| Net income | 25,172 | 26,601 | 1,429 |
| For the 10 months: | | | |
| Earnings from operation | \$1,193,540 | \$1,368,580 | \$175,034 |
| Operating expenses | 607,072 | 705,070 | 98,097 |
| Net earnings | 586,474 | 662,601 | 76,127 |
| Fixed charges | 381,541 | 408,096 | 26,555 |
| Net income | 204,933 | 254,505 | 49,572 |

NORTHERN OHIO TRACTION & LIGHT CO.

The comparative statement of the Northern Ohio Traction & Light Co. for October is as follows:

| | 1902. | 1903. | Increase. |
|-------------------------|-----------|-----------|-----------|
| Earnings from operation | \$65,627 | \$75,271 | \$9,644 |
| Operating expenses | 30,332 | 41,314 | 4,982 |
| Net earnings | 29,394 | 33,957 | 4,563 |
| Interest | 10,700 | 22,446 | 5,077 |
| Net income | 12,525 | 11,511 | *1,014 |
| Operating ratio | .5536 | .5488 | .0048 |
| For the 10 months: | | | |
| Earnings from operation | \$617,526 | \$741,573 | \$124,047 |
| Operating expenses | 340,470 | 403,263 | 62,793 |
| Net earnings | 277,055 | 388,309 | 111,254 |
| Interest | 170,067 | 222,111 | 52,044 |
| Net income | 106,988 | 116,198 | 9,210 |
| Operating ratio | .5513 | .5438 | .0075 |

*Decrease.

LAKE SHORE ELECTRIC RY.

Following are the earnings of the Lake Shore Electric Railway Co. for October:

| | 1902. | 1903. | Increase. |
|-------------------------|----------|----------|-----------|
| Earnings from operation | \$41,975 | \$55,336 | \$7,301 |
| Operating expenses | 20,683 | 35,589 | 5,906 |
| Net earnings | 12,291 | 19,747 | 7,456 |
| Interest | | 20,370 | 20,370 |
| Deficit | | 623 | 623 |

For the 10 months:

| | | | |
|-------------------------|-----------|-----------|-----------|
| Earnings from operation | \$384,549 | \$523,250 | \$138,701 |
| Operating expenses | 244,711 | 326,725 | 82,014 |
| Net earnings | 139,837 | 196,524 | 56,687 |
| Interest | | 200,004 | 200,004 |
| Deficit | | 3,479 | 3,479 |

The passenger earnings for November were \$45,034, a gain of \$4,171. The falling off in October and November is due to the breaking down of boilers in the Fremont power house.

SPRINGFIELD STREET RAILWAY CO.

The annual report of the Springfield (Mass.) Street Railway Co. for the year ending September 30th showed a deficit of \$45,894 after paying an 8 per cent dividend. Following is the comparative statement:

| | 1902. | 1903. | Increase. |
|-------------------------|-----------|-----------|-----------|
| Earnings from operation | \$839,168 | \$907,412 | \$68,244 |
| Miscellaneous earnings | 5,497 | 8,464 | 2,967 |
| Total earnings | 844,665 | 915,876 | 71,211 |
| Operating expenses | 594,636 | 674,426 | 79,790 |
| Net earnings | 250,029 | 241,450 | *8,579 |
| Fixed charges | 28,328 | 130,644 | 42,555 |

| | | | |
|------------|---------|---------|----------|
| Net income | 101,939 | 110,897 | *\$1,132 |
| Dividend | 150,072 | 156,672 | |
| Surplus | 5,207 | | |
| Deficit | | 45,864 | |

Decrease.

The road carried 18,200,010 passengers during the year, an increase of 1,381,114 over 1902, average number of employees, 510. The total assets are \$3,770,862, cost of road and equipment, \$2,600,000; capital stock, \$1,058,000; bonds, \$600,000; loans and notes payable, \$953,000.

PHILADELPHIA CO.

Following is the comparative statement for October of the Philadelphia Co. and affiliated corporation:

| | 1902. | 1903. | Increase. |
|---------------------------|-------------|-------------|-----------|
| Earnings from operation | \$1,140,297 | \$1,283,915 | \$137,618 |
| Expenses and taxes | 659,207 | 799,523 | 137,316 |
| Net earnings | 487,090 | 487,391 | 301 |
| Miscellaneous income | 23,297 | 17,700 | *5,521 |
| Total earnings and income | 510,387 | 505,167 | *5,220 |
| Fixed charges | 315,004 | 328,001 | 12,997 |
| Total income | 195,292 | 177,166 | *18,126 |
| Dividend, Phila. Co. Pref | 23,930 | 23,930 | |
| Surplus | 171,350 | 153,220 | 18,127 |

*Decrease.

For 10 months of calendar year:

| | 1902. | 1903. | Increase. |
|---------------------------|--------------|--------------|-------------|
| Earnings from operation | \$11,255,273 | \$12,611,898 | \$1,356,625 |
| Expenses and taxes | 6,425,059 | 7,330,880 | 911,830 |
| Net earnings | 4,830,213 | 5,275,008 | 444,795 |
| Miscellaneous income | 427,483 | 354,866 | *72,617 |
| Total earnings and income | 5,257,697 | 5,629,875 | 372,178 |
| Fixed charges | 3,075,921 | 3,200,235 | 124,314 |
| Total income | 2,181,776 | 2,429,639 | 247,863 |
| Dividend, Phila. Co. Pref | 240,232 | 230,350 | *876 |
| Surplus | 1,941,543 | 2,190,283 | 248,740 |

*Decrease.

MANHATTAN RAILWAY CO.

The annual report of the Manhattan Railway Co., New York City, for the year ended Sept. 30, 1903, shows the figures for independent operation of the elevated lines by the Manhattan company from Oct. 1, 1902, until the Interborough Rapid Transit Co. took them over under lease on April 1, 1903, and then, for the remaining six months of the fiscal year of the Manhattan company, the report states the dividend rentals received from the Interborough company.

The earnings from operation for the six months ended April 1st were \$6,441,437; operating expenses, \$2,819,763; net earnings, \$3,621,673; total income, \$3,797,957; interest on bonds, \$904,018; taxes, \$587,508; net income, \$2,305,531.

The comparative statement for the year follows:

| | 1902. | 1903. | Increase. |
|--------------------|--------------|--------------|-------------|
| Gross earnings | \$11,097,740 | \$12,051,977 | \$1,584,231 |
| Operating expenses | 5,545,395 | 5,429,174 | *116,921 |
| Net income | 5,552,351 | 7,222,503 | 1,700,152 |
| Total income | 6,608,181 | 7,568,392 | 1,530,211 |
| Interest and taxes | 2,712,689 | 2,844,504 | 132,175 |
| Dividend | 1,020,000 | 3,894,000 | 1,974,000 |
| Surplus | 1,406,062 | 820,798 | *576,264 |

*Decrease.

The Interborough Rapid Transit Co.'s statement of its operation of the Manhattan elevated for the six months ended September 30th is as follows:

| | 1902. | 1903. | Increase. |
|---------------------------------------|-------------|-------------|--------------|
| Earnings from operation | \$8,382,262 | \$6,210,540 | *\$2,171,722 |
| Operating expenses | 2,740,040 | 2,600,710 | *139,330 |
| Net earnings | 2,612,316 | 3,600,830 | 988,514 |
| Gross income | 2,804,801 | 3,771,395 | 966,414 |
| Interest and taxes | 1,300,000 | 1,353,008 | 52,410 |
| Net income | 1,504,801 | 2,418,387 | 913,586 |
| Dividend, Man. Ry. stock, 6% per cent | 900,000 | 1,656,000 | 696,000 |
| Surplus | 604,801 | 762,387 | 157,586 |
| Operating ratio | .319 | .4202 | .1017 |

Decrease.

To Prevent Accidents.

BY G. J. A. P.

The causes of accidents are too numerous to be enumerated, but the one most frequently heard is "the brakes refused to work." If all the accidents attributed to that cause are really the result of brakes refusing to work, there must be a woeful lack of efficiency, or negligent supervision of car barn work. It is incredible that any electric railway manager can be so lax in management as not to make the safety of cars a prime factor in the management of his road. It has been the writer's experience that the sooner a "brakes won't hold" motorman is placed on the retired list the better, both for the man and the company. A motorman who will operate a car even for one-half a trip and does not discover that the brakes are not what they should be is not a safe man to be intrusted with the operation of an electric car.

A method which has been found effective in bringing motormen to a realizing sense of the uselessness of such an excuse is to have each man make a written report of the condition of his car when he leaves it, either at the barn or when he turns it over to the relief crew. In these reports especial stress is placed on the report of "condition of brakes." Failure to note either "O. K.," or call attention to a defect, is cause for reprimand. If, after making a report of "O. K.," the brakes are inspected and found defective, he suffers the consequences. Or, if he brings a car in at night and his report reads "O. K.," then, if he takes the same car out in the morning, and it is not in working order, he is the sufferer. In this manner carmen know that they are held responsible, to the extent of reporting correctly, at least, for the condition of their cars. Should a motorman report a defect, and it is not repaired or adjusted by the car barn employees, motormen have strict instructions not to take out or continue operating such cars, and to report the facts to the superintendent at once. This may seem like allowing motormen to "go over the heads" of the car repair department, but, as safety is an all-important matter, it is a method which tends to prevent work being slighted by the car house employees.

Then we have the rear-end collisions, often caused by bunching cars on one line and not giving ample instructions as to what cars are to make the stops for picking up passengers. In such a case the crew operating the head car will perhaps run by several crossings, relying on the car following to pick up passengers; the next man may think the same thing and follow the head car closely at a good rate of speed; then the first car makes an unexpected stop, the next car is too close to come to a stop in time, and then comes the crash—and next the question, "Who is to blame?"

It appears to me that the safe plan is, first, to prohibit cars from running closer to each other than would allow of making a safe or sure stop at any time; second, when cars are bunched regulations for picking up passengers should be adopted. This can be done by numerous methods, and, if properly handled, time can be saved for all cars. When a line has a number of railroad crossings to contend with, the rule of having all cars come to a "dead stop" should be strictly enforced. It is at these points where the "brakes-won't-hold" man usually comes to grief. He will "sneak" up to a crossing, and, if he thinks the crossing is clear, will not wait for the conductor to flag him across, but "take a chance at it." Then, if anything goes wrong, it is a case of "the brakes would not hold."

The writer has noticed a tendency among carmen to accept a "come ahead" signal from almost any person at a crossing. This is a bad practice, and motormen who do so are not fit to operate cars over such points. An outsider, even though he be a railroad employe, is not familiar with the speed at which a car can safely cross a track, and he may give a signal to come ahead when it is impossible for a motorman to clear the crossing in front of an approaching train.

Other accidents are caused by carmen having indulged a little too freely in intoxicants. This class of men is rapidly being weeded out of the service of all steam and electric roads, and the importance of being rid of such men is too obvious to require comment. Still another frequent cause of accidents is running into open or misplaced switches. A motorman who will run up to and over a blind switch at such rapid speed that he can not come to a stop when he sees the switch is set wrong needs a little advice, and it should be administered before he has an accident resulting from such running. Then we have the numerous accidents caused by

reckless running, misjudging distances, etc. Motormen will too frequently continue running at a high rate of speed after seeing that they are getting into close quarters, but depend on the other party to get out of the road, or rely upon their ability to make a quick enough stop to prevent an accident should they get in a tight place.

But, some will say, you will lose time if you do not take a chance sometimes. That may be true, but of what consequence is a half or, for that matter, a whole trip lost in a day, when your taking chances costs more in accident claims than a good many trips will bring in?

There is one cause of accidents that can be traced directly to the conduct of petty officers in their dealings with the men. The writer's experience with handling men has convinced him that a good many accidents can be avoided by having the good-will of all employes. A good many carmen will neglect their duties simply because they imagine they are not receiving proper consideration from the management. This feeling is very often caused by the action of some petty officer who happens to be in charge of the men, but who has become so arrogant that an employe cannot get a civil answer to a question asked of him. This naturally irritates a carman and leads to carelessness on his part.

If some "bosses" were made to understand that they are there to instruct and be of assistance to the men, and that they are not "mule drivers," a good number of accidents would be avoided. Discipline is most essential to the operation of an electric railway, but you cannot maintain a proper degree of discipline among your employes if you have a disturber as "boss." All men have a certain amount of pride in themselves, and it shows itself in carmen as much as in others. Once a man knows that every employe will be treated according to his merits, and that no favoritism will be shown, that is the man who attends strictly to business, obeys orders and rules laid down by the company. He soon learns that his work is appreciated, and it will tend to make him a valuable employe. On the other hand, allow your "bosses" to treat the men like so many machines, and they will become careless, negligent and disgruntled, and your discipline will fail to have the desired result.

Chicago Car Barn Murderers Caught.

Chicago and Hammond (Ind.) police, aided by Pennsylvania R. R. detectives and farmers living in the vicinity of Hammond, on November 27th, after an all day fight in the Toleston marshes, near Pine, Ind., captured three of the robbers who killed two men and wounded a third at the receiver's office of the Chicago City Railway Co. at 61st and State Sts., Chicago, on the morning of August 30th last, and escaped with \$2,250 which had been turned in by conductors and which was being counted by the clerks. The occurrence was reported in the "Daily Street Railway Review" for Sept. 2, 1903. Previous to the capture of these three, which was not effected until two Chicago officers and a railroad brakeman had been shot, two of them fatally, a fourth member of the gang had been arrested November 21st in a Chicago saloon, after he had killed one of the detectives who went to arrest him, and it was due to his confession that the other three were located hiding in a dugout near Hammond. The quartet are the most atrocious criminals ever known to the Chicago police, having committed no less than eight murders during as many months, according to alleged confessions. None is over 21 years of age and all were reared by respectable parents, in Chicago. The grand jury voted indictments against all.

Elevated-Subway Railway for St. Louis.

Mr. H. K. Gilman, president of the Western Electrical Supply Co., and Mr. H. S. Doyle, a department manager of the same company, are interested in a new company which has applied for a franchise in St. Louis for an elevated-subway railway, to run underground from 3d St. and Washington Ave., under St. Charles St., to between 17th and 19th Sts., thence on an elevated structure over St. Charles St., Bell and Fairfax Aves., west to Taylor Ave., south over Taylor Ave. to Manchester Ave., then over Manchester, Clayton, Berthold, Billon and McCausland Aves. to the city limits on the Watson road.

The carmen employed by the Wilkesbarre & Wyoming Valley Traction Co. have received an increase in wages.

Novel Plan for Handling Coal.

The accompanying illustration shows, in part, the novel method employed by the Milwaukee Electric Railway & Light Co. to deliver coal to the storage bins in its new Commerce St. power house, in which the bins are located over the boilers. The apparatus used to elevate and transfer the coal is a modification of the traveling electric hoist which is made by Pawling & Harnischfeger, of Milwaukee, by whom this special contrivance was built.

A framework of 20-in. I-beams projects beyond the building and one of the beams, which is used as the outer runway, extends back within the power house and above the coal storage bins. From the



SPECIAL ELECTRIC TRAVELING COAL HOIST

lower range of the beam, the hoist is supported by two rigid A-frames, which are attached to the hoist frame by two rigid A-frames.

The hoist frame is supported by two rigid A-frames, which are attached to the hoist frame by two rigid A-frames. The hoist frame is supported by two rigid A-frames, which are attached to the hoist frame by two rigid A-frames.

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The coal is delivered by wagons, which have been equipped with removable boxes holding 8,000 lb. each.

The wagons are driven beneath the hoist and the operator lowers the bottom blocks, so the driver may hook onto the raising bales. Two sets of bales are provided, one set being attached by chains to the drop bottoms of the box, and the other set to the box sides. The bottom hooks are attached to the first set and both serve to retain the coal in the box and permit its being raised to the hoist doorway, and thence it travels to the bin the coal is destined for.

The coal is dumped by the operator throwing a lever, which causes the two auxiliary hooks to engage with the second set of bales, when by slightly lowering the bottom blocks the weight of the coal opens the drop bottoms and the coal falls into the selected bin. When through dumping the operator brings the box onto the first set of bales by raising the bottom blocks and disengaging the auxiliary hooks. He then runs the hoist with the attached box onto the outer framework and lowers the box onto the wagon running gear. Provision is made to suspend the loaded box at any point by means of a load brake, and a limit switch provides against hoisting the load too high.

Green Bay Traction Company.

The Green Bay Traction Co. is the title of the company for which the Knox Engineering Co., of Chicago, is building an interurban line between Green Bay and Kaukauna, Wis. Construction work on the line is well under way, the company having recently begun to build the track. When completed, the trip over this road, which will be made in one hour, will be very interesting, the road running as it does through some of the most beautiful scenery along the lower Fox River, and over ground nearly every foot of which is historic. The line traverses the point where the last and bloodiest battle of the Indian war took place; land owned and occupied for years by Eleazer Williams, the lost dauphin of France; past the site of the first mission established by the Jesuit Fathers, and on to old Fort Howard.

Nonunion Men Assaulted.

Since the termination of the Chicago City Railway Co. strike antagonism to nonunion motormen and conductors has found expression in assaults committed by union sympathizers upon trainmen who do not wear a union button. A secretary of a steamfitters' union was ejected from a Chicago City Railway Co. car December 2d because he refused to pay his fare to a nonunion conductor. Afterward he pursued the car for five blocks and assaulted the conductor so savagely that the latter shot his assailant in self-defense.

December 7th a conductor on the Halsted St. line of the same company was knocked down and sustained a severe cut over the eye from a stone thrown. He was compelled to defend himself with an iron rod while endeavoring to get the names of witnesses to the assault.

A Halsted St. motorman was taunted with being a "scab" and otherwise annoyed, until in desperation he struck one of his tormentors with the controller handle and nearly killed him.

On December 10th an Archer Ave. mob assaulted the crew of a passing car and practically demolished the car body, because the conductor and motorman did not wear union buttons. The conductor would have been killed but for the arrival of a policeman, who kept the crowd at bay with his revolver. The motorman escaped by running, at the same time firing his revolver at the mob.

A car on the Cleveland & Southwestern Traction Co.'s system on December 6th ran between Norwalk, O., and Cleveland, 57 1/2 miles in 4 1/2 hours.

The old-time horse cars on the 14th St. cross-town line of the Interurban Street Railway Co., New York City, were superseded by electric cars December 1st.

The Small Road.

BY L. H. MOUNTNEY, SUPERINTENDENT LEWISBURG, MILTON & WATSONTOWN PASSENGER RAILROAD CO., MILTON, PA.

From the recently issued preliminary report of the United States Census Office, concerning the street and electric railways of this country, it appears that out of 817 operating companies in the United States, 613 or 75 per cent of the total are operating less than 20 miles of track; or to be exact, 394 companies are operating less than 10 miles of track and 219 are operating between 10 and 20 miles. From these statistics, it will be seen that, although the manager of the small road may not be of much importance individually, yet, collectively, he deserves some recognition, and his needs should receive more attention at the electric railway conventions and in the technical press than they usually obtain. I am glad to state that the "Review" has evidently made considerable effort to supply the wants of the small manager for practical information relating to the various topics and problems which confront him, and in the hope of stimulating further discussion on the best ways and means of solving the problems in which those in charge of the 10 and 20-mile roads are particularly interested. I take the liberty of stating my views on some of the everyday questions that the "little fellow" has to answer. Right here, it may be said that the problems of how to increase gross receipts and reduce expenses, which the manager of the small road has to meet, are as important, at least to him, as the questions of policy and practice which confront his brother managers of the larger properties. Moreover the manager of the average road is thrown almost entirely upon his own responsibility and has to find his way out of his troubles alone and usually without the benefit of competent advice from anyone, whereas his more fortunate brother of the larger property has at his command a half dozen men upon whom he can rely for practical advice, and to whom he can intrust the execution of many of the details of the business. Moreover, the larger receipts render available to the manager of the larger property a fund for experiment and possible failure, this fund in many cases amounting to the total net receipts of the smaller road.

This is not minimizing the troubles of the manager of the larger road, but it is emphasizing the fact that the small manager has a few of his own and will appreciate any information he can get as to how some of them can be lessened. The following remarks are made in the hope of starting discussion and an exchange of ideas along this line.

The road of which I am superintendent is 10 miles long and owns eight single truck cars, four of which are open and four closed. The regular cars run 18 hours a day and make about 160 car miles per day. The total population served is about 11,000. The town of Milton with 7,000 population is located at practically the center of our line. We charge a 5-cent fare from Milton to any point north, or to any point south, making a 10-cent fare from terminal to terminal, a distance of 10 miles.

In the first place, I do not believe in building a small road by contract work, nor do I believe in building extensions by contract. It is better to hire a reasonably good track man at a salary of \$800, buy your own material and do the work under your own supervision by day labor. You then know what you are getting and you can save money on the job. For maintaining track on a road of this size, we keep one man the year round to fix joints, grease track, cut weeds and do the odd jobs on track and roadbed that are always necessary. In summer we give the track man a helper at \$1.50 a day. With this force, we keep the track in reasonably good condition.

We keep one man to look after overhead work and he also does car and light repairs. Once a year we give the entire overhead work a good overhauling with two men who work from the roof of an ordinary car.

For a road where the average haul is five miles and the maximum haul is ten miles, I prefer the single truck car with two motors for the regular service, and in this climate it is necessary to have duplicate equipment, open cars for summer and closed cars for winter. It is well to have open trailers for the extra excursion travel, park crowds, etc.

As to the best way of handling car repairs, it is a question how far the small road can go in the matter of repairing parts, such as rewinding armatures, casting babbitt bearings, etc. Our company

does a lighting business in addition to operating the electric railway, and we keep one man who attends to the overhead line, makes car repairs and also does the electric light repairing. If necessary, he gets one of the conductors or motormen to help him with the car repairs, and if absolutely necessary, we call in a machinist from town to help out. Our conductors and motormen have all had training in the shops, and they are glad to do extra work in the shops after hours in times of emergency. Of course, we do not call upon them as a regular thing, but only when there is more work in the shops than our man can handle. It is the ability to utilize the forces at hand in emergencies that will count for success on any small road. The small manager must be able to dispose his forces at all times to the best advantage and he must be able to accomplish things with what he has. The receipts will not warrant retaining even one extra man in order to have him on hand for emergencies.

If a company operates a railway alone without the lighting, I should say it would pay to rewind armatures at the company's shops. One man can do all the car and truck repair work and have time to rewind armatures and do other odd jobs too, granting, of course, that he must have help occasionally from a conductor or motorman or from an outside machinist when necessary. The point is, keep every man you employ busy, for dead time and uselessly expended time means "deficit" at the end of the year's report. This does not mean that men are to be overworked or pushed beyond natural and reasonable limits.

And here should be said a few words as to the treatment of employes and the relations that should exist between the men and the manager or superintendent. The matter can all be summed up in the words, "treat them like men, and they will act like men." Let every man on the road understand that he can stay with the company at a good wage just as long as he behaves himself and fills his position in a reasonably satisfactory way. Foster a spirit of mutual good-will. Let the men understand that they are essential to the company and that the company is essential to them. Invite suggestions from employes. Commend good behavior and encourage the men to take an interest in the company's welfare and in its business generally. The employes are not mere machines but intelligent human beings. Treat them as such.

For painting cars on a road of this size, I am in favor of day labor rather than contract work. When it becomes necessary to go over our equipment, we engaged a good carriage painter at \$2.25 a day for a day of 10 hours. The company buys the material and the superintendent supervises the work. It is surprising how much work one good painter can accomplish. Our system is to burn off, white lead, add two coats of color and finish with two coats of rubbing varnish. We find it costs about \$50 to paint a closed car in this way, this including everything inside and out, hood, trucks, etc. An open car costs \$30 to treat in the same way. A car so painted, if brought into the shop once a year and touched up, should last five or six years without repainting. We are using a Pennsylvania R. R. maroon color but a canary yellow would undoubtedly be more durable.

One clerk in the office keeps all our accounts, receives and counts the conductors' cash and has time to do some collecting for the lighting department.

In the matter of stimulating excursion and pleasure travel a small road can do considerable. We operate a small park outside of Milton where we give orchestra music and dancing three evenings a week. We cannot afford vaudeville of a high enough class to warrant trying it. Dancing takes very well, and we carry from 300 to 1,000 people to the park every pleasant evening. There is a restaurant in connection with the park, and this is well patronized. The orchestra comprises eight pieces.

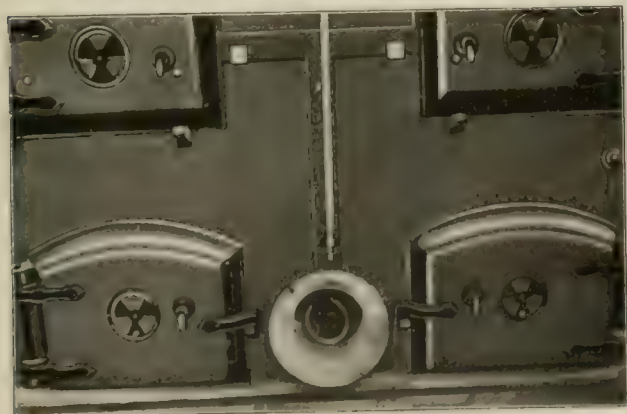
The fair grounds are located about two miles from the center of Milton, and we handle about 10,000 people on each of the two fair days in the year. We have an arrangement with the owners of the fair grounds whereby we lease the grounds for ball games or other attractions, we of course giving the grounds free to any team that wishes to play. We encourage circuses and other traveling shows to give exhibitions at points on our lines outside the city.

Our power house is located in Milton near the center of distribution. It supplies current for the electric railway and also for arc and incandescent lighting. We have been able to combine the railway and the lighting business to excellent advantage, and we are now carrying our entire day load for incandescent lighting and

power by means of a motor-generator set, driven from the railway unit. Our railway machine consists of a 325 kw. 550-volt General Electric railway generator, direct connected to a 475-h.-p. Hamilton Corliss simple non-condensing engine. This unit is sufficiently large to take care of our heaviest peaks and in addition it gives sufficient power for other purposes. The motor-generator set referred to takes current from this unit, the set consisting of a 40-h.-p. 550-volt General Electric motor, operating at 1500 r. p. m. and driving a 30-kw. 1100-volt incandescent lighting machine which carries the day load for light and power and also helps out on the night load. To carry the night load on the incandescent circuit there is one 90-kw. 1100-volt General Electric machine belted to a 100-h. p. simple non-condensing engine. The arrangement is such that this machine can be used in conjunction with the motor-generator set so they can help each other out in time of heavy load, or either one of the machines can carry the load during the light load hours.

For street lighting, there are two Thomson-Houston series arc machines of 50-light capacity each, both belted to a single 100-h. p. simple non-condensing engine.

The boiler equipment consists of two 200-h. p. Keeler boilers, made by E. Keeler, of Williamsport, Pa., and two 125-h. p. boilers made by the Stearns Manufacturing Co., of Erie, Pa. During the coal strike of last winter we were forced to rely upon a very poor quality of coal, and at times all we could get was river coal, which is a coal that comes down the river from the mines and which is dug out of the river bed by anyone who cares to take it. For a part of the time the very best thing we could get for fuel was a poor quality of screenings from nearby coal yards, valued at about 25 cents a ton. In this emergency we rigged up a home-made steam jet blower for use under our boilers and this has worked so satisfactorily that we put it under all of our boilers and, as a consequence, we are now using a rice coal which costs \$1.65 a ton in place of the coal we formerly used, which cost \$2.10 a ton. I am aware that this idea of introducing a jet of steam under the grates is not new, and I am also aware that the scheme is not generally regarded favorably by engineers. But in our own case the blower enables us to keep up steam with a poor quality of coal, and I am



ARRANGEMENT OF STEAM JET FOR BOILERS.

confident we have reduced the cost of power to something like 1.5 cents per kilowatt hour. We carry a normal pressure of 90 pounds of steam on our boilers, and when the peak begins to come on, we can raise the steam pressure 10 pounds in 10 minutes with the use of the steam blower. We do not have to use the blower for more than 10 or 20 minutes at a time, and I am confident that the blower itself uses but a very small amount of the extra steam which it makes available.

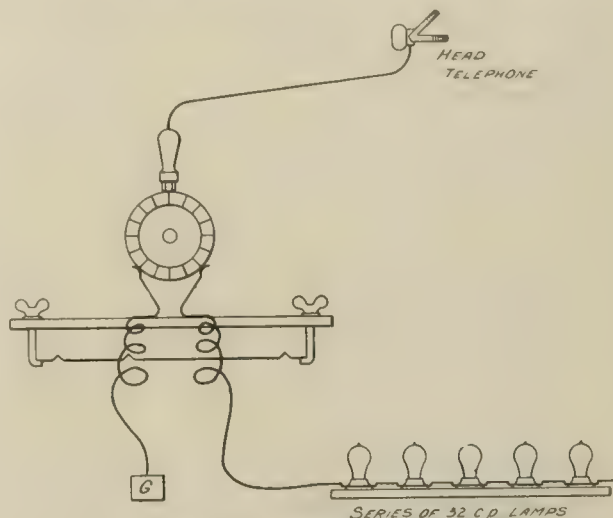
The blower is nothing more than a 20-ft. length of galvanized iron pipe, 9 in. in diameter, which is introduced through the front wall of the boiler room 6 or 8 inches below the grate level, as shown in the accompanying illustration. A 3-in. pipe bridges the live steam down into this 9-in. pipe, and the end of the small steam pipe is bent into a curve so as to point down into the grate. The section of the smaller pipe, included in the larger pipe, is perforated on the side toward the grate so that the live steam is directed back under the grate. When the steam is shut off by opening the valve admitting steam to the blower we can instantly increase our steam pressure to meet all over-

load demands in spite of the comparatively poor coal we are using.

We run our station in two shifts of 12 hours each, with one fireman and one engineer on the day shift, and one fireman and one engineer at night.

Rapid Method of Testing Armatures.

We are indebted to Mr. S. P. Baird, general manager of the Portsmouth (O.) Street Railroad & Light Co., for the following description of an efficient, rapid and economical method of testing for short and open circuits in newly-wound or repaired railway armatures. The company tried various methods with varying results, but none was satisfactory until the present method was



DEVICE FOR TESTING ARMATURES.

adopted. The accompanying sketch will furnish an excellent idea of the arrangement of the testing apparatus.

The armature to be tested is mounted between lathe centers and tested just after the last turning down of the commutator. A board clamped to the lathe carriage carries two brushes so placed as to make contact on the commutator 90 degrees apart, one brush is connected to the ground and the other to the trolley through a series of 32 c. p. lamps. Any telephone may be used with a head receiver to allow the operator two hands to work with. The operator should stand on an insulated platform to prevent accidental shock, in case the trolley contact should happen to be made and the ground contact broken.

The testing operation is as follows. Place the two contacts which connect with the telephone on adjacent bars; if everything is normal, and there are no open or short circuits, the operator will hear the generator current very plainly, as the telephone is in multiple with an armature coil. The armature is revolved and each pair of bars tested. Should two bars be short circuited no sound, or very little, will be heard, depending upon the resistance of the short.

If there is an open circuit no sound will be heard between any bars until the bars are found between which the open circuit occurs, when a very large sound results, as the telephone is in parallel with half the coils in series. The time required for testing by this method is only a few minutes and the cost is trifling.

"How to handle the traveling public" is the subject of a series of heart-to-heart talks which Mr. R. E. Lee, general superintendent of the Cincinnati Traction Co., has been giving to the employees at the different car barns. Uniform politeness and kind words are among the requisites urged.

The Metropolitan Street Railway Co., of Kansas City, began September 1st to improve the 8th St. tunnel according to plans prepared by Messrs. Ford, Bacon & Davis, the company's engineers, the work to cost \$120,000. It will be completed by Mar. 1, 1904. The old tunnel was 776 ft. long; the new will be 1,109 ft.

A Well-Written Folder.

The Ballston Terminal Railroad Co., which operates about 12 miles of track in and near Ballston Spa, N. Y., although owning a comparatively small property, believes in progressive methods of doing business, and as a result the company enjoys a larger gross revenue than the population of the territory itself would seem to afford. A freight and express business has been inaugurated and the actual freight tonnage moved over the road during the past year was in excess of 88,000 tons, this coming largely in car-load lots to and from the mills and other factories along the line.

The company does considerable intelligent advertising. One of its folders issued late in the summer is considered worthy of reproduction in part as furnishing a peculiarly good example of an excellent choice of language for a folder of this nature. The wording is simple with just enough of the poetic to express the sentiment in pleasing form without being too "flowery"—a result to be commended as the average writer is apt to overdo the poetic idea when attempting nature descriptive work.

The following is an abstract from the folder:

"While the attractions of Saratoga and its near-by lake resort at this season of the year are not to be gainsaid, yet to one who has the love of nature implanted strongly within his breast, a trip up the Ballston Terminal R. R. to the pretty village of Middle Grove



POWER HOUSE—BALLSTON TERMINAL R. R.

cluster. Over a large part of the distance the road makes its way through or skirts along dense forests of pine, hemlock and our native hardwoods, which are almost primeval in their luxuriance, and furnish the harmonizing shades of green without which all land-



EMPIRE MILL SWITCH—BALLSTON TERMINAL R. R.

is infinitely more satisfying. The route lies for the most part along the banks of the beautiful Kayaderosseras creek, and passes through several interesting hamlets, whose business lifeblood is furnished by the pulsations of the machinery of the paper mills about which they

scapes would be dull and uninteresting, and which are reflected with little loss of color from the still stretches of the Kayaderosseras. Vistas of distant mountains and open farming country are revealed through breaks in the forest growth, and peaceful homes singly and in groups pass in succession before the eyes. There are anon rushes of waters down the declivities of the stream-bed, ending in deep pools, and the mind conjures a picture of Isaak Walton, and wonders whether the last trout has been taken from the waters that assuredly at one time teemed with them.

"To the amateur botanist and lover of our native plants and flowers, the trip furnishes a panorama of vegetable life that is at once a surprise and a satisfaction. Everywhere we catch glimpses of the different members of the family of brakes, and here and there the drapery of polypods whose dark green will remain to give a touch of color to the winter landscape. In the deeper and cooler recesses of the forest we are quite sure the graceful maidenhair would reveal itself, and in its season jack-in-the-pulpit be discovered preaching his sermon without notes to the forest denizens. In the open places, sumacs, the wild sun-flower, black-eyed susans and other midsummer flowers of high color form a picture of barbaric splendor. Cattails and bull-rushes lave their feet in the shallow margins of the stream. 'Bouncing Bet' is elbowing her weaker sisters aside and appropriating quarter sections to her-



BLUE MILL BRIDGE—BALLSTON TERMINAL R. R.

self. A dazzling flash and a clump of lobelia cardinals on the opposite bank is revealed and holds attention until the intervening shrubbery cuts off the view. Goldenrod is everywhere, and in many of its multitudinous forms. In the damp places and along the margins of the creek the swamp milkweed furnishes a mass of color whose beauty it would be difficult to picture in words. Clematis Virginiana ('virgin's bower') is just opening, and throwing a drapery of lace-like effect in white over brush, and fence, and decaying log. There are other flowers, hosts of them, but before one can make a mental catalog of all, the car has come to a stop in Middle Grove, and the end of the road and of our outward journey is reached."

New Lines and Extensions Opened.

The Joliet, Plainfield & Aurora Railroad Co.'s line has been finished between Joliet and Plainfield (10 miles), and on Sunday, November 8th, regular service was established between these points—two cars on Sunday, with a 45-minute headway, and one car on week days, making the round trip in 1 h. 30 min. The opening of this part of the system was made the occasion of a celebration on November 7th, which was participated in by the mayors and leading citizens of Joliet and Plainfield, as mentioned in the "Review" for November.

The extension of the Toronto branch of the Steubenville (O.) Traction & Light Co., from the north end of Toronto to the New Cumberland Ferry, was opened to the public November 15th.

Trial runs were made November 22d over the Dayton & Western Traction Co.'s new branch line from Richmond to New Paris. The line is now open to traffic.

The formal opening of the Evansville & Princeton Traction Co., mentioned in the "Review" for October, took place December 8th with elaborate ceremonies, for which souvenir tickets were sold at \$5 each.

The Western Ohio Railway Co. has finished its line from Lima, O., to Piqua, Wapakoneta to St. Marys, Celina, New Bremen, and Minster, a total of 78 miles, and cars are running on a new schedule. It is the intention to run cars direct from Lima to Dayton without change.

The Little Rock (Ark.) Traction & Electric Co. inaugurated regular service over its Pulaski Heights extension November 26th. This bids fair to be a profitable line.

The first interurban car over the Indianapolis & Northwestern Traction Co.'s line between Lebanon and Lafayette, Ind., was run December 2d. The regular schedule between Indianapolis and Lafayette was put into operation December 7th. The first car to enter Kokomo was run December 6th and a two-hour schedule between Kokomo and Indianapolis was inaugurated.

The Cleveland & Southwestern Traction Co. inaugurated a through trolley service from Cleveland to Wooster, 53 miles, November 28th.

The Wheeling & Elm Grove Ry. has completed its line from Elm Grove to the state line at West Alexander, W. Va., and through service from Wheeling to that point was instituted December 7th.

The Illinois Valley Traction Co.'s system was opened from Utica to Marseilles, Ill., November 29th. Regular hourly service is given.

The Lonaconing & Westernport Electric Railway Co.'s system has been completed, the first car running into Westernport, Pa., November 29th. The new service between Cumberland and Westernport, over 30 miles.

December 11th gave the date for the opening of the Rockford & Freeport Electric Ry.'s line to Pecatonica, Ill.

The Terre Haute Electric Co.'s interurban line to Clinton, Ind., was formally opened December 11th.

The York Furnace R. R. & Trolley line between York Furnace and Millersville, Pa., was opened December 5th.

December 5th the Nashville Railway & Light Co. placed in operation its first car on the new North First St. line, which reaches a part of the city business district car service.

The Hackensack Heights extension which connects the Newark & Hackensack Traction Co.'s line with the New Jersey & Hudson River Railroad & Ferry Co. was opened for traffic December 7th.

The new line of the Providence Pawtucket Rhode Island Suburban Co., from East Providence to Pawtucket, opened December 4th.

New Orleans Railways Co.'s. New Plant.

When the New Orleans Railways Co.'s new power plant is completed, which will be in less than two years, it will consist of two engine divisions, one for railway uses only, and the other for commercial and electric lighting purposes. Both divisions will be served by one immense boiler plant comprising 16 batteries of two water-tube boilers each. The railway engine division is completed to the extent that one of the three engines is in operation and another is nearly ready. The steam for this division is generated at the present central power house. Part of the new boiler house will be located behind the railway engine room and after it is completed and connections made, the present central power house, which stands upon the adjoining site, will be torn down to make way for the commercial division engine room and the other side of the new boiler house. By this arrangement there will be no diminution of power during the progress of the work.

The new plant will cost, completed, approximately \$1,250,000. It will be located on Market St., between South Peter and Water Sts., and has a total frontage of 349 ft. The railway division of the new plant was designed before Mr. E. C. Foster became president of the company, while the commercial division and the new boiler plant details are directly under that gentleman's supervision.

The power house was designed by Messrs. Sargent & Lundy. It is of brick and steel and is built upon 2,200 60-ft. piles which extend 10 ft. beyond the foundations on all sides. The new equipment of the railway division consists, as at present operated, of one 1,500-kw. G. E. generator directly connected to an Allis-Chalmers vertical cross-compound engine of 3,200 h. p. maximum capacity. The two engines in course of installation will have a combined capacity of 3,250 kw. and these three units will furnish 575 volts exclusively for railway work. The switchboard is of the single-bus type. There will be 20 feeder panels, with switches and auxiliary instruments of 1,500 amperes capacity. The gravity oil system of lubrication has been adopted in the engine room.

When the commercial division is completed the capacity of the plant will be increased by 20,000 kw., involving the installation of 26,000 additional engine h. p. The engines for commercial uses will be three-phase, capable of developing 5,000 kw. each. It is not unlikely that turbines will be installed in the commercial division.

The new boiler house will extend from South Peter St. to Water St., completely across the downtown side of the two engine rooms. It will be equipped with 32 water-tube boilers of 1,100 h. p. capacity each, making a total of 35,200 h. p. The boilers will be symmetrically distributed upon two floors, one superimposed upon another. There will be four smoke stacks, two on each side, and each stack will be connected with two sets of boilers on each floor, or four batteries to each stack. The switchboards will be between the boiler house and engine rooms.

A feature of the boiler house will be a system of coal conveyors, overhead bunkers and mechanical stokers. The coal will be carried by the conveyors from the coal yards, which are about 150 yards from the plant, to coal reserve bunkers in the loft of the boiler house, these bunkers having a capacity of 5,000 tons. It will then be mechanically distributed to the furnaces. In case fuel oil is to be used it may be obtained through a system of pipes which lead to an oil barge landing adjacent to the coal yard, and supply either the boilers directly or the reserve fuel tanks of 11,000 bbl. capacity, which are already in use in connection with the old central power plant.

The two new engines which are being set up in the railway engine room were designed by Mr. Charles H. Ledlie, while the boilers and the commercial engine plant were planned by Messrs. Sanderson & Porter. The electrical connections were designed by and installed under the direction of Mr. McKinney, chief electrical engineer of the railway company.

The York & Wrightsville Traction Co. plans to open its extension to Hellam, seven miles east of York, Pa., December 25th, when the citizens will celebrate the event. The line will be completed to Wrightsville early in the spring.

The Twin City Rapid Transit Co. will expend a large sum of money in St. Paul next year in extensions and improvements to the street car system, and in addition will build shops and car barns on Snelling Ave., which will employ 1,000 men.

Personal.

MR. EDWARD O'HARA has been appointed manager of the Lorain Street Railway Co., of Lorain, O.

MR. E. B. CUYLER, of Chicago, has been appointed general agent for the Indianapolis & Northwestern Traction Co. at La Fayette, Ind.

MR. JAMES W. CROSBY has been appointed general manager of the Halifax (N. S.) Electric Tramway Co., Limited, vice Mr. F. A. Huntress, resigned.

MR. JOHN H. BUSHNELL has been appointed assistant manager of the Springfield, Troy & Piqua Railway Co., and the Springfield & Xenia Traction Co.

MR. EDWARD E. GATES, claims attorney of the United Railroads of San Francisco, and one of the foremost men in that line

in the country, ended a very successful career with the United Railroads on Dec. 1, 1903, to engage in the general practice of law, which he believes offers greater advantages than his former position. Mr. Gates was born in 1871, and is nearly 33 years of age. He graduated from Yale in 1891, studied at the New York Law School, New York City, and took the degree of LL. B. from the Indianapolis Law School, Indianapolis, Ind. After practicing for about six years in that city he abandoned his law business in 1900 to assume the duties of assistant claims attorney of the



E. E. GATES.

Southern Pacific Co., resigning to become claims attorney of the United Railroads of San Francisco in March, 1902, at the time that company was organized. Mr. Gates is a director of the Union League Club, of San Francisco, and served with the 27th Light Battery Indiana Volunteers in the Spanish-American war.

MR. CHARLES REMELIUS recently resigned as chief engineer and master mechanic of the Indianapolis Traction & Terminal Co. to accept a position with the St. Louis Transit Co.

MR. A. C. HARRINGTON has resigned as manager of the Erie (Pa.) Rapid Transit Street Railway Co. It is stated that Mr. Harrington has retired from electric railway work.

MR. EDWARD HAMMETT, JR., will sever his connection with the Mayer & Englund Co., January 1st, to accept a position with the Eureka Automatic Electric Signal Co., of Lansford, Pa.

MR. T. C. CHERRY has been appointed superintendent of the Saginaw-Bay City Light & Railway Co.'s lines in Saginaw, Mich., assuming his new duties December 1st. He was formerly manager of the Lorain (O.) Street Railway Co.

DR. F. A. C. PERRINE, Mem. A. I. E. E., and president of the Stanley Electric Manufacturing Co., delivered the Founder's Day address, November 30th, at the Thomas S. Clarkson Memorial School of Technology, Potsdam, N. Y.

MR. A. A. ANDERSON has been appointed general superintendent of the Indianapolis & Cincinnati Traction Co. He was formerly general superintendent of the Indiana Union Traction Co., and later became interested in a proposed electric interurban road in eastern Kansas.

MR. HARRY BULLEN has been appointed general superintendent of the Detroit United Ry., to succeed Mr. Albert H. Stanley, who recently resigned to accept a position with the Public Service Corporation of New Jersey. Mr. Bullen was formerly assistant general superintendent of the company.

MR. H. C. REAGAN, formerly superintendent of motive power of the Appleyard syndicate's roads, with headquarters at Medway, O., has been appointed to a similar position with the Cleveland, Painesville & Ashtabula Railway Co., where he will have charge of the power stations, sub-stations, and overhead lines.

MR. H. A. DAVIS has been appointed superintendent of the railway department of the Nashville Railway & Light Co. Until recently he has been associated with Messrs Ford, Bacon & Davis, the engineering firm in charge of the reconstruction work at Nashville, and was formerly connected with the New Orleans Railways Co.

MR. CHARLES V. WESTON, Mem. A. Soc. C. E., has severed his connection with the Chicago Engineering & Constructing Co., of which he was president, and will now give his entire attention to his duties as chief engineer of the South Side Elevated Railroad Co., of Chicago, and to his practice as a consulting engineer.

MR. JOSEPH C. LUGAR, who has been acting superintendent of the Wilmington & Chester Traction Co., Wilmington, Del., since Mr. C. R. Van Trump became unable to fill the position on account of sickness, has resigned. Mr. Lugar, who has business interests in Philadelphia, was recently severely injured in a railroad accident near Atlantic City.

MR. JAMES H. GAY has been elected a director of the Union Traction Co., of Philadelphia, to succeed the late Mr. William L. Elkins. He is a member of the carpet manufacturing firm of John Gay Sons, and is a director of the Fifth and Sixth Streets Passenger Railway Co., the Electric Traction Co., and also a director of the nautical schoolship Saratoga.

MR. THOMAS M. JENKINS has been elected president and general manager of the Imperial Transit Co., of St. Louis, which plans to operate an omnibus system between the downtown district and the Exposition grounds, and after the Exposition to inaugurate a regular city service. Mr. Jenkins was formerly general manager of the St. Louis & Suburban Railway Co.

MR. FREDERICK A. HUNTRESS has been appointed general manager of the Worcester Consolidated Street Railway Co., vice Mr. R. T. Laffin, who resigned to accept a position in Manila. Mr. Huntress was for five years general manager of the Halifax (N. S.) Electric Tramway Co., Limited. He began his street railway career with the West End Street Railway Co., of Boston, and later held a position in the electrical department of the Montreal Street Railway Co.

MR. S. M. MANIFOLD, formerly general superintendent of the Western Maryland R. R., with headquarters at Baltimore, has been appointed general superintendent of the York County Traction Co., York, Pa. The scope of Mr. Manifold's new duties will be very extensive, as the Traction company's system, when completed, will form a complete network over York county, and there will be considerable surveying, track-laying and construction work which will come directly under his supervision.

MR. J. B. McCLARY has resigned as manager of the railway department of the Birmingham Railway, Light & Power Co., the resignation to take effect January 1st. Mr. McClary has been associated with the various street railways of Birmingham for 16 years and was until 1901 general manager of the Birmingham Railway & Electric Co. Upon the consolidation of the gas, electric light and railway companies in that year he became manager of the railway department. He will enjoy a much-needed rest before deciding upon future business engagements. For seven years before his connection with the street railway company Mr. McClary was associated with the Pratt Coal & Iron Co. and the Tennessee Coal, Iron & Railway Co. Later he was secretary of the Woodward Iron Co. Mr. McClary is considered one of the most proficient managers in the street railway business, being a very practical man, familiar with every detail of operation. Under his management the railway department of the Birmingham company has shown marked progress.



J. B. McCLARY.

MR. SAMUEL J. DILL has been appointed superintendent of the Michigan Traction Co.'s lines in Kalamazoo and Battle Creek and the interurban system between these cities and adjacent summer resorts. His headquarters are at Kalamazoo. Mr. Dill has been for the past two years superintendent of the Detroit, Ypsilanti, Ann Arbor & Jackson Ry. He was previously connected with the operating department of the Metropolitan Street Railway Co., New York City, and before that with the train service of the New York, New Haven & Hartford Railroad Co.

MR. H. F. J. PORTER, who has been associated with Westinghouse interests since the first of the year, and has held the position

of assistant manager of the Westinghouse companies' publishing department, with offices in East Pittsburg and 10 Bridge street, New York City, has been made second vice-president of the Nernst Lamp Co., of which enterprise Mr. George Westinghouse is president, with the duties of general manager and with headquarters at Pittsburg. He assumed charge December 1st. This appointment does not affect Mr. Porter's relations with the publishing department at the present time.

MR. WILLIAM P. JACKSON was appointed general superintendent of the Bay Cities Consolidated Railway Co. on October 15th last. Mr. Jackson entered upon street railway work about 10 years ago in the shops of the Columbus Railway Co., where for about three years he was engaged in various departments of shop and electrical work. He resigned to accept the position of general manager of the Marion Street Railway Co., where he remained about six years, resigning in January of this year to accept a position with the Indiana Union Traction Co., as local superintendent at Anderson, Ind. From Anderson he went to Bay City.

MR. FRANK G. BOLLES has been appointed business manager of Cassier's Magazine and the Electrical Age, the latter journal having recently been purchased by Mr. Louis Cassier, and both being issued from the same office at No. 9 W. 29th St., New York. Mr. Bolles' earliest experience in technical journalism was gained in the editorial department of the Electrical World 10 years ago. He next became head salesman of a large steam and electrical machinery and supply house, and from that he entered the employ of the Westinghouse Electric & Manufacturing Co. as designer of advertisements and writer of special booklets. In 1898 he became manager of the advance and foreign sales department of the Bullock Electric Manufacturing Co., of Cincinnati, where he remained until going with Mr. Cassier. He is a member of the American Society of Mechanical Engineers and of the American Institute of Electrical Engineers.

MR. GEORGE H. HARRIS has been appointed superintendent of the railway department of the Birmingham Railway, Light & Power Co., and will assume his new duties January 1st. He was born in Rome, Ga., a little over 30 years ago and has been connected with the Birmingham street railways for 13 years. In 1880, when the mule-car system was being changed to electricity, Mr. Harris was in charge of the reconstruction and upon the completion of the work was made master mechanic, in which capacity he served until about two years ago, at which time the office of superintendent of traffic was created and he was chosen for the place. Upon the resignation of Mr. McClary as manager, Mr. Harris was appointed superintendent. Mr. Harris is a graduate in civil engineering, and was on the engineering corps of the Chattanooga, Rome & Columbus R. R., Briarfield, Blocton & Birmingham R. R., Southern Ry., Alabama, Georgia & Florida R. R., and the Georgia Midland & Gulf R. R., serving in the construction departments of these roads.

MR. WALTER H. WHITESIDE, the manager of the detail and supply department of the Westinghouse Electric & Manufacturing Co., has also been made the general manager of the Sawyer-Man Electric Co. and has added the duties of this new office to his former ones. Few men are better known than Mr. Whiteside in the electrical business. He has been connected with electrical trade interests for nearly twenty years and during that time has extended his acquaintanceship to every part of the country and cemented friendships wherever he went. Mr. Whiteside became a special salesman for the Westinghouse company in Chicago in 1898. A year later he was sent to Washington, D. C., to take charge of sales to the Government. This led, in 1900, to his being made manager of the company's office for that district, then having its headquarters in Washington. From the Washington office Mr. Whiteside was promoted to the management of the detail and supply department of the company, with headquarters at Pittsburg, and under his management the business of this department has greatly increased.

The Chicago city council has adopted a resolution instructing its local transportation committee to begin negotiations with the Union Traction Co. for the removal of its tracks in the La Salle and Washington St. tunnels under the Chicago River, to permit the destruction of the bores, on the ground that the tunnels are a great obstruction to shipping. The company ought to operate cars in the tunnels, but has been unable to do so.

Obituary.

MR. FRANK A. DRAPER, formerly superintendent of the Detroit, Lake Shore & Mt. Clemens Ry., and later associated with the Detroit & Northwestern Railway Co., died recently at Liberty, N. Y.

MR. CLARK YERRICK, assistant superintendent of the San Francisco, Oakland & San Jose Railway Co., was instantly killed near his home at Oakland, Cal., November 21st, by accidental contact with a dead telephone wire which had fallen across a live electric light wire. He had been in the employ of the Oakland Transit Co. since 1894, and was formerly employed by the Southern Pacific Co.

New Publications.

THE INFLUENCE OF ELECTRICITY ON THE DEVELOPMENT OF WATER POWERS. A paper read before the New England Cotton Manufacturers' Association. By F. A. C. Perrine, D. Sc., Pittsfield, Mass. Published in pamphlet form, 11 pages. Press of E. L. Barry, Waltham, Mass.

VERBATIM REPORT OF SEVENTH ANNUAL MEETING OF STREET RAILWAY ACCOUNTANTS' ASSOCIATION. This is a complete record of the proceedings of the last regular convention of the Association, held in the Grand Union Hotel, Saratoga Springs, N. Y., Sept. 2-4, 1903. It contains 198 pages of carefully compiled data, together with a lithograph frontispiece showing an excellent likeness of Mr. H. J. Davies, president of the Association for 1902-03. In addition to the usual index of contents there is appended a summary index of previous reports, comprising addresses, papers read, portraits of former presidents of the Association, remarks, committee reports and the United States Census statistical report. The report was prepared by Mr. W. B. Brockway, secretary of the Association.

PROCEEDINGS OF TWELFTH ANNUAL MEETING OF PENNSYLVANIA STREET RAILWAY ASSOCIATION. This is the complete verbatim report of the 12th annual meeting of this Association, held at the Park Hotel, Williamsport, Pa., Sept. 23-24, 1903. Among other features the report contains a very complete Question Box, consisting of 370 questions and answers relating to all phases of street railway work. These questions and answers form a very valuable contribution to literature pertaining to the electric railway industry. The Question Box was printed in full in the October and November issues of the "Street Railway Review." The appearance and convenient arrangement of the contents of this report reflect unqualified credit upon Mr. Ernest H. Davis, the retiring president of the Association, and Mr. G. E. Wendle, editor of the Question Box.

LES CHEMINS DE FER ELECTRIQUES. By Henry Matéchal. 596 pages, cloth, 516 illustrations. Published by the Librairie Technique, Ch. Béranger, editor, Paris, France. Price \$5.00 (25 francs).

This is a general discussion of electric traction, in which the standard types of construction, generating and transmission apparatus are compared, the subjects including dynamos, transformers, direct, alternating and three-phase current, storage batteries, motors, cars, trucks, track and line construction, rail bonding, etc. Leading features of the Westinghouse, General Electric, Sprague, Thomson-Houston, Auvert and other systems are touched upon, and the Langen and Behr-Larigue mono-rail systems are also described. There is a chapter, also, showing the comparative cost of city and suburban electric railways. The book is very complete and contains many examples of the most modern practice in electric railways.

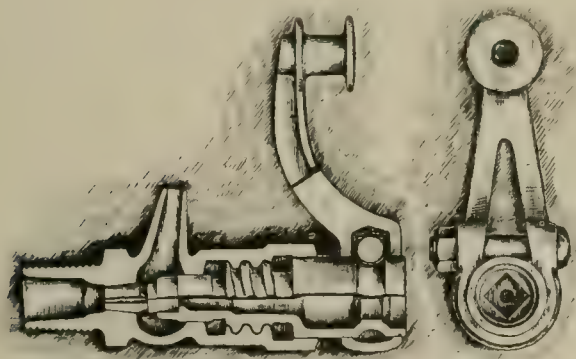
POOR'S MANUAL OF RAILROADS, 1903. The 36th annual number. Royal octavo, cloth, 1,720 pages, 24 colored state and group maps, together with railroad maps, indexes, etc. Published by Poor's Railroad Manual Co., 68 William St., New York City. Price, \$10.00.

The statements presented in the number of Poor's Manual are arranged in four sections, the first comprising the statements of all the steam railroads in the United States and Canada and the chief ones in Mexico; the second all the street railway and traction companies in the United States; the third the leading industrial corporations and organizations auxiliary to the railway interests, and the fourth showing the finances and resources of the United States,

the several states, and the chief counties, cities and towns in the country. Features are the compilation of dividends paid by the steam and street railroad companies and industrial corporations from 1896 to 1903, a directory of railway officials, and railroads merged in other lines. The new edition of the Manual is considerably larger than any previous issue and correspondingly more complete in its scope and contents, returns of all leading railroads for the year ending June 30, 1903, or later, that were received up to Nov. 1, 1903, being included in its pages. Compared with the Manual for 1902, the current issue increased in the department of steam railroads from 846 to 880 pages, the number of corporations for which statements are presented being 2,043 this year, against 1,937 in 1902. In the section devoted to statements of city and suburban railways the number of corporations reported in 1903 is 1,177; in 1902, 1,156; number of pages in this section, 257 in 1903, against 239 in 1902. In the department of miscellaneous industrial corporations, statements are presented for 230 enterprises, against 199 in 1902. To provide space for this expansion in the scope of that department called for an increase of 32 pages, the Manual for 1903 devoting 145 pages to the presentation of statements of the affairs of the "Industrials" against 113 pages in the previous issue of the book.

A Gage Cock That Can Be Closed Tight.

The gage cock illustrated herewith is in reality the outcome of "trouble." The writer had ordered what he considered high grade gage cocks for the Aurora, Elgin & Chicago Ry. power station, which he designed and superintended the construction and putting into operation. The gage cocks which he placed on the boilers were perhaps as good as any that are on the market. These had a so-called regrinding lever and chain-operated valve and closed by means of a light spring together with steam pressure. These were reground many times, but notwithstanding this the gage cocks were constantly leaking either on one boiler or another, and it finally became evident that the only cure was to replace them with something more practical. It had been noticed that if a man went up to a gage cock that was leaking slightly and forced the valve to its seat by raising hard on the lever that the leak could be stopped. This demonstrated a fact that had not been fully considered, namely, that we were trying to make a gage cock tight



TIGHT CLOSING GAGE COCK.

under almost no pressure to force the valve to its seat. We all know what would happen to the other valves in a steam plant if we should simply close them lightly on their seats, allowing steam to escape by the seat ever so slightly. This point constitutes "defective detail" and the same rule applies in connection with gage cocks as to any other device with defective detail. "It may work part of the time, but it can never be relied upon."

We therefore came to a consideration of what the gage cock should be in order to be a success. First, it had to be of such a form that the valve could be forced to its seat and held there under considerable pressure. Second, it must contain a soft disk that will take up all ordinary wear. Third, it should have a hard bronze seat, readily removable in case of being damaged by metal chips or the like.

An attempt was made to find on the market a gage cock comply-

ing with these specifications, but without success. The only thing which approached these requirements was a fine-thread compression-gage cock with a soft disk set in the stem and operated with a hand wheel, but how could this be operated from the floor, at a height of about 12 ft.? In the meantime we had concluded that a gage cock such as the one illustrated herewith was what was necessary to fully meet our requirements, and as we found nothing available on the market we had a number of these cocks made and equipped this plant with them. These have been operating on the eight boilers at the Batavia power house for about a year and all of them have been tight all the time, and not one soft disk has been renewed. This success is due entirely to the fact that the valve can be forced to its seat the same as we should wish to force down any valve. A valve covering a 3-16 in. hole has but 1-36 sq. in. surface and 5 lb. pressure to close it. The valve shown herewith has a 3-in. lever and 1/4-in. screw pitch, or 19-in. lever travel to 1/4 in. of screw travel toward the seat, and with 10-lb. pressure on the lever a pressure of 760 lb. would be exerted on the seat face, or about 350 lb. after allowing for screw friction. In fact, the pressure can be increased on the lever sufficiently to force the soft disk to a new seating face in case a leak is allowed to blow until the face is grooved. In order to be able to return the lever to the proper angle after forcing the soft disk, a square bar shaped like the letter L is used as a key to keep the center plug from turning while moving the lever back to the desired position. A jaw piece is attached to the end of a light but stiff hardwood pole, which enables the ready operation from the floor of any gage cock desired. The lever is reversible on the screw plug of the gage cock so that the center gage cock lever will not interfere with the upper and lower gage cock levers. No chains, rods or other dangling devices hang from the column, and one operating rod is sufficient for the entire plant. This rod being an unjointed, rigid affair, contains nothing to get loose or out of order.

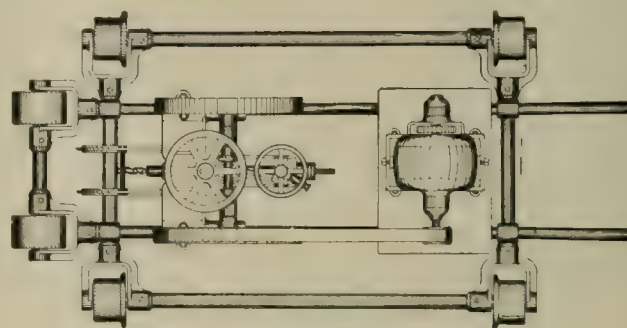
A patent has been allowed the writer on these gage cocks and arrangements have been made whereby they can be furnished to anyone desirous of securing them.

Chicago, Ill.

WILLIAM L. MORRIS, M. E.

New "Cleveland" Drill for City Use.

The Ludlow Supply Co., of Cleveland, has just completed a track-drilling machine for use in cities where there are tracks in streets and where it is necessary to get machines off the track quickly, so as not to delay cars.



NEW "CLEVELAND" DRILL.

As will be seen from the illustration, there are two flat wheels at the side, which stand about one inch above the pavement when the machine is being operated. By raising the rear end of the machine a few inches, the weight is thrown upon the flat wheels, when it can readily be pushed off the track, one man handling it without much effort. This machine, it is claimed, can be taken off the track and replaced much quicker than a hand ratchet and is ready for immediate use when replaced. It will drill within 1 1/2 in. of the bottom of a 9-in. girder rail.

These machines are made for hand power or electric power with automatic feed, drill grinder, etc., complete, and ready for use when received.

The Brooklyn Rapid Transit Co., at the request of patrons, has issued orders to permit smoking on the rear platforms of all closed cars on its system.

Street Railway Legislation for 1903.

Arizona.

RESTRICTION ON GRANTING OF FRANCHISES.

No. 81 of the Laws of Arizona of 1903, an act to restrict granting of franchises for public utilities in municipal corporations, provides, in part, that hereafter no franchise for any public utility shall be granted by any municipal corporation or the authorities thereof in the territory of Arizona, to be maintained or operated by any private person, etc., in any municipal corporation in the territory unless authorized to be granted by a majority vote of the qualified voters of such municipal corporation at a regular election held in said municipal corporation.

Connecticut.

STREET RAILWAYS NOT RUNNING ON PUBLIC STREETS OR HIGHWAYS TO BE FENCED.

Chapter 70 of the Public Acts of Connecticut of 1903, entitled "An act concerning fencing street railways," provides that the provisions of sections 3733 and 3735-9 of the general statutes, relative to the construction of cattle guards and the fencing of railroads, shall hereafter apply to street railways, except when such street railways are located in public streets or highways.

DIFFERENT KIND OF PAVING NOT TO BE REQUIRED.

Chapter 209 of the Public Acts of Connecticut of 1903 provides that, on an appeal taken under the provisions of section 3832 of the general statutes to the railroad commissioners, the latter shall make no order providing for the paving of a highway required by law to be paved by street railway companies, which shall require the use of a different substance for such pavement than that with which the whole remaining width of such highway is paved.

TITLE BY ADVERSE POSSESSION NOT ACQUIRED TO LAND USED BY ELECTRIC RAILWAY COMPANY.

Chapter 85 of the Public Acts of Connecticut of 1903 provides that if any person shall take into his enclosure any part of land belonging to a railway company within the limits of which said company has located an electric railway, or shall erect any building upon any part of such land, said person shall not by adverse possession acquire any title to the land so enclosed or built upon.

Florida.

RAILWAY TRAINS AND STREET CARS TO STOP AT CROSSINGS OF TRACKS AND TO SLOW DOWN CROSSING DRAW BRIDGES.

Chapter 1276 (No. 111) of the Laws of Florida of 1903 provides that section 2263 of the revised statutes of the state relative to railway trains shall be amended as follows: "Every train of passenger cars or of freight cars drawn by one or more locomotives and every street car drawn by horses, propelled by steam, electricity, compressed air, or other power, upon railway track shall come to a full stop before arriving or crossing the track of another railroad company or street railway track and within four hundred feet thereof, and the train or street car as the case may be arriving at such crossing first shall move on and cross first, and every such train or street car shall also slow down to a speed of not more than one mile an hour before running on or crossing the draw of any draw bridge over a stream which is regularly navigated by vessels. Besides the liability of the company to a penalty for the violation of the above provisions, the motorman or other person operating a street or locomotive engine who shall violate them shall be punished by imprisonment in the county jail for a period of not more than six months, or by fine

of not more than \$500, or by both such fine and imprisonment at the discretion of the court.

Georgia.

DEDUCTION ON FRANCHISE TAXES.

On pages 18 and 19 of the Georgia Laws of 1903 is an act to provide for the deduction on franchise taxes due counties, cities, towns, and villages of all amounts paid, or liable to be paid, under any agreement therefor or otherwise to such counties, cities, towns and villages by the person, partnership, association or corporation affected, except amounts due for ad valorem taxes on account of the physical property located therein. But any money that may be paid for bridge rentals, or for paving or repairing of pavement of any street, highway or public place, shall not be included within the amounts to be deducted, and no greater credit shall be allowed on account of the payments above mentioned than the amount of the franchise tax due the county, city, town or village for the current year.

STREET RAILROAD COMPANIES AUTHORIZED TO FURNISH STEAM HEAT AND POWER.

On page 684 of the Georgia Laws of 1903 provides that all electric street railroad companies now or hereafter incorporated under the laws of the state shall have power, in addition to the powers they now have, to furnish steam for heating and power purposes to any person or corporation within the limits of the counties in which such corporations operate, with power and authority to charge and collect reasonable compensation for the same, and with full power to do any and all things necessary or convenient to carry the power herein conferred into full effect, and to use the streets and public places to lay and maintain their pipes and other appliances for conveying and distributing such steam; provided, that before any of said companies shall be entitled to use any of the streets of any city in the state the consent of such city shall be obtained.

Minnesota.

AUTHORITY CONFERRED ON VILLAGES TO GRANT FRANCHISES.

Chapter 130 of the General Laws of Minnesota for 1903 empowers the village council of any village in the state having a population of less than 3,000 inhabitants to grant by ordinance to any person, persons, or corporation, for the purpose of connecting any such village with other villages, cities, or outside territory by what is commonly known as street railway lines the right to construct, maintain and operate street railway lines, by other than steam power, for the transportation of passengers on any of the public streets of said village for a period of not exceeding 25 years; provided, however, that nothing herein contained shall be construed to authorize the granting of any exclusive franchise. Such action previously taken is legalized and confirmed.

Missouri.

ELECTRIC LIGHT PLANTS MAY OPERATE STREET RAILWAYS IN CITIES OF 10,000 OR LESS.

On page 102 of the Laws of Missouri of 1903 is an act which provides that, in all cities and towns of ten thousand inhabitants or less, any corporation having the right to operate electric lights or furnish electricity or motive power may extend its business to include the purchase, construction, and operation of street railroads, such extension of business to be made in the same manner as provided in sections 1328 and 1329 of the revised statutes.

WHERE AND HOW REMOVAL OF MORE THAN TWO TRACKS IN STREET MAY BE REQUIRED.

On pages 133-135 of the Laws of Missouri of 1903 is an act which provides that the county court of any county of the state or the municipal authorities of any incorporated city or town, which now has a population of 50,000 inhabitants or more and adjoining a city which now has or may hereafter have a population of 300,000 inhabitants or more shall have the power and authority when petitioned by a majority of the owners of the land representing more than one-half of the frontage along any public road or street of the state, upon which is now constructed or may hereafter be constructed more than two street railroad tracks, stating in said petition that said public road or street has more than two tracks constructed thereon and that the same is rendered impracticable by reason thereof, the court may compel said railroad company or companies or any one of said companies to take up and remove its said track or tracks so as not to leave more than two tracks on said road or street. Any street railroad company which is or may be hereafter authorized by the county court or the municipal authorities of any incorporated city or town, to operate a line of street railroad cars along, across or upon any of the public roads or streets, along, across or upon which public roads or streets any other street railroad company owns a street railroad, may be compelled by said county court or the municipal authorities of any incorporated city or town to permit and authorize said company whose tracks have been ordered removed to operate and run its cars over the tracks of said other company upon the payment of just compensation to said other company, for the ascertainment of which rules and regulations are prescribed in this act. The company using the tracks, or parts of the track of another company, under the provisions of this act, shall run its cars while on said track at the same rate of speed as the cars of the company owning said track, and shall construct and keep its connections with the track of the company so as not to delay or interfere with the cars of the company owning the track. Any company using the track of another company, in whole or in part, shall charge no more than one fare over its whole line. Any company required under the provisions of this act to take up and remove its said track or tracks shall repair the road or street in as good condition as before the taking up of said track and with the same material and under the supervision of the commissioner of roads and bridges.

Montana.

LIABILITY FOR DAMAGES TO EMPLOYEES.

Chapter LXXXIII of the Laws of Montana of 1903 provides that every railway corporation, including electric railway corporations, doing business in the state shall be liable for all damages sustained by an employe thereof, within the state, without contributing negligence on his part, when such damages are caused by the negligence of any train dispatcher, telegraph operator, superintendent, master mechanic, yardmaster, conductor, engineer, motorman or of any other employe who has superintendence of any stationary or hand signal. No contract of insurance, relief, benefit, or indemnity in case of injury or death, nor any other contract entered into either before or after the injury, between the person injured and any of the employes named in this act shall constitute any bar or defense to any cause of action brought under the provisions of this act.

New York.

PLATFORMS TO BE ENCLOSED.

Chapter 325 of the Laws of New York of 1903 provides under penalty that every corporation operating a street surface railroad in the state, except such as operate a railroad or railroads either in the borough of Manhattan or Brooklyn, in the city of New York, shall cause the front and rear platforms of every passenger car propelled by electricity, cable, or compressed air, operated on any division of such railroad which extends in or between towns or outside of city limits, during the months of December, January, February, and March, except cars attached to the rear of other cars, to be enclosed from the fronts of the platforms to the fronts of the hoods so as to afford protection to any person

stationed by such corporation on such platforms to perform duties in connection with the operation of such cars. All street surface railroad passenger cars hereafter purchased, built or rebuilt and operated in the state of New York on and after the passage of this act, except those owned by any company operating either in the borough of Manhattan or Brooklyn, in the city of New York, shall be constructed in accordance with the foregoing provisions of section one. This act shall take effect December 1, 1904. Except that where the cars of any corporation affected by section one of this act are operated in cities other than the boroughs of Manhattan or Brooklyn in the city of New York, the cars belonging to the corporations so operated shall be equipped with the enclosures provided for: one-third thereof before December 1, 1904, one-third after December 1, 1904, and before December 1, 1905, and the remaining one-third thereof after December 1, 1905, and before December 1, 1906.

North Dakota.

AUTHORIZES TROLLEY LINE TO CAPITOL, CONVICTS TO BE EMPLOYED IN CONSTRUCTING SAME.

Chapter 29 of the Laws of North Dakota of 1903 authorizes the board of trustees of public property to construct, keep in repair, and operate a single track electric trolley line of railway from the capitol building to the Northern Pacific depot or a point conveniently near said depot in the city of Bismarck; provided, that the board shall, so far as the same can reasonably and profitably be done, utilize the labor of the convicts in the state penitentiary in constructing said electric railway.

North Carolina.

STREET RAILWAY COMPANIES DEFINED.

Chapter 350 of the Public Laws of North Carolina of 1903 amends chapter 6, Public Laws of 1901, entitled an act to authorize the incorporation of street railway companies under the general law, by adding at the end of section 1: The term "street railway companies" wherever used in this act shall be held to include railways operated either by steam or electricity, or by whatever motive power which are used and operated as means of communication between different points in the same municipality, or between points in municipalities lying adjacent or near to each other, or between the territory lying contiguous to the municipality in which is the home office of said company, and such railways may carry and deliver freights: Provided, that no such railway shall operate a line extending in any direction more than fifty miles from the municipality in which is located its home office.

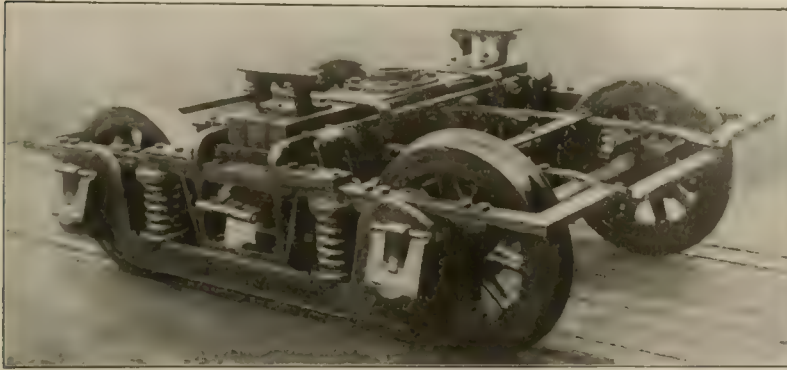
Oklahoma.

AUTHORITY FOR INCORPORATION.

Article 4 of chapter 9 of the Session Laws of Oklahoma of 1903 provides that corporations may be formed under the general railway laws of the territory "who" shall have the power to use electricity for the propulsion of their cars and rolling stock, provided that no surface conductor, third rail or other similar device for the transmission of such power other than for return circuit shall be used. Such corporations in addition to the powers exercised by railroad corporations generally, may, with the consent of the authorities of any city or town in the territory of Oklahoma located upon or along its lines, construct a system of street railways upon such streets and upon such terms and conditions as may be agreed upon between such corporations and such city or town, and may also accept lighting contracts with such cities or towns to supply the said cities or towns or the inhabitants thereof, with light or electric current for power, or such railways or such corporations may also acquire by purchase or consolidation, plants, franchises, contracts, good will, and other property of any existing street railway or lighting company. All licenses or franchises heretofore granted to any street railway company authorizing the construction and operation of an electric street railroad in any city of the first class in the territory and which have not become forfeited or lapsed by their terms, are hereby ratified, legalized and confirmed.

"Interborough Special" Truck.

The accompanying illustration shows one of a lot of 400 trailer trucks which are being built by the St. Louis Car Co., and which are known as its "Interborough Special" trucks. These were built for the Interborough Rapid Transit Co., of New York City. This truck comprises a solid forged top frame, in one piece, composite side frames and a flitch swing bolster supported by two triple



"INTERBOROUGH" TRUCK. ST. LOUIS CAR CO.

elliptic springs, and it is also fitted with two equalizer double coil springs. The transoms are forged, the transom plates and all wearing plates and bolts are machine fitted and all holes are drilled. The truck is equipped with M. C. B. journal boxes. The wheel base is 5 ft. 6 in., and the total weight of the truck is 8,800 lb.

Accidents.

November 19th two persons were killed and eight injured in a rear end collision between two motor trains on the Brooklyn Elevated R. R. The two who lost their lives were the conductor and motorman of the rear train, who were burned to death. The blame was attached to the dead motorman.

November 24th two Third Ave. elevated trains collided at the 129th St. station, New York City, and two passengers were seriously injured. Several cars were damaged.

November 24th a switch engine on the Chicago & Eastern Illinois R. R. ran into a Chicago General Railway Co. car at 22d St. and Stewart Ave., Chicago, injuring six persons severely. The fault was said to lie with the steam road employees.

A Wheeling Traction Co. car jumped the track at Bellaire November 25th, went over an embankment, and was left standing on end. There were no passengers, but the conductor and motorman were slightly injured and the car was badly damaged.

November 30th there were two accidents on the Metropolitan Underground Ry., Paris, France, similar to the accident of August 10th, which was described in the "Review" for August. There was no loss of life this time, but in each case a car was burned between stations and passengers had to escape along the tracks.

There was a collision between two motor trains on the Brooklyn Elevated R. R., on the incline at Jamaica Ave. and Crescent St. November 24th. Four of the injured were sent to the hospital.

December 2d a dense fog in the morning caused a rear end collision between north-bound trains on the South Side Elevated Railroad Co's. system, Chicago, at 51st St. Six persons were injured.

Six persons were injured in a trolley collision in Philadelphia November 28th between an 18th St. car and a South St. car.

A Baltimore & Ohio R. R. milk train ran into a South Chicago City Railway Co. car in South Chicago December 2d and five persons were seriously hurt. A defective air brake on the electric car was blamed.

Two interurban cars of the Cincinnati & Eastern Traction Co. collided at East Hill, O. November 29th, through a misunderstanding of orders. Both motormen were badly injured.

December 6th an engine on the Chicago, Lake Shore & Eastern Ry. ran into a South Chicago City Railway Co. car, injuring three persons.

A collision occurred on the St. Elmo division of the Chattanooga Electric Railway Co. December 2d. Four persons were injured and the cars damaged to quite an extent.

Two Pacific Electric Railway Co. cars were telescoped at Whittier Junction November 30th. Both cars were wrecked and fifteen passengers injured, one seriously. It was foggy.

December 3d, in a head-on collision between cars on the Dayton & Western Traction Co's. line, 17 miles east of Richmond, Ind., one person was killed and several injured.

A Moline, East Moline & Watertown Railway Co. car was wrecked at East Moline December 4th, as the result of some one having placed two rocks on the track with the evident intention of wrecking the car. The car was overturned and badly damaged, and one passenger was seriously injured.

Two Central Pennsylvania Traction Co. cars collided in a dense fog at Harrisburg December 4th. One car was badly damaged and the motorman was severely but not fatally hurt.

Combination Safety Gate and Step Guard.

We present herewith two illustrations of a combination safety gate and trap-door step guard which has been invented for use on electric cars to prevent passengers from alighting from the wrong side and also to protect them from the danger of being struck by passing cars. It was designed by the mechanical department of the Pacific Electric Railway Co., with the co-operation of Mr. Joseph McMillan, chief clerk to the general manager of the company.

As will be noted by reference to the right-hand view, the gate is made of two sections of $\frac{3}{4}$ in. pipe, one end of each section being



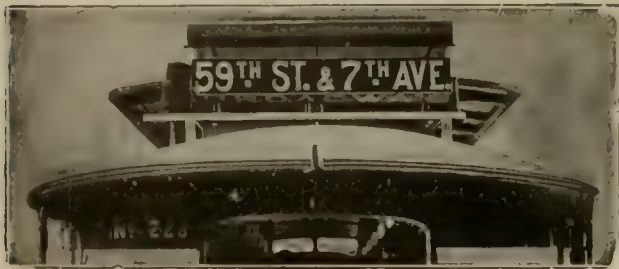
FOLDING GATE AND STEP GUARD.

screwed into a brass casting which is secured to the door post and acts as a hinge, the opposite ends being similarly secured to castings which drop into brackets upon the gate being lowered into a closed position. The lower pipe section of the gate is connected with the trap door by means of a wrought iron strap, so that when the gate is raised and folded back against the door post, the same movement raises the trap door, and the whole is fastened back on the way by means of a latch attached to the door post.

The contrivance is so simple that any one can operate it, and it contains so few parts and requires so little material that it is inexpensive. Furthermore, the absence of bulkiness serves to render it ornamental as well as useful.

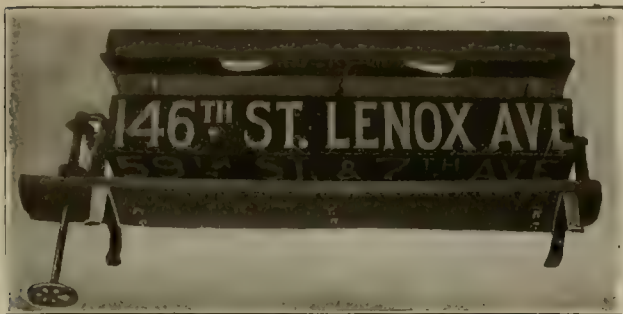
"Seein' Things at Night."

Under this catchy title, the Columbia Machine Works & Malleable Iron Co., Chestnut St., Brooklyn, N. Y., has published a small folder describing the Millen illuminated reversible car sign, of which this company is the sole maker. This is the sign that is



EXTERIOR OF MILLEN CAR SIGN.

now in use on all the cars of the Metropolitan and Union street railways of New York City and on many other roads. The sign has four sides, giving four separate indications, but these can be in-



MILLEN CAR SIGN, SHOWING DEVICE FOR TURNING.

creased to eight by inserting a second slide in front of each of the four original faces. Any one of the sides can be brought into view by turning the hand-wheel from the platform for the end signs and from the inside of the cars for the side signs. The lettering on the hand wheel corresponds with the lettering on the sign, and the conductor or motorman is therefore able to tell what sign is in view without going outside the car. Each sign has two incandescent lights placed above it with a reflector above the lamps which throws the light down on the sign, making it as readable by night as by day. These incandescent lamps are independent of the revolving part of the sign.

The Columbia Machine Works & Malleable Iron Co. has recently greatly enlarged its factory and in addition to its other specialties the company is making a special feature of supplying castings of all kinds, especially motor cases. The iron foundry is 200 x 100 ft. and the cast iron department is about 100 ft. square. There has just been added a new cupola with a capacity of 15 tons a day. A new tapering machine has been added for forming and tapering the well-known "Columbia" steel trolley poles.

Bicycle Street Car Inspectors.

The Georgia Railway & Electric Co., of Atlanta, has established a bicycle corps of street-car inspectors with excellent results. The bicycle facilitates the work of the inspectors and makes it possible for them to get about more quickly. They watch after the schedules and straighten out any difficulty that may occur on the lines. The company employs 12 inspectors, and heretofore all of them have depended upon the street cars to get them over the city. Under the new arrangement six of them use bicycles, while the other six operate as of old.

The Growth of a Privilege.

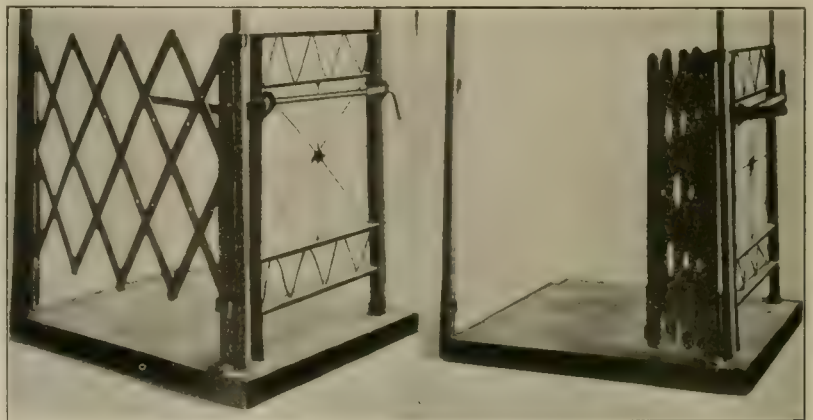
"It wasn't many years ago that you went where you could, not where you wanted. There were beaten tracks of travel and the tracks were well beaten, too, and far apart. First the path through the forest. Then the pike and the stage coach. Then an isolated railroad track and with each step we were properly jubilant. Man moved in the crowds of his fellows, for the avenues only were traversable. Increased facilities of travel rub man against man, broaden our civilization and develop the personality of the individual. This is turgid, maybe, but we are getting on. Today what one can do upon his responsibility, where he can go at his own volition, is no better typified than in the accessibility to all of the special car. One can secure these—by telephoning to headquarters—for private parties, for lodge meetings in the near-lying towns, for any purpose where one desires the exclusive society of one's friends."—Extract from Detroit United Weekly, Issued by Detroit United Ry.

Folding Gate for Car Platform.

Herewith are presented two views of a new folding gate, the invention of Messrs. Samuel and Harry Kalisher, of Chicago, which is adaptable for street cars, and is particularly suitable for elevated railroad use. It has been designed especially to avoid inconveniencing passengers and at the same time to allow the occupancy of the full platform space, and it is so constructed that it may be quickly opened and closed without in the least discommoding patrons, even when the platform is crowded to its capacity.

The new gate is built on the extension principle. It is operated by a crank shaft or rod which turns in bearings on the uprights at the front of the car platform, or on any suitable, fixed support. On the end of the operating rod farthest from the gate is a handle by which the rod is turned and the necessary leverage acquired; on the end of the rod nearest the gate is a crank arm to which is attached the mechanism which directly operates the gate. The end of the crank arm is two-pronged, and between the forked ends is pivoted one end of the link which transmits the motion to the gate, the other end of the link having a pivotal connection with the gate. This link is in the form of a turn-buckle, so that the action of the gate may be adjusted to suit different width openings.

The pivotal connection of the link with the gate is on a level with the center of the operating rod, so that when the gate has been closed the pivotal connection between the crank arm and the



FOLDING GATE FOR CAR PLATFORMS.

link is brought below the level of the link bearing on the gate, and when in this position the crank arm engages a stop on the guard frame which prevents further downward movement of the crank arm. This results in locking the gate automatically, so that it is impossible for it to be opened except by manipulating the operating rod. When the gate has been opened it is automatically locked back in a similar manner. By constructing the gate nearly the full height of the car passengers are prevented from climbing over it, or leaning out and interfering with signals between trainmen and guards.

DO stand upon your merits.—Buzzard's Bay Philosophy.

To Signal Cars at Night.

The patrons of interurban roads frequently complain that it is difficult to attract the attention of motormen on lines that run through sparsely populated districts. A common way of signaling the motorman of an interurban car is to light a match and hold the flame so that it will be visible from the approaching car, but this method is inconvenient for women and at the best is an unsatisfactory makeshift. Besides, a passenger desires a light while waiting for a car, particularly if it be in a dark and lonely place. A number of roads maintain clusters of lamps at all regular stopping points, but if the lights are kept burning continuously there is a very considerable expense for current and also for the replacement of lamps. Moreover, the continuous lighting of the stations at night has the objection of not showing the motorman in time if there be a passenger waiting or not, for a person is not visible to him even when standing under the light at any great distance, and a reduced speed is required at all the stations so in case there is a passenger, a

The lights are extinguished automatically and the maker offers the choice of two methods for extinguishing the lamps after they have accomplished their purpose. One of these will extinguish the lights in any pre-arranged time, say 10 minutes, entirely by the action of gravity and has no delicate mechanism. This device can be arranged so that the switch will reset itself within any period, ranging from 10 seconds to thirty minutes. If the lights should go out before the car arrives, they may be relighted by the prospective passenger by again pulling down the handle.

In the other system there is no time limit and the lights will burn until a passing car puts them out. This is accomplished by a suitable device introduced between the trolley hanger and the ear suspending the trolley wire. The ear need not be removed to place the device in position, as the upward movement of the trolley wire when the car is passing actuates the switch and extinguishes the lights. Any ordinary cluster of five 16-candle power lamps can be used, but Mr. Painter recommends a special cluster which can be furnished by him in two designs, one in bracket form to be at-



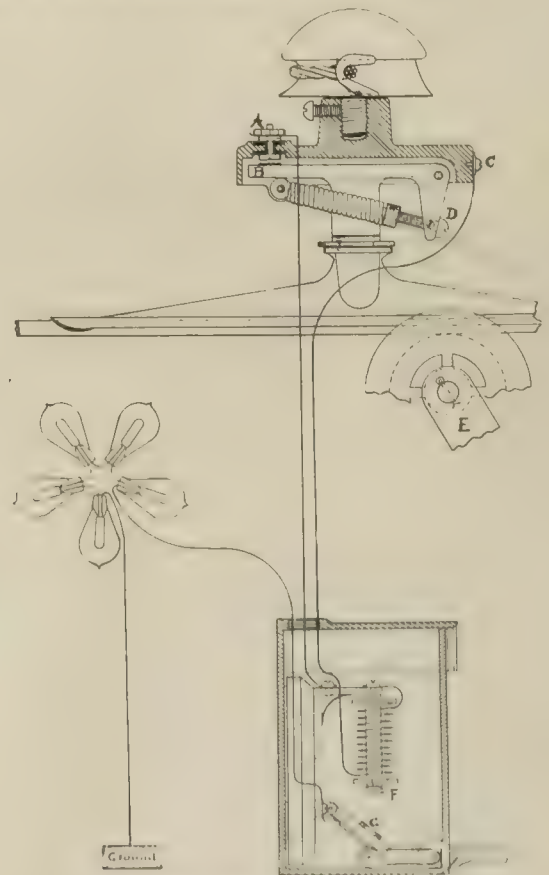
AUTOMATIC DEVICE WITHOUT COVER.



EXTINGUISHING DEVICE.



SIGNAL BOX WITH FRONT REMOVED.



WIRING DIAGRAM FOR CAR SIGNAL.

sudden stop can be avoided. With the idea of furnishing a satisfactory signal device by which the intending passenger can signal an approaching car, G. E. Painter, of Baltimore, Md., is placing on the market a suburban railway passenger signal, which consists of a switch to be operated by the prospective passenger, a cluster of lamps which lights when the switch is closed and a device for automatically extinguishing the lamps after they have served their purpose, the lamps being lighted only when actually used by a passenger.

The switch for lighting the lights is protected by a cover and is connected to a trolley wire and has a thoroughly insulated, porcelain and vulcanized rubber. The box is located on a trolley pole and the switch handle projects through the front within easy reach of any one standing on the ground. Stamped on the cover of the box is the instruction, "To signal at night, push down the handle."

After the cluster is lighted by the prospective passenger, he cannot extinguish it nor affect the mechanism in any way. This prevents any of the numerous unscrupulous persons from playing or meddling with the mechanism, as used by the car, if the switch could be manually reset.

tached to the pole, the other arranged to be suspended from the trolley wire.

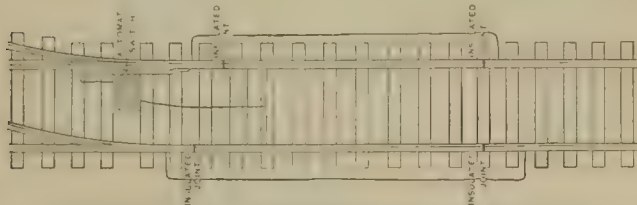
Mr. Painter also makes signals for road-crossings, which besides ringing a bell as a warning turns on a cluster of red lights, using the railway current to operate it. This device is also suitable for a caution signal on sharp curves, bridges and viaducts.

THE CENTRAL ELECTRIC CO. of Chicago, reports a most gratifying business for the outgoing year 1903, and asserts that 1904 will witness still further improvements and developments of its already immense business. The company states that it will continue to push the same specialties with which its name is already so well identified, Okonite and I X L wires, D. & W. enclosed fuses, Pittsburg transformers and Columbia lamps.

Four passenger cars and two motor cars were burned at the terminus of the Douglas Park branch of the Metropolitan West Side Elevated Railroad Co., Chicago, on the morning of December 5th, entailing a loss of about \$100,000.

A New Automatic Track Switch for Electric Roads.

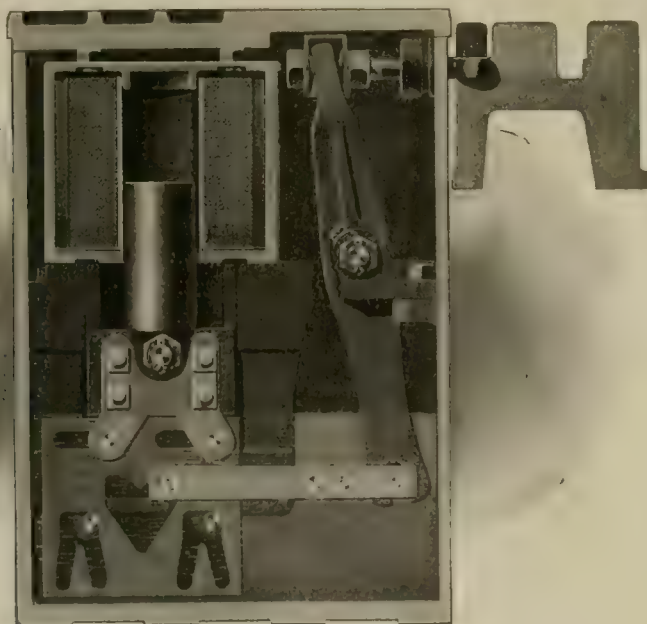
The American Automatic Switch Co., 120 Liberty St., New York City, has developed an automatic track switch by means of which the motorman of an electric car is enabled to turn the switch point in either direction from the platform of his car without the use of a switch rod or bar. The idea of an automatic track switch is not new, but this particular device appears to possess certain novel features. The mechanism directly controlling the switch point is encased in a water tight box, buried at the side of the track near the point, the top of the box being flush with the paving. In connection with this box there is either an insulated section of trolley wire or an insulated section of rail, so that the flow of current to the mechanism in the switch box can be controlled by the motorman of



LOCATION AND CONNECTIONS OF TRACK SWITCH.

an approaching car. To turn the switch from rest in either position, to the other position, the car must pass over the insulated section with the controller handle on the first or second point, thereby permitting current to flow through the switch box. If the switch is in the right position as the car approaches, the motorman turns off the current and drifts over the insulated section with the power off.

The mechanism within the switch box comprises essentially a solenoid coil, within which moves a plunger, having at its lower end a specially designed cam-plate, which by its movement when the plunger is raised operates a lever mechanism to throw the switch point. It will be understood that when an impulse of current passes through the magnet coils, the plunger will be raised and the switch



MECHANISM OF TRACK SWITCH.

point moved to the position opposite to the one which it previously occupied.

The claims set forth in favor of this new device include the following: As the switch box is completely water proof and water tight, no dirt, water, ice or salt can come in contact with the magnet or the working parts of the switch. The coils of the magnet are enclosed in an inner sealed case within the larger box, and the magnet is immersed in a special oil. The larger box is also partly filled

with oil, so that all of the working parts of the switch move in a bath of oil. The switch mechanism is made of tool steel. The cam-plate produces a semi-lock, but does not prevent turning of the switch with the switch iron.

The officers of the American Automatic Switch Co. are as follows:

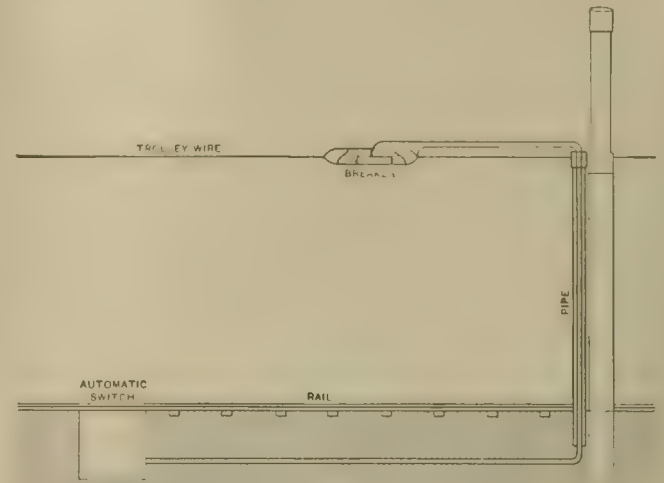


DIAGRAM OF WIRING FOR TRACK SWITCH.

President, J. Roosevelt Shanley; vice-president, Roy V. Collins; secretary and treasurer, H. Hardcastle Pennock; consulting engineer, Alfred K. Warren; sales manager, H. N. Powers.

Spotting from Outside of Cars.

It being inevitable that as long as there are dishonest conductors some system of espionage must be employed by street railway companies, the following suggestions which the "Review" has received from a street car conductor may serve to point the way to a more satisfactory plan of spotting than that in vogue. Instead of having spotters ride upon the cars, it is suggested that a means can be found whereby a spotter, by riding alongside or following a car, may succeed in keeping track of the passengers boarding and alighting from the car quite successfully, and also catch frequent glimpses of the fare register as he goes along. A motorcycle might be employed for the purpose. It is suggested also that an incandescent lamp on the roof of the car might be connected to the register in such manner that every time a fare is registered it will glow. The spotter on his motorcycle could readily keep the tally by that means, it is thought.

It is further suggested that the company should always have a man in each car house as "extra" motorman, whose duty it shall be to watch out for those conductors who arrange with the motormen beforehand plans for robbing the company.

Suit to Determine Taxable Value of Track.

The Louisville Railway Co. is being sued by the auditor of Jefferson county, Kentucky, for taxes amounting to about \$375,000, inclusive of a claim of 20 per cent on its track mileage during the past five years, the point at issue being whether the mileage shall be measured by single or double tracks. The auditor's agent claims that the taxable value of the tracks is by single trackage. Mr. T. J. Minary, president of the road, states that the law reads "road" instead of "track," and the company accordingly numbers the miles of track in its system on the basis of double track where it is double and single track where it is single. This, he states, is the rule elsewhere.

Turbines and Electric Locomotives for New York Central.

The New York Central & Hudson River Railroad Co. has placed an order with the General Electric Co. for eight turbo-generators of 7,500 h. p. capacity each. The turbines are of the four-stage, vertical Curtis type; the generators are 25 cycle, 3-phase, generating current at a pressure of 11,000 volts. An order has also been placed with the same company for 30 electric locomotives of an entirely new design. Each locomotive will weigh 85 tons, with an adhesive weight on the drivers of 67 tons, and each will have a capacity of 2,200 h. p., and will be capable of hauling a train of 500 tons at a speed of 60 miles an hour. These are the largest orders of the kind ever placed.

Handsome Cars for Hudson River Ry.

The J. G. Brill Co., of Philadelphia, recently shipped four semi-convertible cars to the New Jersey & Hudson River Railway & Ferry Co., of Hackensack, which were ordered through the engineering firm of Ford, Bacon & Davis, and which are considered exceedingly handsome cars. The accompanying views show the exterior of one of the cars and a diagram of the seating arrangements. The cars are painted a dark red, with gold leaf lettering and lines. As the floor plan shows, they are divided into two compartments, one being for the use of smokers. The dividing partition is of quartered oak with glass in the upper part. Quartered oak is used for the entire interior finish, including the ceilings.

The side sills are of long leaf yellow pine, plated on the inside with 12 in. x $\frac{3}{8}$ in. steel the full length and turned around the corners, lapping the end sills by 10 inches. The end sills are of Indiana white oak, $3\frac{3}{4}$ in. x $7\frac{1}{4}$ in. There are three cross sills, $3\frac{3}{4}$ in. x $6\frac{5}{8}$ in., each having a $\frac{5}{8}$ -in. tie rod. The diagonal braces are 2 in. x 6 in. The outside platform knees are reinforced with Z-bars, 6 in. x $3\frac{1}{2}$ in. x $\frac{5}{8}$ in., extending from the angle iron bumpers to the body bolsters. Three T-bars 24 in. apart are used instead of center sills, extending 10 ft. back from the end sills. Heavy gusset plates are bolted to the sills under the corner posts and under the side sills at the crossings.

The length of the car over the corner posts is 29 ft. $2\frac{1}{2}$ in.; over the bumpers, 40 ft. $2\frac{1}{2}$ in.; length over all from tip to tip of draw bars, 43 ft. $2\frac{1}{2}$ in. The vestibules are 4 ft. $5\frac{1}{4}$ in. long at the center; width of cars over the side posts, 7 ft. $8\frac{1}{2}$ in.; interior width, measured from the lining between the posts, 7 ft. 4 in. This last

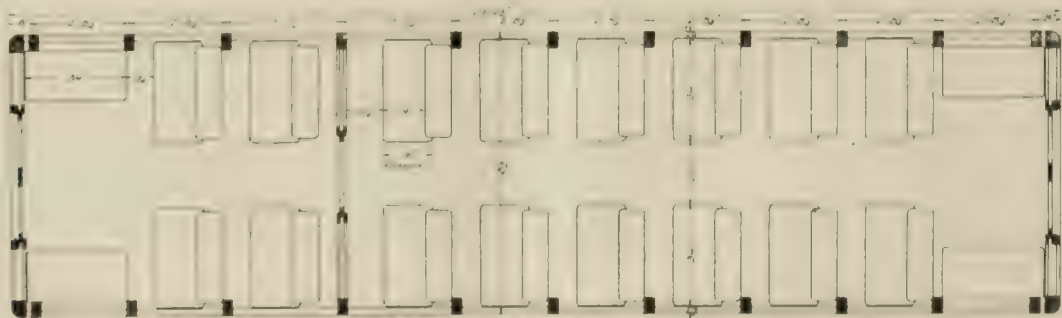


NEW CAR FOR HACKENSACK, N. J. J. G. BRILL CO.

motor driven fan. Both engines and motors have been developed under the exacting conditions usually incident to fan practice, namely, high speed and constant operation with comparatively little attention. These motors are built in sizes ranging from $1\frac{1}{2}$ to 250 kw.

Convicted of Transfer Frauds.

Two persons who had been charged by the Boston & Northern Street Railway Co. with conspiracy and forging and uttering



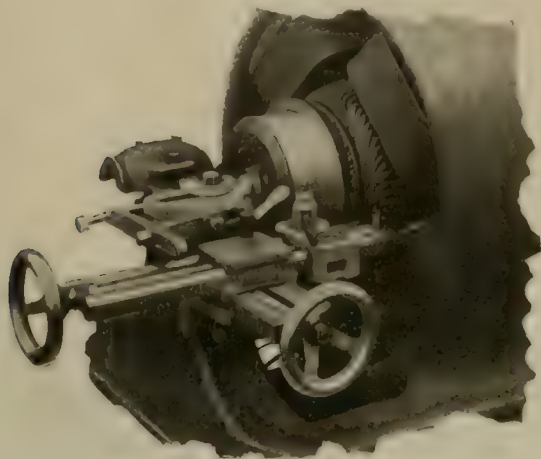
SEATING PLAN OF BRILL CAR.

transfer check coupons, and two who were charged with larceny, were convicted in the Superior Court at Boston, Mass., November 20th. These cases, which are but a portion of those on the docket, grew out of extensive transfer frauds which had extended over a long period, and by means of which the company was stated to have lost thousands of dollars. The counterfeit checks were made by two printers and sold to conductors at a nominal price, and they turned them in to the company at full value.

The new freight house of the Indiana Union Traction Co., at Muncie, Ind., was opened for business December 1st. The new building is to be used as a freight house only until the new terminal station is completed.

Carr Commutator-Truing Device.

The Akron (O.) Electrical Manufacturing Co., maker of the Carr commutator truing device, which is illustrated herewith, recently issued a bulletin (No. 429) describing and illustrating this useful tool, which has been adopted by a number of the leading electric railway companies. This device has been submitted to very rigid tests and the maker has no hesitation in claiming that it is an ab-



CARR COMMUTATOR TRUING DEVICE.

solutely reliable tool for turning up the commutator of a generator without having to remove the armature from its bearing. The device is built on the engine lathe principle and is directly attachable to any machine having a removable bearing cap. Its work is done while the shaft is running in its bearings and consequently the face of the commutator runs perfectly true, and it is possible to do the work in less time than it ordinarily takes to remove a small armature, even.

In practice, the device is attached to the machine by means of a T-shaped clamp which is bolted on in the place of the bearing cap, set screws being provided in its lower end to rest against the pedestal and steady the tool. On this binding piece is clamped the tool bar by means of an ingenious saddle that allows the bar to move perpendicularly and also parallel to the face of the commutator, and instantly clasps the two parts by drawing a lever nut on top. The tool bar carries a slide, which in turn carries the tool post, the slide being manipulated by means of a screw and hand wheel. The tool bar is easily adjusted to any width of commutator up to 12 and 18 in., according to the size of device used. The bar may also be reversed by slacking the lever nut and removing the top half of the saddle, and this with the double tool post makes it possible to use the device on either side of the machine. The tool can be adjusted at right angle to the face of the commutator. A center is attached to the device by adjustable brackets to prevent end motion in the commutator while being turned. For the best work a commutator speed of from 200 to 250 ft. per minute is recommended.

The company is also making commutator-truing devices which have been ordered for several street railway power houses. The General Electric Co. handles the device, while the Stanley-Northern Co., as well as many manufacturing companies and central station plants have adopted them.

The De Kalb-Sycamore Electric Co. has removed its generating apparatus from the Sycamore power house to De Kalb, Ill., in consequence of increased demands for power.

The Chicago Constructing & Engineering Co., formerly Weston Bros., has been awarded the contract for grading the Galesburg, Monmouth & Rock Island Ry., one of the new McKinley properties, from Galesburg to Monmouth, Ill., 15 miles, the work to be completed by May 15th next.

A New Submarine Cable Plant.

The John A. Roebling's Sons Co. has just completed a new building which will enable it to largely increase its product of insulated wires and cables of all kinds, and will provide room for introducing on an adequate scale the manufacture of submarine cables. The company has made submarine cables for many years, but this part of the business seems to demand greater facilities, and to provide for this one of the largest and most complete plants in this country will be installed. The new buildings are located so that shipments may be made either by water or rail.

Both rubber and gutta percha core is used, and the present large rubber plant will take care of those orders calling for rubber insulated cables. Formerly the company has imported gutta percha core, but it is the intention in the new plant to provide a complete factory for manufacturing this core under the direction of a most competent and experienced manager, who has had a long and successful experience abroad in this kind of work.

It is intended to so equip the new factory that submarine cables of any kind of core, with any description of armor, may not only be made, but also to provide the necessary apparatus and equipment to lay any of the cables manufactured.

The Roebling company will be able not only to furnish the variety of insulations, but also will be prepared to take contracts to turn over to the purchaser the submarine cables laid and ready for use. The company has the advantage of manufacturing all the constituent parts of a cable, copper wire, insulated core, and armor wire, which should reduce the cost and insure to the purchaser the very best materials.

Cars for Blue Grass Traction Co.

The Laconia Car Company Works, of Boston, recently built for the Blue Grass Traction Co., of Lexington, Ky., a number of cars similar to that shown by the accompanying illustration. These cars are each 45 ft. 5½ in. over all, or 35 ft. over body, and 8 ft. 8 in. wide over all. The roof is of steam-car pattern. There are 12 double sash windows on each side, both sashes being arranged to drop into window pockets. When the windows are so dropped the openings are covered with a hinged cover which forms a convenient arm rest. Pantasote curtains of the Curtain Supply Co. make are fitted to the windows.

The interior finish, both sides and ceiling, is of selected quartered oak. Each car is divided into two compartments by means of a partition with a glass top, and having a single swing door in the center. There are nine Wheeler No. 42 seats in the main compartment, at



CAR FOR BLUE GRASS TRACTION CO.—LACONIA CAR CO.

the side, upholstered in rattan, with bronze grab handles on the backs. In the smoking compartment longitudinal slatted seats are used, arranged so that they may be folded when not in use. The cars are also provided with basket racks running the full length of the cars; also a sash-adjusting device for opening all monitor windows. Window guards extend the entire length of the car on the outside.

The cars are equipped with the Wood patent folding gates, New Haven registers, Philadelphia type; Mosher arc headlights, with dimmers; Kilborn sand boxes, Wilson trolley catchers, Consolidated heaters, Christensen air brakes, and G. E. No. 67 motors. The trucks are the Laconia No. 9-B-3, with 5 ft. 4-in. wheel base, and patented cushion swing bolsters, and fitted with Laconia 33-in. double plate wheels, with 3-in. tread and 1-in. flange.

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